

Market Trends

The projections in *AEO2000* are not statements of what will happen but of what might happen, given the assumptions and methodologies used. The projections are business-as-usual trend forecasts, given known technology, technological and demographic trends, and current laws and regulations. Thus, they provide a policy-neutral reference case that can be used to analyze policy initiatives. EIA does not propose, advocate, or speculate on future legislative and regulatory changes. All laws are assumed to remain as currently enacted; however, the impacts of emerging regulatory changes, when defined, are reflected.

Because energy markets are complex, models are simplified representations of energy production and consumption, regulations, and producer and consumer behavior. Projections are highly dependent on the data, methodologies, model structures, and assumptions used in their development.

Behavioral characteristics are indicative of real-world tendencies rather than representations of specific outcomes.

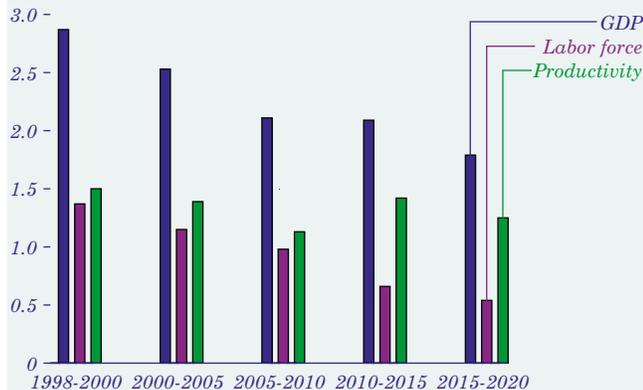
Energy market projections are subject to much uncertainty. Many of the events that shape energy markets are random and cannot be anticipated, including severe weather, political disruptions, strikes, and technological breakthroughs. In addition, future developments in technologies, demographics, and resources cannot be foreseen with any degree of certainty. Many key uncertainties in the *AEO2000* projections are addressed through alternative cases.

EIA has endeavored to make these projections as objective, reliable, and useful as possible; however, they should serve as an adjunct to, not a substitute for, analytical processes in the examination of policy initiatives.

Trends in Economic Activity

Strong Economic Growth Is Expected To Continue

Figure 33. Average annual real growth rates of economic factors, 1998-2020 (percent)

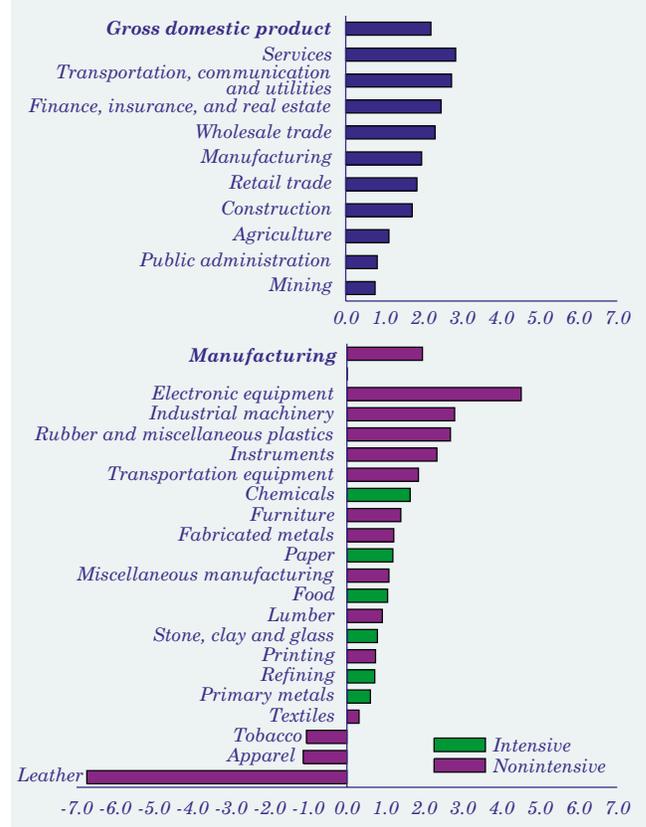


The output of the Nation's economy, measured by gross domestic product (GDP), is projected to increase by 2.2 percent a year between 1998 and 2020 (with GDP based on 1992 chain-weighted dollars) (Figure 33), slightly higher than the 2.0-percent growth projected in *AEO99* for the same period. The projected growth rate for the labor force is similar to last year's forecast through 2020; however, in the *AEO2000* projection, productivity growth (GDP growth minus labor force growth) is 1.3 percent a year, up from 1.2 percent a year in *AEO99*.

The projected rate of growth in GDP slows in the latter half of the forecast period as the expansion of the labor force slows, but sustained levels of labor productivity growth moderate the effects of lower labor force growth. Total population growth remains fairly constant after 2000; the slowing growth in the size of the labor force results instead from the increasing size of the population over 65 years old after 2000. As more people retire from the work force, and as life expectancy rises, the labor force participation rate—the percentage of the population over 16 years of age actually holding or looking for employment—peaks in 2007 and then begins to decline as “baby boom” cohorts begin to retire. Thus, from 2010 to 2015, labor force growth slows to 0.7 percent, and from 2015 to 2020 it falls to 0.5 percent a year. Labor force productivity growth, however, remains above 1 percent a year throughout each of the 5-year periods.

Electronic, Industrial Equipment Lead Manufacturing Growth

Figure 34. Sectoral composition of GDP growth, 1998-2020 (percent per year)

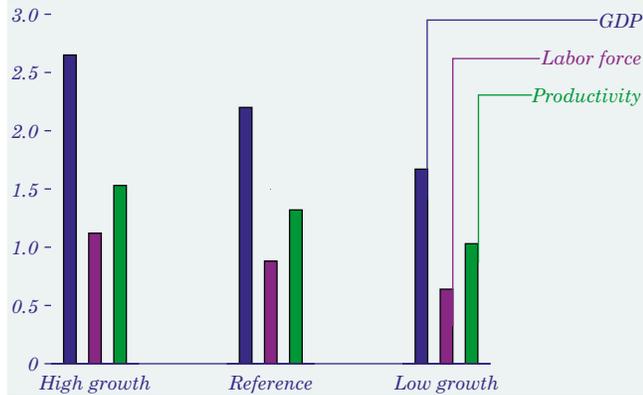


The projected growth rate for manufacturing production is 2.0 percent a year, slightly lower than the 2.2-percent annual growth projected for the aggregate economy. Energy-intensive manufacturing sectors are projected to grow more slowly than non-energy-intensive manufacturing sectors (1.1 percent and 2.4 percent annual growth, respectively) [54], due in part to rising real energy prices.

The electronic equipment and industrial machinery sectors lead the expected growth in manufacturing, as semiconductors and computers find broader applications (Figure 34). The rubber and miscellaneous plastic products sector is expected to grow faster than manufacturing as a whole, with plastics continuing to penetrate new markets as well. Higher growth is expected for the services sector than for the manufacturing sector, as in last year's forecast.

High and Low Growth Cases Reflect Uncertainty of Economic Growth

Figure 35. Average annual real growth rates of economic factors in three cases, 1998-2020 (percent)



To reflect the uncertainty in forecasts of economic growth, *AEO2000* includes high and low economic growth cases in addition to the reference case (Figure 35). The high and low growth cases show the effects of alternative growth assumptions on energy markets. The three economic growth cases are based on macroeconomic forecasts prepared by Standard & Poor's DRI (DRI) [55]. The DRI forecast used in generating the *AEO2000* reference case is the August 1999 trend growth scenario, adjusted to incorporate the world oil price assumptions used in the *AEO2000* reference case. The *AEO2000* high and low economic growth cases are based on the spread between the optimistic and pessimistic growth projections prepared by DRI in February 1999.

The high economic growth case incorporates higher growth rates for population, labor force, and labor productivity. With higher productivity gains, inflation and interest rates are lower than in the reference case, and economic output grows by 2.6 percent a year. GDP per capita grows by 1.6 percent a year, compared with 1.4 percent in the reference case. The low economic growth case assumes lower growth rates for population, labor force, and productivity, resulting in higher prices, higher interest rates, and lower industrial output growth. In the low growth case, economic output increases by 1.7 percent a year from 1998 through 2020, and growth in GDP per capita slows to 1.1 percent a year.

Long-Run Trend Shows Slowing of the U.S. Economic Growth Rate

Figure 36. Annual GDP growth rate for the preceding 20 years, 1970-2020 (percent)



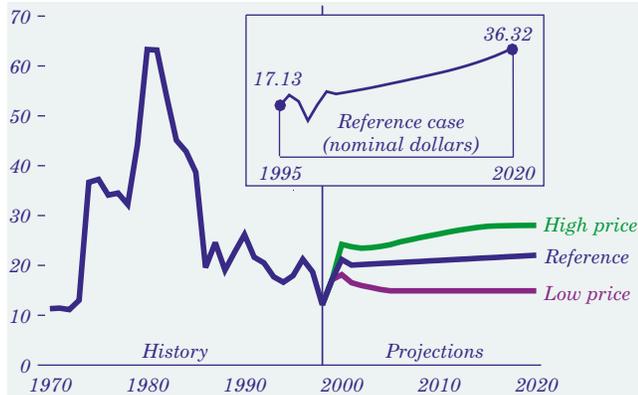
Figure 36 shows the trend in the moving 20-year annual growth rate for GDP, including projections for the three *AEO2000* cases. The value for each year is calculated as the annual growth rate over the preceding 20 years. The 20-year average shows major long-term trends in GDP growth by smoothing more volatile year-to-year changes (although the increase shown for 2000-2002 reflects the slow and negative growth of 1980-1982). The overall trend is downward, reflecting lower rates of capital accumulation during the 1970s and 1980s, lower labor force growth rates, and shifts in the demographic makeup of the population. In addition, annual GDP growth has fluctuated considerably around the trend. The high and low growth cases capture the potential for different paths of long-term output growth.

One reason for the variability of the forecasts is the composition of economic output, reflected by growth rates of consumption and investment relative to the overall GDP growth for the aggregate economy. In the reference case, consumption grows by 2.3 percent a year, while investment grows at a 2.9-percent annual rate. In the high growth case, growth in investment increases to 3.6 percent a year. Higher investment rates lead to faster capital accumulation and higher productivity gains, which, coupled with higher labor force growth, yield faster aggregate economic growth than in the reference case. In the low growth case, annual growth in investment expenditures slows to 1.9 percent. With the labor force also growing more slowly, aggregate economic growth slows considerably.

International Oil Markets

Projections Vary in Cases With Different Oil Price Assumptions

Figure 37. World oil prices in three cases, 1970-2020 (1998 dollars per barrel)



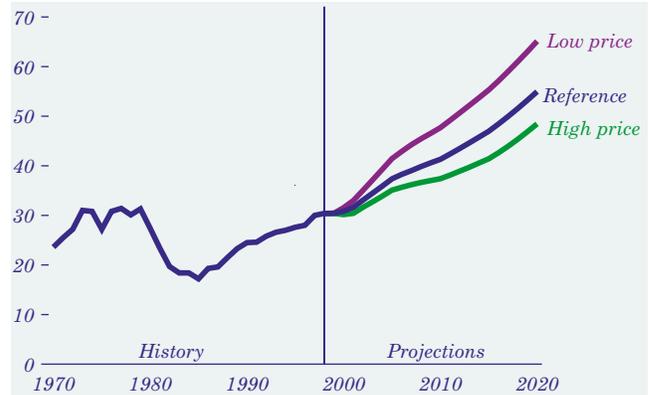
Just as the historical record shows substantial variability in world oil prices, there is considerable uncertainty about future prices. Three *AEO2000* cases with different price paths allow an assessment of alternative views on the course of future oil prices (Figure 37). For the reference case, prices rise by about 2.8 percent a year, reaching \$22.04 in 2020 (all prices in 1998 dollars unless otherwise noted). In nominal dollars, the reference case price exceeds \$36 in 2020. The low price case has prices declining, after the current price rise, to \$14.90 by 2005 and remaining at about that level out to 2020. The high price case has a price rise of about 5.0 percent a year out to 2015 and then remains at about \$28 out to 2020. The leveling off in the high price case is due to the market penetration of alternative energy supplies that could become economically viable at that price.

All three price cases are similar to the price projections in *AEO99* beyond 2005, reflecting considerable optimism about the potential for worldwide petroleum supply, even in the face of the substantial expected increase in demand. Production from countries outside OPEC is expected to show a steady increase, exceeding 45 million barrels per day by the turn of the century and increasing gradually thereafter to more than 56 million barrels per day by 2020.

Total worldwide demand for oil is expected to reach 112 million barrels per day by 2020. Developing countries in Asia show the largest growth in demand, averaging 3.1 percent a year.

Uncertain Prospects for Persian Gulf Production Shape Oil Price Cases

Figure 38. OPEC oil production in three cases, 1970-2020 (million barrels per day)



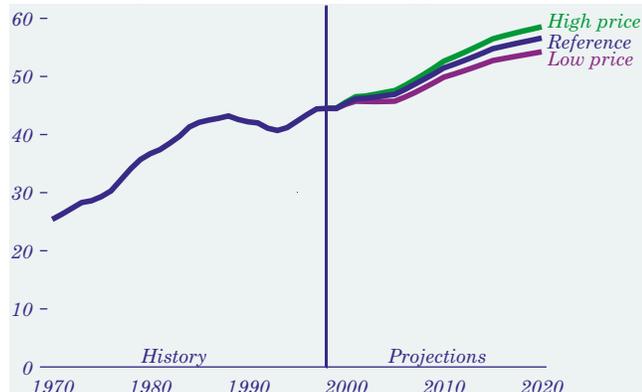
The three price cases are based on alternative assumptions about oil production levels in OPEC nations: higher production in the low price case and lower production in the high price case. With its vast store of readily accessible oil reserves, OPEC—primarily the Persian Gulf nations—is expected to be the principal source of marginal supply to meet future incremental demand.

By 2000, OPEC supply in the reference case is over 32 million barrels per day, consistent with announced plans for OPEC capacity expansion [56]. By 2020, OPEC production is more than 55 million barrels per day (almost twice its 1998 production) in the reference case, almost 49 million in the high case, and nearly 66 million in the low case (Figure 38). Worldwide demand for oil varies across the price cases in response to the price paths. Total world demand for oil ranges from 120.3 million barrels per day in the low price case to 107.8 million barrels per day in the high price case.

The variation in oil production forecasts reflects uncertainty about the prospects for future production from the Persian Gulf region. The expansion of productive capacity will require major capital investments, which could depend on the availability and acceptability of foreign investments. Iraq is assumed to continue selling oil only at sanction-allowed volumes until 2002. Recent discoveries offshore of Algeria and Nigeria, as well as Venezuela's aggressive capacity expansion plans, will more than accommodate increasing demand in the absence of Iraq's full return to the oil market.

Production Increases Are Expected for Non-OPEC Oil Producers

Figure 39. Non-OPEC oil production in three cases, 1970-2020 (million barrels per day)

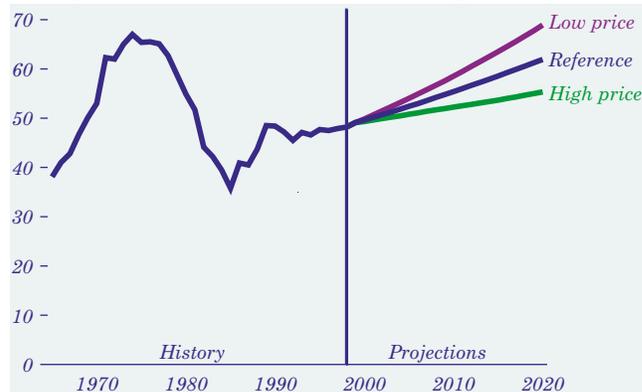


The growth and diversity in non-OPEC oil supply have shown surprising resilience even in the low price environment of this decade. Although OPEC producers will certainly benefit from the projected growth in oil demand, significant competition is expected from non-OPEC suppliers. Countries in the Organization for Economic Cooperation and Development (OECD) that are expected to register production increases over the next decade include North Sea producers, Australia, Canada, and Mexico. In Latin America, Colombia, Brazil, and Argentina are showing accelerated growth in oil production, due in part to privatization efforts. Deepwater projects off the coast of western Africa and in the South China Sea will start producing significant volumes of oil early in the next century. In addition, much of the increase in non-OPEC supply over the next decade is expected to come from the former Soviet Union, and political uncertainty appears to be the only potential barrier to the development of vast oil resources in the Caspian Basin.

In the *AEO2000* reference case, non-OPEC supply is projected to reach almost 57 million barrels per day by 2020 (Figure 39). In the low oil price case, non-OPEC supply grows to more than 54 million barrels per day by 2020, whereas in the high oil price case it reaches more than 58 million barrels per day by the end of the forecast period.

Persian Gulf Producers Could Take More Than Half of World Oil Trade

Figure 40. Persian Gulf share of worldwide oil exports in three cases, 1965-2020 (percent)



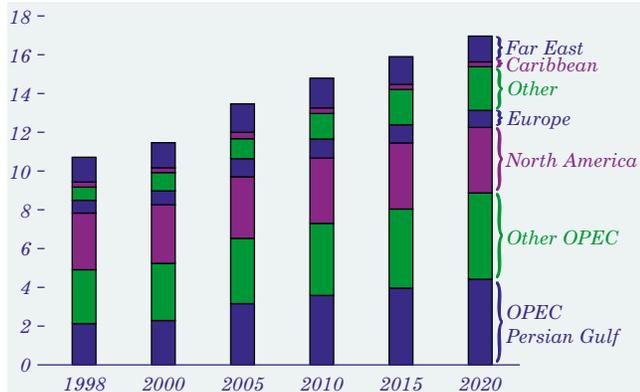
Considering the world market in oil exports, the historical peak for Persian Gulf exports (as a percent of world oil exports) occurred in 1974, when they made up more than two-thirds of the oil traded in world markets (Figure 40). The most recent historical low for Persian Gulf oil exports came in 1985 as a result of more than a decade of high oil prices, which led to significant reductions in worldwide petroleum consumption. Less than 40 percent of the oil traded in 1985 came from Persian Gulf suppliers. Following the 1985 oil price collapse, the Persian Gulf export percentage has been steadily increasing. Early in the next decade, Persian Gulf producers are expected to account for more than 50 percent of worldwide trade for the first time since the early 1980s.

In the reference case, the Persian Gulf share of worldwide petroleum exports exceeds 50 percent shortly after the turn of the century and increases gradually to almost 62 percent by 2020. In the low oil price case, the Persian Gulf share of total exports reaches almost 69 percent by 2020. All Persian Gulf producers are expected to increase oil production capacity significantly over the forecast period, and both Saudi Arabia and Iraq are expected to more than double their current production capacity.

International Oil Markets

OPEC Accounts for More Than Half of Projected U.S. Oil Imports

Figure 41. U.S. gross petroleum imports by source, 1998-2020 (million barrels per day)



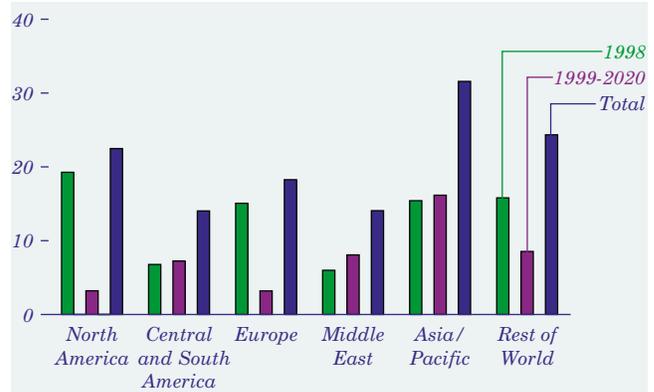
In the reference case, total U.S. gross oil imports increase from 10.7 million barrels per day in 1998 to almost 17 million in 2020 (Figure 41). Crude oil accounts for most of the increase in imports through 2000, whereas imports of petroleum products make up a larger share of the increase after 2000. Product imports increase more rapidly, as U.S. production stabilizes and U.S. refineries lack the capacity to process larger quantities of imported crude oil.

Not until 2014 does OPEC account for more than 50 percent of total projected U.S. petroleum imports. The OPEC share increases gradually to more than 52 percent in 2020. The Persian Gulf share of U.S. imports from OPEC increases from about 43 percent in 1998 to almost 50 percent in 2020. Crude oil imports from the North Sea increase slightly through 2010, then level off as North Sea production ebbs. Significant imports of petroleum from Canada and Mexico continue, and West Coast refiners are expected to import crude oil from the Far East to replace the declining production of Alaskan crude oil.

Imports of light products are expected to more than triple by 2020, to more than 3.9 million barrels per day. Most of the projected increase is from refiners in the Caribbean Basin and the Middle East, where refining capacity is expected to expand significantly. Vigorous growth in demand for lighter petroleum products in developing countries means that U.S. refiners are likely to import smaller volumes of light, low-sulfur crude oils.

Asia/Pacific Region Is Expected To Surpass U.S. Refining Capacity

Figure 42. Worldwide refining capacity by region, 1998 and 2020 (million barrels per day)



Worldwide crude oil distillation capacity was 78.3 million barrels per day at the beginning of 1998. To meet the growth in international oil demand in the reference case, worldwide refining capacity is expected to increase by almost 60 percent—to nearly 125 million barrels per day—by 2020. Substantial growth in distillation capacity is expected in the Middle East, Central and South America, and the Asia/Pacific region (Figure 42).

The Asia/Pacific region has been the fastest growing refining center in the 1990s. It has recently passed Western Europe as the world's second largest refining center and, in terms of distillation capacity, is expected to surpass the United States by 2010. While not adding significantly to their distillation capacity, refiners in the United States and Europe have tended to improve product quality and enhance the usefulness of heavier oils through investment in downstream capacity.

Future investments in the refinery operations of developing countries must include configurations that are more advanced than those currently in operation. Their refineries will be called upon to meet increased worldwide demand for lighter products, to upgrade residual fuel, to supply transportation fuels with reduced lead, and to supply both distillate and residual fuels with decreased sulfur levels. An additional burden on new refineries will be the need to supply lighter products from crude oils whose quality is expected to deteriorate over the forecast period.