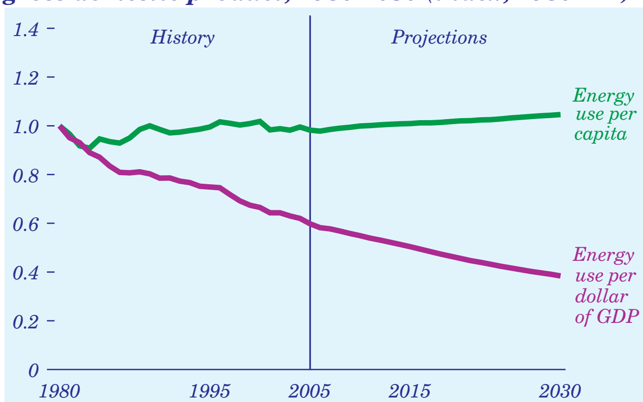
Average Energy Use per Person Increases Through 2030

Figure 33. Energy use per capita and per dollar of gross domestic product, 1980-2030 (index, 1980 = 1)



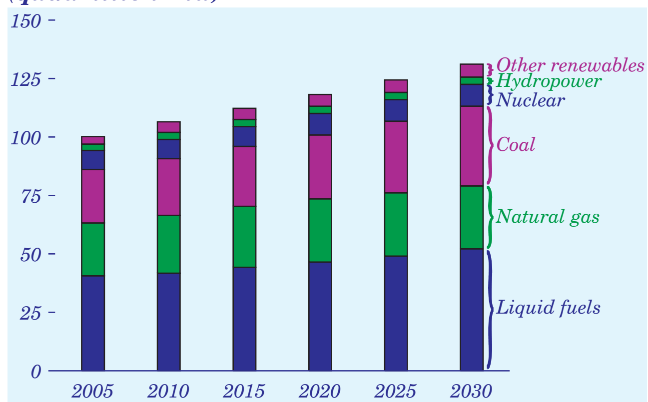
The future path of U.S. energy demand will depend on trends in population, economic growth, energy prices, and technology adoption. *AEO2007* cases developed to illustrate the uncertainties associated with those factors include low and high economic growth cases, low and high price cases, and 2006 and high technology cases (see Appendixes B, C, D, and E).

Population growth is a key determinant of energy demand for housing, services, and travel. Its impact is magnified by changes in energy consumption per capita, which reflect the combined effects of economic growth, energy prices, and other factors. In the reference case, energy consumption per capita grows by 0.3 percent per year from 2005 to 2030, faster than it has in recent history (Figure 33), as a result of projected growth in real disposable income per capita.

Although the Nation's reliance on imported fuel has been growing, the economy is becoming less dependent on energy in general. U.S. energy intensity (energy use per 2000 dollar of GDP) declines by an average of 1.5 percent per year in the low growth case, 1.8 percent in the reference case, and 1.9 percent in the high growth case. Efficiency gains and faster growth in less energy-intensive industries account for most of the projected decline, more than offsetting growth in demand for energy services in buildings, transportation, and electricity generation. The decline is more rapid in the high economic growth case, because the additional growth is concentrated in less energy-intensive industries. In all three growth cases, as energy prices moderate over the longer term, energy intensity declines at a slower rate.

Coal and Liquid Fuels Lead Increases in Primary Energy Use

Figure 34. Primary energy use by fuel, 2005-2030 (quadrillion Btu)



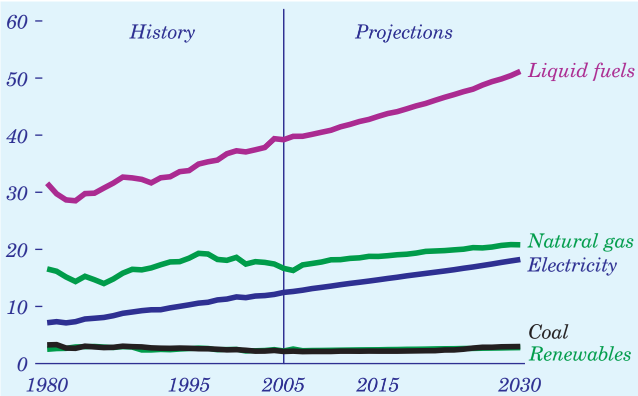
Total primary energy consumption, including energy for electricity generation, grows by 1.1 percent per year from 2005 to 2030 in the reference case (Figure 34). Fossil fuels account for 87 percent of the growth. The increase in coal use occurs mostly in the electric power sector, where strong growth in electricity demand and favorable economics under current environmental policies prompt coal-fired capacity additions. About 61 percent of the projected increase in coal consumption occurs after 2020, when higher natural gas prices make coal the fuel of choice for most new power plants. Over the longer term, growth in natural gas consumption for power generation is restrained by its high price relative to coal, although natural gas use increases in the near term. Industry and buildings account for about 90 percent of the increase in natural gas consumption from 2005 to 2030.

Transportation accounts for 94 percent of the projected increase in liquids consumption, dominated by growth in fuel use for light-duty vehicles. Fuel use by freight trucks, second in energy use among travel modes, grows by 1.8 percent per year on average, the fastest annual rate among the major forms of transport. The remainder of the liquids growth in the *AEO2007* reference case occurs in the industrial sector, primarily in refineries. The projected trend in liquid fuels use in the buildings sectors is relatively flat in the reference case.

AEO2007 projects rapid percentage growth in renewable energy production, partly as a result of State mandates for renewable electricity generation. Additions of new nuclear power plants are also projected, spurred by PTCs available under EPACT2005.

Liquid Fuels and Electricity Lead Growth in Energy Consumption

Figure 35. Delivered energy use by fuel, 1980-2030 (quadrillion Btu)



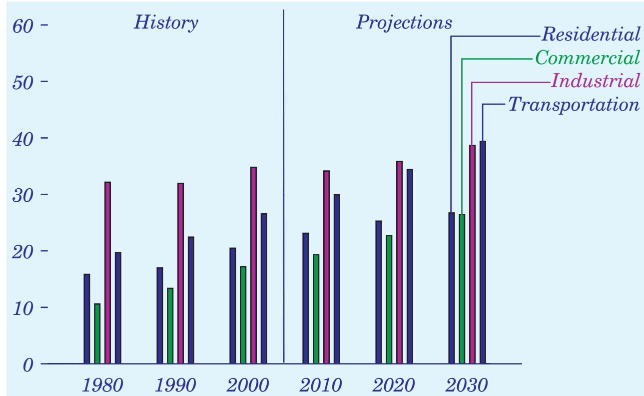
Delivered energy use (excluding losses in electricity generation) grows by 1.1 percent per year from 2005 to 2030 in the reference case. Liquid fuels use, which makes up more than one-half of total delivered energy use, grows by about the same percentage (Figure 35). About 93 percent of the projected increase is in the transportation sector, which depends heavily on liquid fuels. Even in the high price case, liquid fuels use for transportation grows by 0.9 percent per year on average through 2030. Growing population, incomes, and economic output spur travel demand, while fuel efficiency improves only slightly. With varying assumptions on population and economic growth, average annual growth in delivered energy use from 2005 to 2030 ranges from 0.7 percent in the low growth case to 1.5 percent in the high growth case.

Recent trends in electricity use are expected to continue, given strong growth in commercial floorspace, continued penetration of electric appliances, and increases in industrial output. Natural gas use grows more slowly than overall delivered energy demand, in contrast to its more rapid growth during the 1990s. Natural gas consumption in the residential sector is projected to grow by less than 10 percent over the 25-year projection.

End-use demand for energy from marketed renewables, such as wood, grows by 1.1 percent per year. Industrial biomass, mostly a byproduct fuel in the pulp and paper industry, is the largest component of end-use renewable fuel. Renewable energy from solar and geothermal heat pumps more than doubles over the projection, but those sources remain at less than 1 percent of residential delivered energy use.

U.S. Primary Energy Use Climbs to 131 Quadrillion Btu in 2030

Figure 36. Primary energy consumption by sector, 1980-2030 (quadrillion Btu)



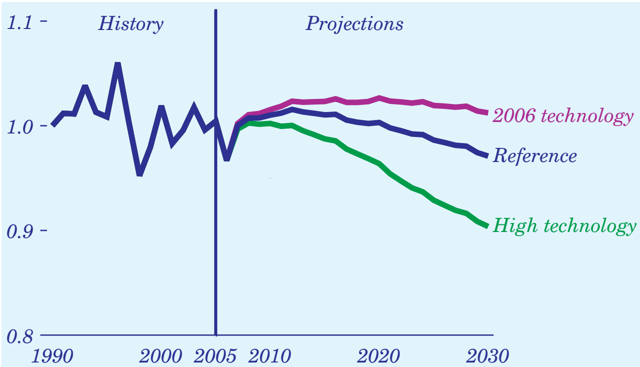
Primary energy use (including electricity generation losses) is projected to increase by 31 percent over the next 25 years in the reference case (Figure 36). The projected growth rate of energy consumption approximately matches the average from 1981 to 2005. Demand for energy in the early 1980s fell in the face of recession, high energy prices, and changing regulations; but beginning in the mid-1980s, declining real energy prices and economic expansion contributed to a marked increase in energy consumption. The long-term upward trend in energy use is projected to continue in the *AEO2007* reference case, but the growth is moderated by rising energy prices.

The most rapid growth in sectoral energy use is in the commercial sector, where services continue to expand more rapidly than the economy as a whole. The growth rate for residential energy use is about half that for the commercial sector, with demographic trends being a dominant factor. Transportation energy use grows by 1.4 percent per year from 2005 to 2030 (about the same as the growth rate from 1980 to 2005), despite relatively high fuel prices. Increases in travel by personal and commercial vehicles are only partially offset by vehicle efficiency gains.

In the reference case, primary energy use grows more slowly in the industrial sector than in the other sectors, with efficiency gains, higher real energy prices, and shifts to less energy-intensive industries moderating the expected growth. In the high economic growth case, however, the projected increase in industrial energy use is almost double that in the reference case.

Residential Energy Use per Capita Varies With Technology Assumptions

Figure 37. Residential delivered energy consumption per capita, 1990-2030 (index, 1990 = 1)

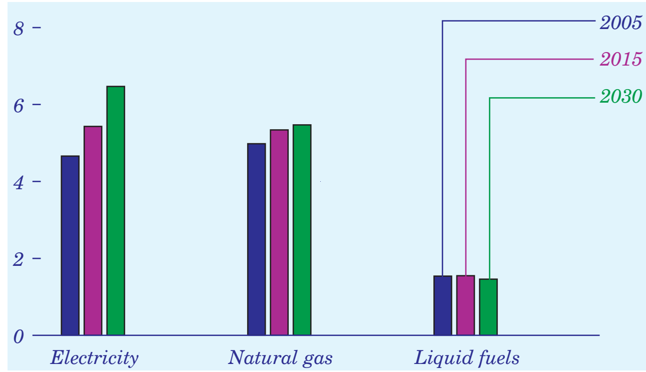


Residential energy use per person has remained fairly constant since 1990 (taking into account year-to-year fluctuations in weather), with increases in energy efficiency offset by consumer preference for larger homes and by new residential uses for energy. As the U.S. population has shifted to the South and West, all-electric homes have become more prevalent and electricity use for air conditioning has increased, leading to a rise in electricity consumption per capita while natural gas use and liquid fuels use per capita have fallen. In the reference case, however, as the population shift to warmer climates continues, slower penetration of new energy-using appliances and increases in efficiency are projected to reduce energy use per capita.

In the *AEO2007* projections, residential energy use per capita changes with assumptions about the rate at which more efficient technologies are adopted. The 2006 technology case assumes no increase in the efficiency of equipment or building shells beyond those available in 2006. The high technology case assumes lower costs, higher efficiencies, and earlier availability of some advanced equipment. In the reference case, residential energy use per capita is projected to fall below the 1990 level after 2020. The 2006 technology case approximates an upper bound on energy use per capita in the future: delivered energy use per capita remains above the 1990 level through 2030, when it is 4 percent higher than projected in the reference case (Figure 37). The high technology case indicates a lower bound for energy use per capita in the cases considered here, falling below the 1990 level after 2013 and reaching a 2030 level that is 7 percent below the reference case projection.

Household Uses for Electricity Continue To Expand

Figure 38. Residential delivered energy consumption by fuel, 2005, 2015, and 2030 (quadrillion Btu)

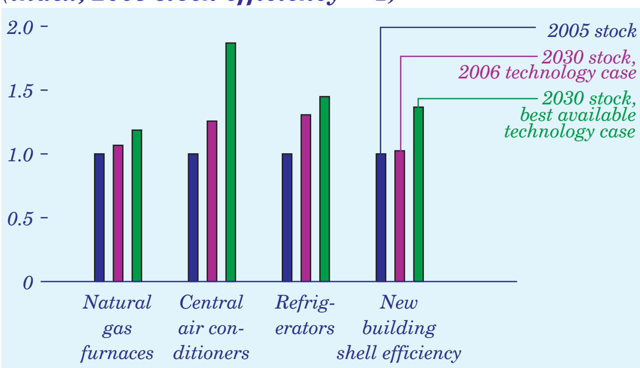


Over the past several decades, residential electricity demand has increased as more uses for electricity have emerged. The reference case projects further increases in residential electricity consumption, averaging 1.3 percent per year from 2005 to 2030 (Figure 38), as more electric devices and larger television sets with digital capability continue to penetrate residential markets. Two alternative cases—the high economic growth case and the high technology case—provide high and low ranges, respectively, for the projections. In the high growth case, population increases lead to more households, which use more electric appliances. In the high technology case, more efficient houses and appliances lead to lower electricity use. The 2030 projections for residential electricity use in the two cases are 0.4 quadrillion Btu higher and 0.6 quadrillion Btu lower, respectively, than the reference case projection of 6.5 quadrillion Btu.

Changes in natural gas and liquid fuels consumption in the residential sector over the past 20 years have been less dramatic. For residential natural gas consumption, the reference case projects annual growth averaging 0.4 percent from 2005 to 2030, and for liquid fuels use a slight decrease is projected. In the high economic growth case, the sector's natural gas use in 2030 is 0.3 quadrillion Btu higher than the reference case level of 5.5 quadrillion Btu; in the high technology case it is 0.3 quadrillion Btu lower. For liquid fuels use, the low and high price cases provide high and low estimates, respectively, both varying in 2030 by 0.1 quadrillion Btu from the reference case level (1.5 quadrillion Btu). With relatively few new homes using oil furnaces, the economic growth cases do not have as much effect on residential liquid fuels use.

Increases in Energy Efficiency Are Projected To Continue

Figure 39. Efficiency indicators for selected residential appliances, 2005 and 2030 (index, 2005 stock efficiency = 1)



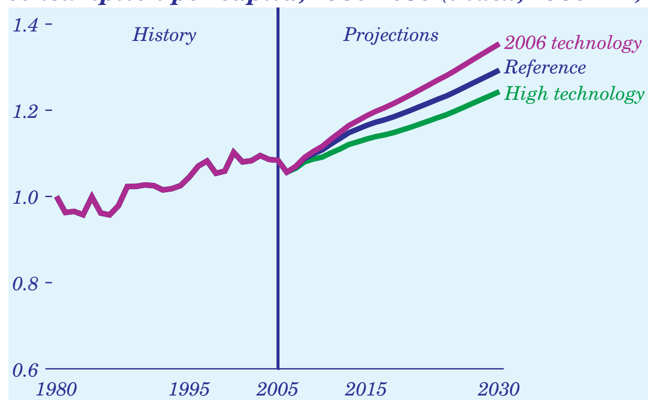
The energy efficiency of new household appliances plays a key role in determining the types and amounts of energy used in residential buildings. As a result of stock turnover and purchases of more efficient equipment, energy use by residential consumers, both per household and per capita, has fallen over time. In the 2006 technology case, which assumes no efficiency improvement for available appliances beyond 2006 levels, normal stock turnover results in higher average energy efficiency for most residential equipment in 2030, as older appliances are replaced with more efficient models from the 2006 stock (Figure 39).

The greatest gains in residential energy efficiency are projected in the best available technology case, which assumes that consumers purchase the most efficient products available at normal replacement intervals regardless of cost, and that new buildings are built to the most energy-efficient specifications available, starting in 2007. In this case, residential delivered energy consumption in 2030 is 27 percent less than projected in the 2006 technology case and 24 percent less than in the reference case. Purchases of more energy-efficient products, such as solid-state lighting and condensing gas furnaces, reduce the amount of energy used without lowering service levels.

Several current Federal programs, including Zero Energy Homes and ENERGY STAR Homes, promote the use of efficient appliances and building envelope components, such as windows and insulation. In the best available technology case, use of the most efficient building envelope components available can reduce heating requirements in an average new home by nearly 30 percent.

Rise in Commercial Energy Use per Capita Is Projected To Continue

Figure 40. Commercial delivered energy consumption per capita, 1980-2030 (index, 1980 = 1)

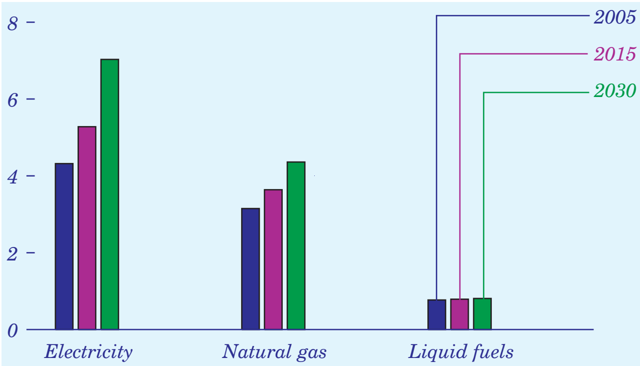


In the commercial sector, delivered energy consumption per capita increased by 8 percent from 1980 to 2005, primarily as a result of rising electricity use as the Nation moved increasingly to a service economy. Commercial energy use per person is projected to increase more rapidly in the reference case, by a total of 19 percent from 2005 to 2030, as the transition to a service economy continues and energy prices moderate from current levels. Depending on assumptions about the availability and adoption of energy-efficient technologies, the size of the projected increase varies from a low of 15 percent in the high technology case to a high of 25 percent in the 2006 technology case (Figure 40).

The reference case assumes future improvements in efficiency for commercial equipment and building shells, as well as increased demand for energy services. While commercial energy use per capita increases by 19 percent from 2005 to 2030 in the reference case, commercial energy intensity (delivered energy consumption per square foot of floorspace) shows little change, increasing by only 1 percent. The 2006 technology case assumes the same laws and regulations as the reference case but with no increase in the energy efficiency of commercial equipment and building shells beyond those available in 2006. The result is a 5-percent increase in commercial delivered energy use in 2030 relative to the reference case. In the high technology case, assuming earlier availability, lower costs, and higher efficiencies for more advanced equipment and building shells, delivered energy consumption in 2030 is 4 percent below the reference case projection.

Electricity Leads Expected Growth in Commercial Energy Use

Figure 41. Commercial delivered energy consumption by fuel, 2005, 2015, and 2030 (quadrillion Btu)

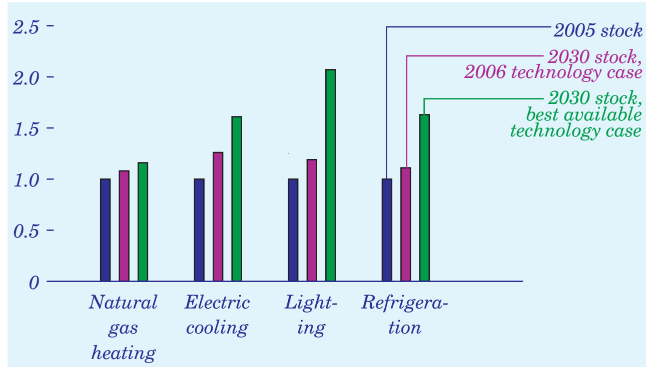


Commercial floorspace growth and, in turn, commercial energy use are driven by trends in economic and population growth. In the *AEO2007* projections, growth in disposable income leads to increased demand for services from hotels, restaurants, stores, theaters, galleries, arenas, and other commercial establishments, which in turn are increasingly dependent on electricity both for basic services and for business services and customer transactions. In addition, the growing share of the population over age 65 increases demand for healthcare and assisted living facilities and for electricity to power medical and monitoring equipment in those facilities. The reference case projects further increases in commercial electricity use, averaging 2.0 percent per year from 2005 to 2030 (Figure 41). The high and low economic growth cases provide high and low ranges for the average annual growth rate of commercial electricity demand from 2005 to 2030, at 2.3 percent and 1.6 percent, respectively.

For commercial natural gas use (primarily for space heating and water heating), the reference case projects average annual growth of 1.3 percent from 2005 to 2030, and for liquid fuels use the projected average annual growth rate is 0.2 percent. The alternative projections for natural gas use in 2030 range from a high of 4.7 quadrillion Btu in the high growth case to 4.0 in the low growth case, compared with 4.4 in the reference case. For liquid fuels use, the low and high oil price cases provide high and low estimates, respectively, which in 2030 vary by 0.2 and 0.1 quadrillion Btu from the reference case projection of 0.8 quadrillion Btu.

Current Technologies Provide Potential Energy Savings

Figure 42. Efficiency indicators for selected commercial energy end uses, 2005 and 2030 (index, 2005 stock efficiency = 1)



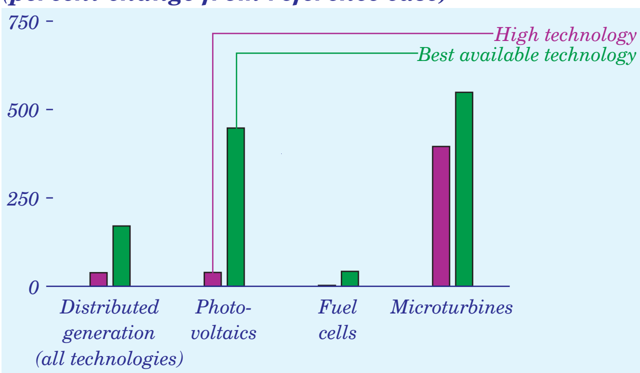
The stock efficiency of energy-using equipment in the commercial sector increases in the *AEO2007* reference case. Adoption of more energy-efficient equipment is expected to moderate the projected growth in demand, in part because of building codes for new construction and minimum efficiency standards, including those in EPACT2005; however, the long service lives of many kinds of energy-using equipment limit the pace of efficiency improvements.

The most rapid increase in overall energy efficiency for the commercial sector is projected in the best technology case, which assumes that only the most efficient technologies are chosen, regardless of cost, and that building shells in 2030 are 50 percent more efficient than projected in the reference case. With the adoption of improved heat exchangers for space heating and cooling equipment, solid-state lighting, and more efficient compressors for commercial refrigeration, commercial delivered energy consumption in 2030 in the best technology case is 13 percent less than projected in the reference case and 17 percent less than in the 2006 technology case.

In the 2006 technology case, which assumes equipment and building shell efficiencies limited to those available in 2006, energy efficiency in the commercial sector still is projected to improve from 2005 to 2030 (Figure 42), because the technologies available in 2006 can provide savings relative to commercial equipment currently in place. When businesses consider equipment purchases, however, the additional capital investment needed to buy the most efficient technologies often carries more weight than do future energy savings.

Advanced Technologies Could Slow Electricity Consumption in Buildings

Figure 43. Buildings sector electricity generation from advanced technologies, 2030 (percent change from reference case)

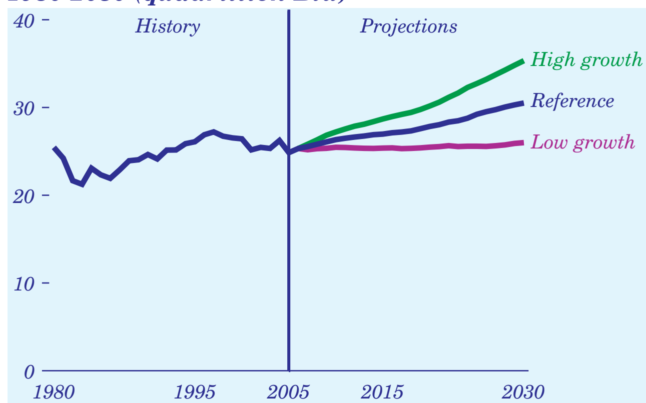


Alternative technology cases for the residential and commercial sectors vary the assumptions about availability and market penetration of distributed generation technologies. In the high technology case, buildings generate 6.2 billion kilowatthours (38 percent) more electricity in 2030 than the 16.1 billion kilowatthours projected in the reference case (Figure 43), most of which offsets residential and commercial electricity purchases. In the best available technology case, electricity generation in buildings in 2030 is 27.4 billion kilowatthours (171 percent) higher than in the reference case, with solar systems responsible for 78 percent of the increase. The optimistic assumptions of the best technology case benefit solar PV systems in particular, because there are no fuel expenses for solar systems. In the 2006 technology case, assuming no technological progress or cost reductions after 2006, electricity generation in buildings in 2030 is 6.1 billion kilowatthours (38 percent) lower than in the reference case.

Some of the heat produced by fossil-fuel-fired generating systems may be used to satisfy heating needs in CHP applications, increasing system efficiency and enhancing the attractiveness of distributed generation technologies for buildings. On the other hand, additional natural gas use for distributed generation systems in the high technology and best technology cases offsets some of the energy cost reductions that result from improvements in end-use equipment and building shells. In addition, if natural gas prices increased substantially, commercial establishments could find electricity purchases more economical than the installation of distributed generation technologies.

Economic Growth Cases Show Range for Projected Industrial Energy Use

Figure 44. Industrial delivered energy consumption, 1980-2030 (quadrillion Btu)



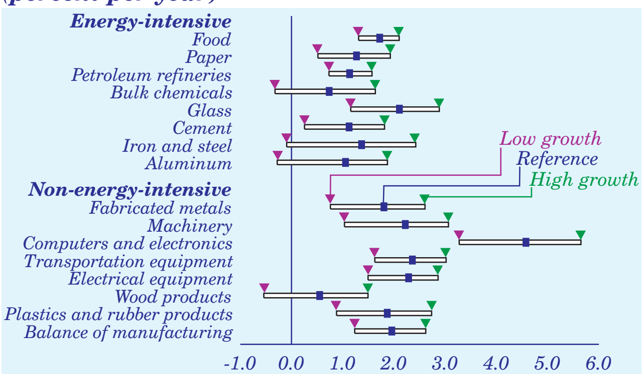
In the *AEO2007* projections, the path of industrial delivered energy consumption varies significantly, depending on the assumptions used in different cases. The projections for industrial sector energy consumption in 2030 range from 26.0 quadrillion Btu in the low economic growth case to 35.3 quadrillion Btu in the high growth case, with the reference case projection approximately midway between the two at 30.5 quadrillion Btu (Figure 44).

In the refining industry, reliance on nonconventional inputs for liquid fuels production is projected to increase rapidly. As a result, energy consumption by refineries in the reference case increases from 3.7 quadrillion Btu in 2005 to 6.3 quadrillion Btu in 2030. More than 60 percent of the increase is the result of increased coal use for CTL production and biomass use for ethanol production.

Non-fuel uses of energy transform normal energy inputs into other, non-energy products. In 2005, the U.S. chemical industry converted petroleum products with an estimated energy value of 3.4 quadrillion Btu into products such as plastics and fertilizers. Such non-fuel use is projected to increase in the reference case, to 3.9 quadrillion Btu in 2030. In addition, petroleum use to make asphalt and road oil, which are necessary components of construction industry activities, is projected to increase from 1.3 quadrillion Btu in 2005 to 1.4 quadrillion Btu in 2030. If energy consumption in the refining sector were excluded, nonfuel uses of petroleum would account for all the projected increase in industrial sector petroleum use in the reference case.

Energy-Intensive Industries Grow Less Rapidly Than Industrial Average

Figure 45. Average output growth in the manufacturing subsectors, 2005-2030 (percent per year)



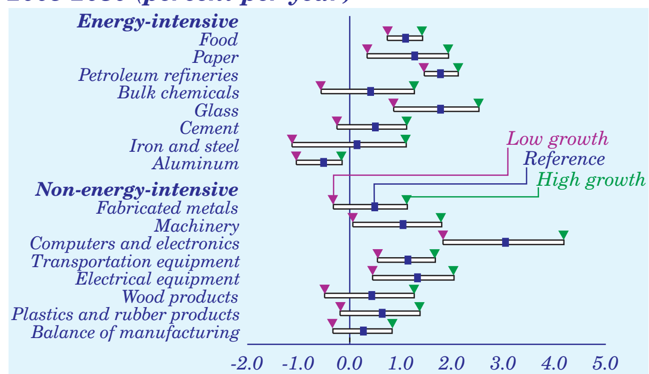
One of the most important determinants of industrial sector energy consumption is growth in value of shipments. In *AEO2007*, average annual growth in value of shipments for the industrial sector from 2005 to 2030 ranges from 1.2 percent per year in the low economic growth case to 2.8 percent per year in the high growth case, with the reference case projection approximately midway between the two at 2.0 percent per year. The range of growth in the individual subsectors is even wider.

By manufacturing subsector, the projected rate of growth in value of shipments in the reference case ranges from a low of 0.6 percent per year (wood products) to a high of 4.6 percent per year (computers). In general, the projected growth rates for the energy-intensive manufacturing subsectors are lower than those for the non-energy-intensive subsectors. Glass is the only energy-intensive subsector with a projected growth rate above 2 percent per year in the reference case.

The projected growth rates for value of shipments in the industrial subsectors in the high and low economic growth cases generally are symmetrical around the reference case (Figure 45). Industries with the most rapid projected growth in the reference case show the widest ranges, so that the pattern of faster value of shipments growth for the non-energy-intensive manufacturing sectors in the reference case is also evident in the high and low economic cases.

Energy Consumption Growth Varies Widely Across Industry Sectors

Figure 46. Average growth of delivered energy consumption in the manufacturing subsectors, 2005-2030 (percent per year)



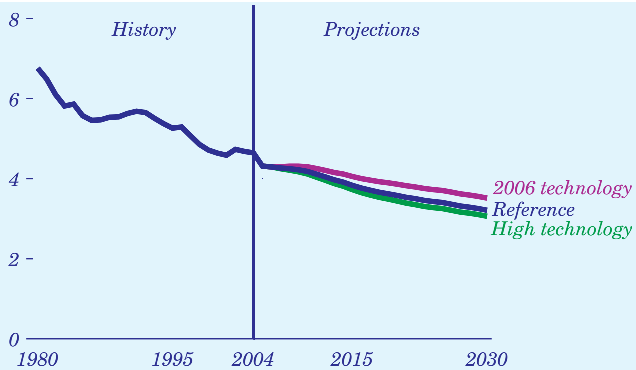
The average annual growth rate for total delivered energy consumption in the industrial sector from 2005 to 2030 ranges from an increase of 0.2 percent per year to an increase of 1.4 percent per year in the alternative cases for *AEO2007*. The widest variation is across the economic growth cases. Again, the range of the projections for individual subsectors is wider.

In the reference case, energy consumption growth rates for the manufacturing subsectors range from an increase of 3.0 percent per year (computers and electronics) to a decrease of 0.5 percent per year (aluminum). Delivered energy consumption growth in some of the energy-intensive industries (aluminum and steel) is held down by expected changes in production technology over the projection period. In general, the subsectors with the highest projected growth rates in energy consumption are those with the highest projected growth rates in value of shipments (computers and glass). The petroleum refining sector is an exception. As more refineries shift to alternative feedstocks for liquids production (biomass, coal, heavier crude oil) they use more energy per unit of output than is used for traditional petroleum-based refining.

The projected rates of growth in energy consumption in the alternative economic growth cases are generally symmetric around the reference case (Figure 46); however, the rate of growth is moderated by the level of investment in each case.

Energy Intensity in the Industrial Sector Continues To Decline

Figure 47. Industrial delivered energy intensity, 1980-2030 (thousand Btu per 2000 dollar value of shipments)



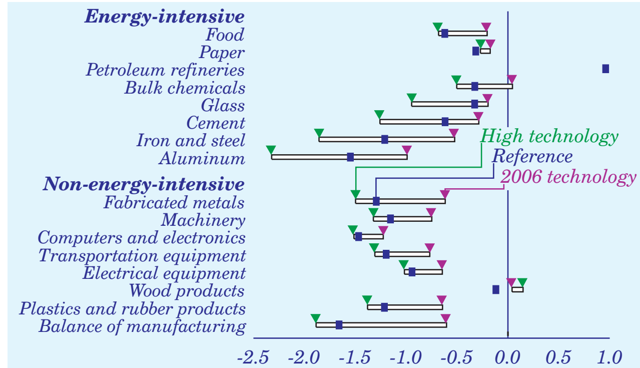
From 1980 to 2004 [*162*], energy consumption in the industrial sector was virtually unchanged, growing by a total of 3.1 percent, while value of shipments increased by 50 percent. Thus, industrial delivered energy use per dollar of industrial value of shipments declined by an average of 1.6 percent per year from 1980 to 2004 (Figure 47). Since 1990, however, the rate of decline in the sector's energy intensity has slowed: a 29-percent increase in industrial output from 1990 to 2004 resulted in a 6.5-percent increase in energy use and a 1.4-percent average annual decline in energy intensity.

Factors contributing to the decline in industrial energy intensity include a greater focus on energy efficiency after the energy price shocks of the 1970s and 1980s and a reduction in the share of industrial activity accounted for by the most energy-intensive industries. The energy-intensive industries' share of industrial output fell from 24 percent in 1980 to 21 percent in 2004.

The industrial value of shipments is projected to grow by 65 percent overall from 2005 to 2030, and the share attributed to the energy-intensive industries is projected to fall from 20 percent in 2005 to 17 percent in 2030. Consequently, even if no specific industry showed a reduction in energy intensity, the aggregate energy intensity of the industrial sector as a whole would decline [*163*].

Expected Declines in Energy Intensity Vary by Industry and Technology

Figure 48. Average change in energy intensity in the manufacturing subsectors, 2005-2030 (percent per year)

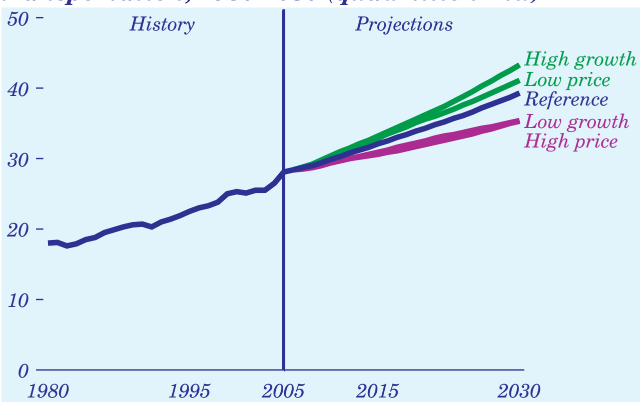


Energy intensity in the industrial subsectors can change for a variety of reasons. For example, no new primary smelting capacity is expected to be constructed in the U.S. aluminum industry, and secondary smelting, a less energy-intensive process of melting scrap, is expected to become the subsector's dominant technology. As a result, the reference case projection for energy intensity in the aluminum industry in 2030 is nearly one-third less than the 2005 level. In the petroleum refining industry, projected increases in coal use for CTL production result in increasing energy intensity, at an average rate of 1.0 percent per year from 2005 to 2030 [*164*].

A range of potential energy intensity and energy consumption outcomes for the industrial sector were developed for *AEO2007*. Energy intensity in the refining industry does not change in the 2006 technology and high technology cases [*165*]. Excluding refineries, projected average annual decreases in aggregate industrial energy intensity range from 1.0 percent per year in the 2006 technology case to 1.7 percent per year in the high technology case (Figure 48). In the high technology case, industrial delivered energy consumption in 2030 (excluding refining) is 1.4 quadrillion Btu less than in the reference case for the same level of output; in the 2006 technology case, it is 2.9 quadrillion Btu higher than in the reference case. Although the energy efficiency of new equipment is assumed to remain at 2006 levels in the 2006 technology case, average efficiency improves as old equipment is retired.

Transportation Energy Use Is Expected To Increase

Figure 49. Delivered energy consumption for transportation, 1980-2030 (quadrillion Btu)



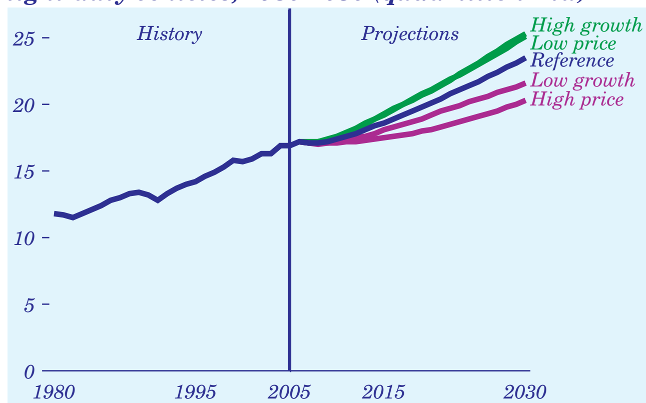
Total delivered energy consumption in the transportation sector is projected to grow at an average annual rate of 1.4 percent in the *AEO2007* reference case, from 28.1 quadrillion Btu in 2005 to 39.3 quadrillion Btu in 2030 (Figure 49). The reference case projection is consistent with recent historical trends.

Energy demand for transportation is influenced by a variety of factors, including economic growth, population growth, fuel prices, and vehicle fuel efficiency (for example, economic growth drives energy demand for heavy vehicle travel, and fuel prices and economic growth drive energy demand for light-duty vehicle travel). *AEO2007* provides several cases to examine the impacts of those factors on delivered energy demand. In 2030, the sector's delivered energy demand is about 10 percent higher in the high economic growth case and 10 percent lower in the low economic growth case than projected in the reference case, and it is about 10 percent lower in the high world oil price case and 5 percent higher in the low oil price case than in the reference case.

By transportation mode, the most rapid increase in the share of total delivered energy demand for transportation is projected for heavy vehicle travel, which includes medium and large freight trucks and buses. Energy demand for heavy vehicles accounted for 18 percent of the sector's total delivered energy demand in 2005, and in 2030 it accounts for 20 percent of the total in the reference case. Energy demand for air travel accounts for 10 percent of the total in 2030, the same as in 2005, because infrastructure constraints limit the potential growth of air travel in the United States.

Higher Prices Slow Increase in Demand for Light-Duty Vehicle Fuels

Figure 50. Delivered energy consumption in light-duty vehicles, 1980-2030 (quadrillion Btu)



Delivered energy consumption for light-duty vehicle travel is projected to grow at an average annual rate of 1.3 percent in the reference case, from 16.9 quadrillion Btu in 2005 to 23.5 quadrillion Btu in 2030 (Figure 50). In 1980, energy use for light-duty vehicle travel totaled 11.8 quadrillion Btu.

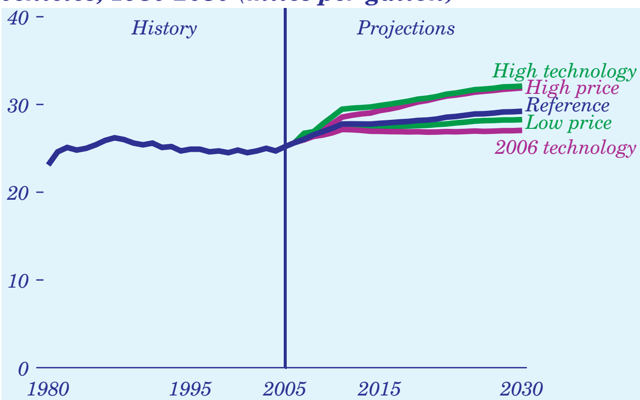
The two factors that have the greatest impact on energy demand for light-duty vehicles in *AEO2007* are fuel price and, to a lesser extent, disposable income. The high economic growth case and high world oil price case provide higher and lower ranges, respectively, for the projections. The high growth case projects 25.3 quadrillion Btu, and the high price case projects 20.3 quadrillion Btu, for light-duty vehicle energy use in 2030.

The projections in the low world oil price case are nearly the same as those in the high economic growth case. As compared with the reference case, increased travel demand in the high growth case results in an 8-percent increase in energy use for light-duty vehicles in 2030; in the low price case, the combination of lower vehicle fuel economy and higher travel demand leads to a 7-percent increase.

Energy demand for light-duty vehicle travel in 2030 is lower in both the high price case and the low growth case than projected in the reference case, by 14 percent and 8 percent, respectively. Lower travel demand is the chief reason for the decrease in both cases. In addition, the high price case projects a 9-percent increase in light-duty vehicle fuel economy in 2030 relative to the reference case projection.

New Technologies Promise Improved Fuel Economy for Light-Duty Vehicles

Figure 51. Average fuel economy of new light-duty vehicles, 1980-2030 (miles per gallon)



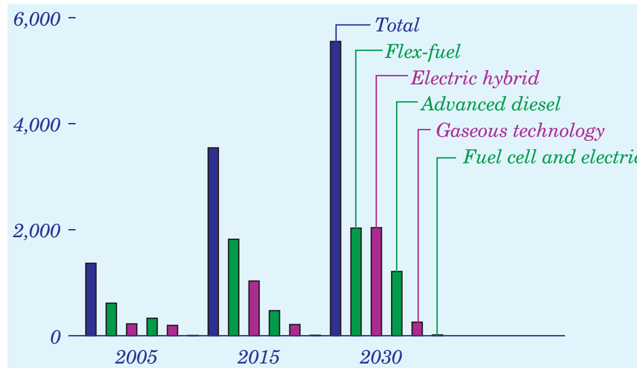
In 2005, U.S. sales of light trucks account for more than one-half of all new light-duty vehicles sold (as compared with only one-quarter of all new light-duty vehicle sales in 1980) [*166*]. Consequently, despite fuel economy improvements for cars and light trucks over the past years, the average fuel economy of new light-duty vehicles has declined from a 1987 peak of 26.2 miles per gallon to 25.2 miles per gallon in 2005 (Figure 51).

In March 2006, NHTSA finalized a new fuel economy standard for light trucks, based on vehicle footprint and product mix offered by the manufacturer (see "Legislation and Regulations"). The new CAFE standard, coupled with technological advances, is expected to have a positive impact on the fuel economy of new light-duty vehicles. In the reference case, average fuel economy for new light-duty vehicles is projected to increase to 29.2 miles per gallon in 2030. Additional improvement is projected in the high technology and high price cases, as a result of consumer demand for more fuel-efficient cars and improved economics that make producing them more profitable.

In the 2006 technology and low oil price cases, the projections for light-duty vehicle fuel economy in 2030 are lower than those in the reference case, but they still are higher than the 2005 CAFE standard for cars and the 2011 CAFE standard for light trucks. In the low price case, fuel economy for new light-duty vehicles in 2030 is 3.3 percent lower than projected in the reference case—due to consumer preference for more powerful vehicles over fuel economy—and in the 2006 technology case it is 7 percent lower than in the reference case.

Unconventional Vehicle Technologies Exceed 27 Percent of Sales in 2030

Figure 52. Sales of unconventional light-duty vehicles by fuel type, 2005, 2015, and 2030 (thousand vehicles sold)



Concerns about oil supply, fuel prices, and emissions continue to drive the development and market penetration of unconventional vehicles (vehicles that can use alternative fuels or employ electric motors and advanced electricity storage, advanced engine controls, or other new technologies). Without new legislation or regulation, sales of unconventional vehicles total 5.5 million units in 2030 in the reference case (Figure 52), making up more than 27 percent of total new light-duty vehicle sales. In the high oil price case, unconventional vehicle sales total 8.1 million units, or more than 40 percent of new light-duty vehicle sales, as compared with 28 percent of sales in the low economic growth case.

Hybrid vehicles are becoming more popular, and in the reference case they are projected to top 2 million vehicles sold in 2030, as manufacturers continue to introduce new product lines. Light-duty diesel engines with advanced direct injection, which can significantly reduce exhaust emissions, are projected to capture 6 percent of the new light-duty vehicle market in 2030. The availability of ULSD and biodiesel fuels, along with advances in emission control technologies that reduce criteria pollutants, increase the projected sales of unconventional diesel vehicles.

Currently, manufacturers selling FFVs receive fuel economy credits that count toward their compliance with CAFE regulations. Continued commitment to the technology and increased product offerings are expected to increase sales of FFVs to 2 million units in 2030 in the reference case, from the 2005 level of 612,400 units.