CHAPTER EIGHTEEN

Energy

Energy is the lifeblood of an industrial economy. It heats and lights our homes and powers our vehicles and factories.

Energy also is a major source of pollution. The combined effects of the production, distribution, and consumption of fossil fuel energy are the nation's largest source of pollution. Driven by population growth and economic growth, the demand for energy will continue to increase, thus posing a continuing environmental protection challenge, both domestically and internationally.

The ongoing challenge is to find ways to accommodate population and economic growth through improved energy efficiency; to use more efficient technologies and different kinds of energy to prevent or reduce energy-based pollution; and to take advantage of market-based incentives to make energy as cost-effective, reliable, and environmentally benign as possible.

BACKGROUND

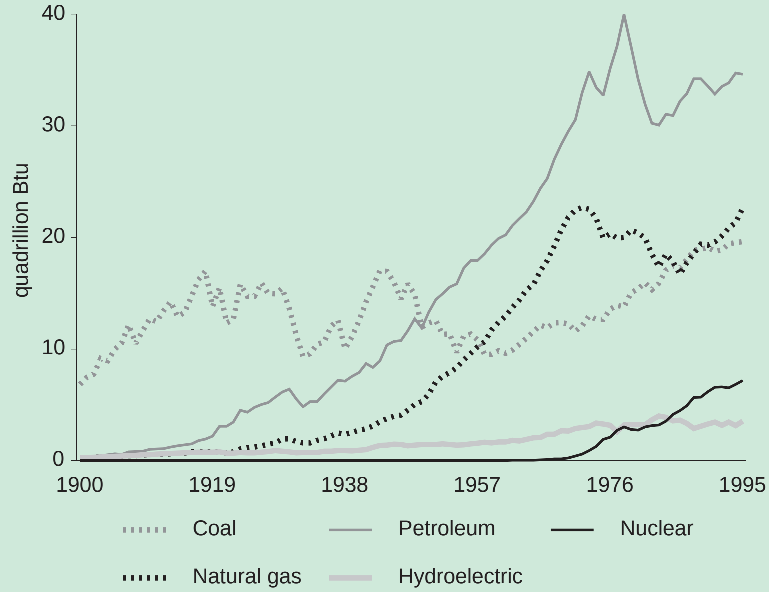
Inexpensive and abundant energy has been a vital cog in the expansion of the U.S. economy.

At the turn of the century, coal was the dominant source of energy in the United States, providing 90 percent of all energy consumed in 1900 (Figure 18.1). But the demands of World War I, mining labor shortages, and other factors combined to create a severe coal shortage. Soon the price of coal more than doubled. The general coal strike of 1919 caused a second fuel price shock. In response, petroleum became the dominant source of energy supply. New technologies such as ships, planes, and trucks created rapidly growing new sources of demand for oil.

Domestic oil continued to support U.S. economic growth through the 1930s and 1940s. Sparked by economic growth in the 1960s, demand for oil in Europe and Japan grew rapidly. Industrial countries' dependence on oil produced by the Organization of Petroleum Exporting Countries (OPEC) continued to grow. By 1971, OPEC was able to influence oil production and prices. The 1973 Arab oil embargo caused every nation to reassess its energy policies.

In the 1960s, nuclear energy began to play a role in the nation's energy picture. A 1962 Atomic Energy Commission report projected that electricity from nuclear power would provide about 30 percent of the nation's total projected energy supply in the year 2000. By 1995, nuclear power plants generated about one

Figure 18.1 U.S. Energy Consumption by Source, 1900-1995



Source: Energy Information Administration (EIA), *Annual Energy Review1996* (EIA, Washington, DC, 1996).
Note: Petroleum includes natural gas plant liquids. Hydroelectric includes geothermal after 1948.

fifth of the electricity in the U.S. But prospects for nuclear energy have diminished severely over the past few decades. Factors contributing to the decline included the rapid rise in the capital construction costs of new nuclear plants, ongoing concerns about safety and environmental problems such as the disposal of high-level nuclear waste, and the 1979 accident at the Three Mile Island Nuclear Power Plant in Pennsylvania.

In the 1970s, high energy prices, high dependence on foreign sources, and assumptions that energy demand would continue to grow led to an increased focus on energy efficiency as a goal.

The Energy Policy and Conservation Act of 1975 was enacted to promote energy efficiency improvements and diversification of supply and sources. The act required states to prepare energy conservation plans in order to receive financial assistance for eligible programs. It also set energy efficiency standards for appliances and light-duty vehicles and authorized federal grants for energy inspections and audits of schools and hospitals. Energy prices fell in the late 1980s, which tended to undermine efficiency incentives somewhat. Since then, consumers' interest in the energy efficiency of cars has declined. More recently, many states have relaxed the fuel-saving 55-mph speed limit on their highways.

In other respects, the policy context has changed. According to a report by the

National Academy of Engineering, the key energy policy assumptions of the 1990s differ substantially from those of the 1970s (Table 18.1).

The high prices of the 1970s spurred an investment boom that led to increased oil production by non-OPEC countries and a much greater understanding of the opportunities to make energy use more efficient through demand-side management, conservation, and new technologies. Some of these gains were based on improved design of automobiles, buildings, appliances, and factories. The 1975 Energy Policy and Conservation Act helped this process along.

In the mid-1970s, according to the National Academy of Engineering report, most experts were predicting that annual energy demand would rise to around 115 quads by 1985, yet in 1986 the United States used only 74 quads, the same as in 1973 (1 quad equals 1 quadrillion Btu, the energy equivalent of 171.5 million barrels of crude oil). From 1973 to 1995, total energy consumption increased by 22 percent, while GDP increased by 73 percent (Figure 18.2).

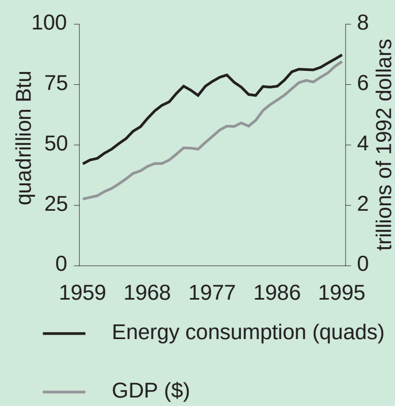
By the 1990s, the environmental implications of energy use were much more widely recognized. The major impacts include the following:

- On a global level, increased use of fossil fuels will mean an increase in greenhouse gas emissions, which contribute to global climate change.
- On a regional and local level, burning of fossil fuels releases smog-related emissions and may increase acid precipitation, affect human health, and degrade downwind habitats; mining can lead to land degradation and water pollution; and nuclear energy, though not a source of air pollution or greenhouse gas emissions, nevertheless has serious environmental impacts associated with both production risks and radioactive waste disposal.

CONDITIONS AND TRENDS

The United States has one of the most energy-intensive economies among advanced industrialized nations, according to a recent report by the Organisation for Economic Co-operation and Development (OECD) (Figure 18.3; see also section on energy intensity below). In addition, a relatively high proportion of U.S. energy consumption is related to transportation (Figure 18.4), in part because of the nation's relatively low energy prices, large land area, and comparatively low population density. Cana-

Figure 18.2 U.S. Energy Consumption and GDP, 1959-1995



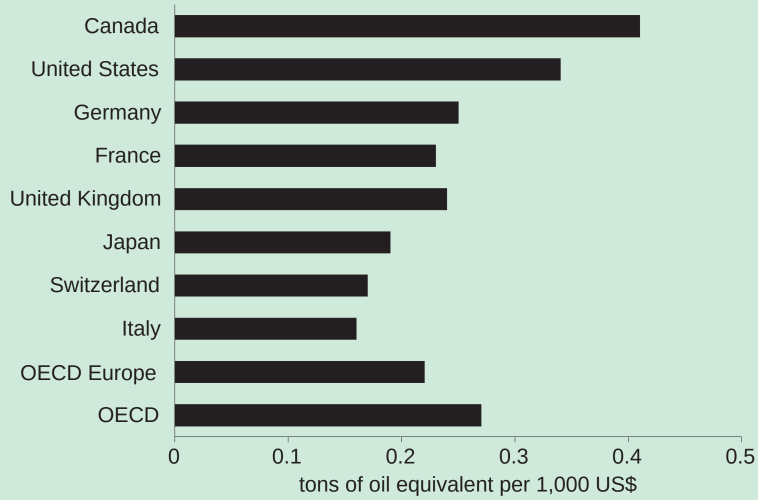
Source: See Part III, Tables 9 and 85.

Table 18.1
Key Energy Policy Assumptions

1970s	1990s
• Rapidly rising prices	• Volatile prices oscillating around a gradually changing average price, probably rising in real terms
• Widely held beliefs that both prices and consumption would continue to rise without moderation	• Increased recognition of price elasticities in free markets, and the realization that these elasticities are constructive and tend to moderate emergencies
• Perceived episodic shortages leading to real episodic shortages; rising consumption exacerbated by panic purchases; government interventions to allocate scarce supplies	• Shifts from supply shortages to supply excess and rising consumption
• Major emphasis on supply management; belief that all viable energy sources should be mobilized and alternative energy sources should be developed for the future	• More sophisticated understanding of demand management and how demand can be mitigated by efficiency measures and how price influences supply growth and incentives for development of alternative fuels; federal deregulation of supply sectors such as the electric power distribution grid and natural gas pipelines
• Strong market and government incentives for investment in long-term energy supply	• Disincentives for long- range energy investments, such as energy commodity price volatility and short time horizons for competing capital investment opportunities
• Tacit assumptions that environmental problems would remain local in scope and that their solution would be straightforward	• Mounting concerns about energy system impacts on the environment at the local, regional, and global scales
• Acute concern over economic and strategic vulnerabilities due to high petroleum prices and dependence on foreign supplies	• Growing concern that the U.S. energy system will eventually be vulnerable again to price shocks, given increasing consumption and diminishing development of new energy sources because of currently lower energy prices

Source: National Academy of Engineering (1990).

Figure 18.3 Energy Intensity per Unit of GDP for Selected Industrialized Nations, 1993



Source: *OECD Environmental Data, Compendium 1995* (OECD, Paris, 1995).
Note: GDP at 1991 prices and purchasing power parities.

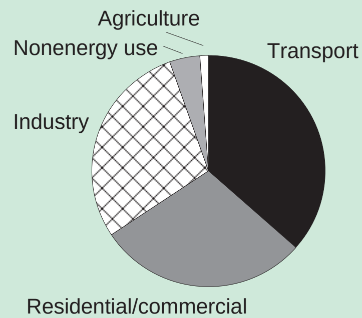
da, with similar geographical characteristics, also has a relatively high energy intensity.

As in most other industrialized nations, the general trend in the United States has been a steep decline in energy intensity per unit of GDP from 1970 until the early 1980s, followed by a period of leveling off and a period of relatively slow decline (see Part III, Table 87).

U.S. energy prices are among the lowest in the OECD, mainly because of the low level of energy taxation. According to the OECD report, for example, the average price of premium unleaded gas in the United States in 1993 was only about 43 percent of the price in Europe, while the average cost of electricity was only about three fifths that in Europe.

According to the *Annual Energy Review 1995*, a report by DOE's Energy Information Administration (EIA), U.S. energy consumption grew by a little over one third, from 66.43 to 90.62 quads,

Figure 18.4 U.S. Total Final Energy Use by Sector, 1993



Source: International Energy Administration.

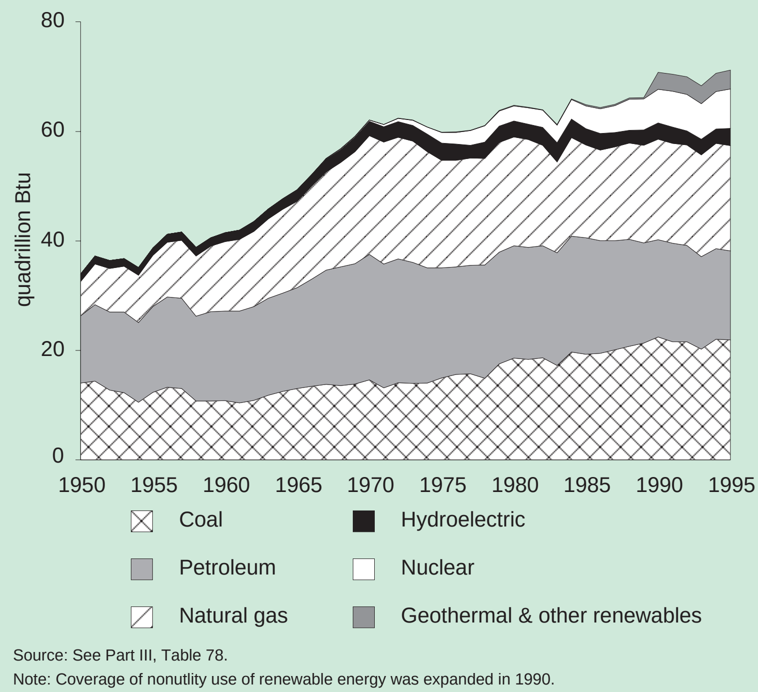
over the 1970–95 period, though this trend was interrupted several times by declines following sustained increases in oil prices. Domestic energy production grew by 15 percent, from 62.07 to 71.16 quads (Figure 18.5). The production of coal and nuclear energy rose dramatically: coal from 14.61 to 21.91 quads and nuclear from 0.24 quad to 7.19 quads, while various forms of renewable energy (other than conventional hydroelectric energy) grew from 0.01 quad to 3.40 quads. Gas production, however, declined by 10 percent (from 21.67 to 19.23 quads), while oil production dropped significantly, from 20.40 to 13.82 quads. (For more information on these trends, see Part III, Table 78.)

The growth in the role of electricity continued. Net generation by electric utilities nearly doubled, rising from 1,532 billion kilowatt-hours in 1970 to 2,995 billion kilowatt-hours in 1995 (Figure 18.6). Nearly half of that growth was provided by nuclear generating units.

The transportation sector continued to be the main generator of new demand, rising nearly 50 percent to 24.06 quads in 1995 (Figure 18.7). Consumption in the industrial and residential/commercial sectors rose by 5.84 quads and 10.36 quads, respectively.

During this time frame, net imports of primary energy sources more than tripled, rising from 5.72 to 17.86 quads; increased imports of petroleum account-

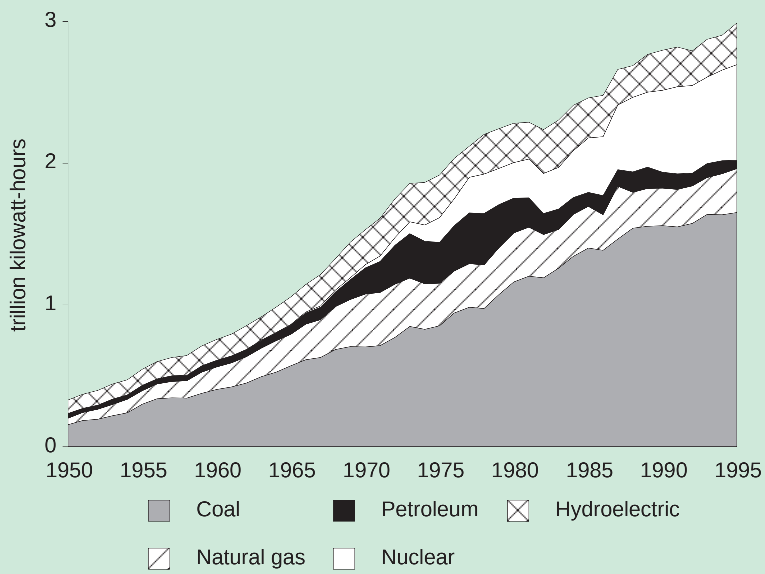
Figure 18.5 U.S. Energy Production by Source, 1950-1995



Source: See Part III, Table 78.

Note: Coverage of nonutlity use of renewable energy was expanded in 1990.

Figure 18.6 U.S. Electricity Generation by Source, 1950-1995



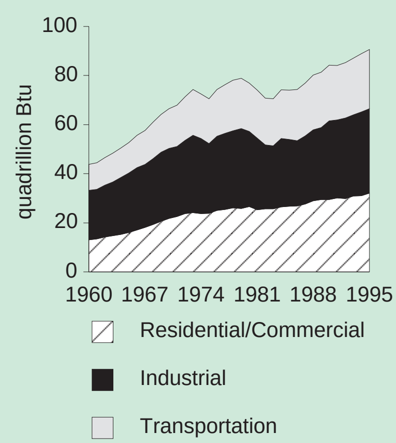
Source: See Part III, Table 82.

ed for nearly all the increase (Figure 18.8; see also Part III, Table 84).

Trends in Energy Supply and Production

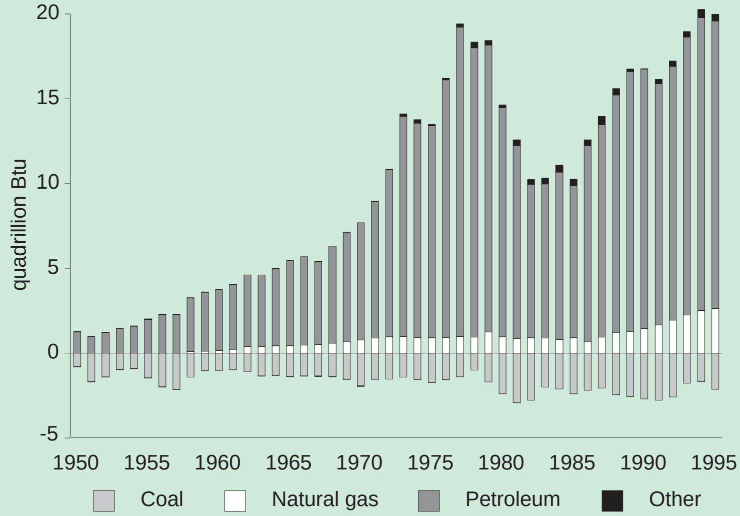
According to data in the DOE/EIA *Annual Energy Review 1995*, U.S. energy production from 1970 to 1995 has been characterized by a rapid increase in coal production, especially in production of low-sulfur western coal; a continuing decline in domestic oil production, accompanied by a rise in imports approaching the record level of 1977; and a recent 9-year rise in gas production. Electricity output continues to increase; coal fuels 55.1 percent of the output, oil 2.0 percent, gas 10.3 percent, nuclear power 22.5 percent, hydropower 9.9 percent, and other renewable energy sources 0.2 percent.

Figure 18.7 U.S. Energy Use by Sector, 1960-1995



Source: See Part III, Table 85.

Figure 18.8 Net U.S. Imports of Energy Sources, 1950-1995



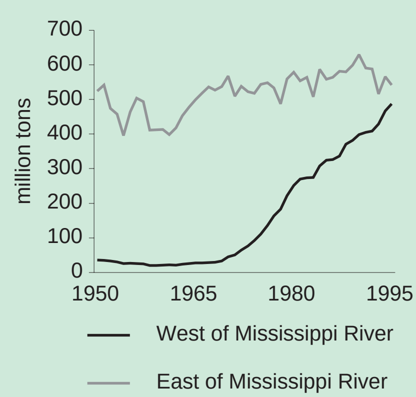
Source: See Part III, Table 84.

Coal. In 1995, according to EIA, estimated production of all types of coal totaled 1,030 million tons, the highest total ever. The West's share of total U.S. production has increased almost every year since 1965 (Figure 18.9). Production in the West grew from 45 million to 487.5 million tons (47 percent of the total) between 1970 and 1995. The growth in western coal production was due in part to environmental concerns that led to increased demand for low-sulfur coal, which is concentrated in the West. In addition, surface mining, with its higher average productivity, is much more prevalent in the West.

Coal production is forecast by EIA to increase to 1,240 million tons per year by 2015, with western production growing to 623 million tons.

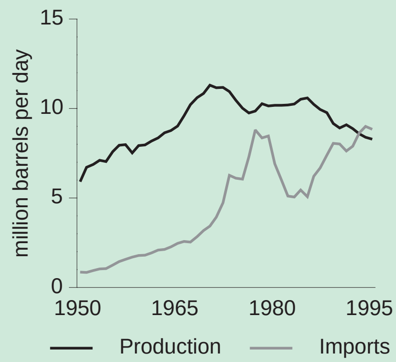
Petroleum. By the 1970s, the average productivity of domestic wells began to decline, and domestic oil production leveled off. Increases in Alaskan production at the end of the 1970s and through 1988 partially offset production declines in the lower 48 states. In 1989, Alaskan

Figure 18.9 U.S. Coal Production by Location, 1950-1995



Source: See Part III, Table 79.

Figure 18.10 U.S. Oil Production and Imports, 1950-1995



Source: See Part III, Table 80.
Note: Data include natural gas plant liquids.

production declined. In 1995, U.S. oil production totaled 6.5 million barrels per day. Of total U.S. production, 79 percent came from onshore wells and 21 percent from offshore.

In 1994, petroleum imports reached a 17-year high of 45 percent, nearly returning to the 1977 peak level of 47 percent (Figure 18.10). Saudi Arabia, Venezuela, Canada, Mexico, and Nigeria were the primary foreign suppliers.

Domestic oil production is projected by EIA to decline through 2005. After 2005, production is projected to increase as drilling is stimulated by rising prices and as the cumulative effects of improved technology reduce the costs of finding, developing, and producing oil resources.

Natural Gas. According to EIA, gross withdrawals of natural gas from wells totaled 24 trillion cubic feet in 1995, up for the ninth consecutive year. Texas, Louisiana, and Oklahoma accounted for 61 percent of the U.S. total. The total gross withdrawals yielded 20 trillion cubic feet of marketed production (Figure 18.11).

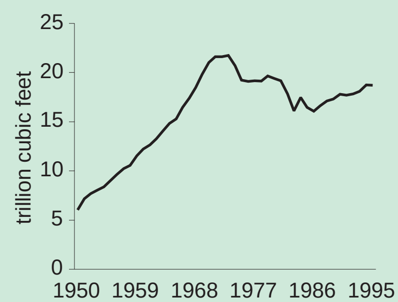
The total includes a small but rapidly growing amount of methane produced from coalbeds. In 1993, gross withdrawals of coalbed methane totaled about 732 million cubic feet, accounting for about 4 percent of total production.

After peaking at 435,000 cubic feet per day in 1971, average gas well productivity has trended downward to 164,000 cubic feet per day in 1995, or just 38 percent of the 1971 level.

Gas production is projected by EIA to increase, reflecting the combined impact of rising prices, relatively abundant resources, and improvements in technologies, which reduce costs and provide methods for economic recovery of unconventional and offshore gas resources.

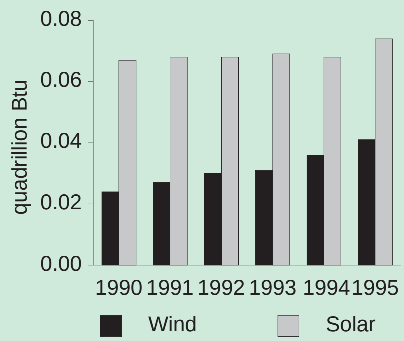
Nuclear Energy. In 1995, there were 109 licensed nuclear generating units operating in the United States, 1 unit was licensed for start-up, and construction had been canceled or halted on 6 other

Figure 18.11 U.S. Natural Gas Production, 1950-1995



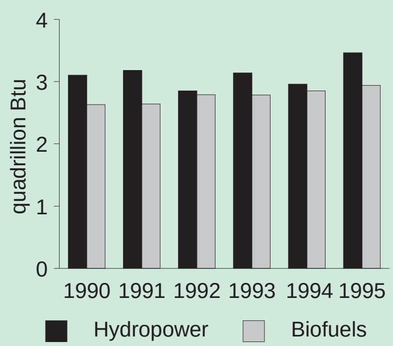
Source: See Part III, Table 81.

Figure 18.12 U.S. Wind and Solar Energy, 1990-1995



Source: See Part III, Table 88.

Figure 18.13 U.S. Hydropower and Biofuels Energy, 1990-1995



Source: See Part III, Table 88.

planned units. In comparison, 48 units were operating in 1974, but the total number of units in all stages of planning, construction, or operation at that time was 226, well above the 1995 total (see Part III, Table 83). Environmental, safety, and health concerns have contributed to the decline in the number of planned units. In addition, costs of plant construction have increased, growth in electricity demand has been slower than expected, and the uncertain economic environment has made electric utilities less willing to invest in new units.

Nuclear power's contribution to U.S. electricity net generation increased almost every year from the late 1950s through 1995. Production rose to 673.4 billion kilowatt-hours in 1995, up 5.2 percent from the year before.

Renewable Energy. EIA estimates that renewable energy—solar, biomass, wind, geothermal, and hydropower technologies—supplied 7 percent of total U.S. energy consumption in 1994. Of the amount provided by renewables, 48 percent was from conventional hydroelectric facilities and 45 percent was from biomass resources. Wind-generated electricity showed the greatest percentage increase (71 percent) over the 1990–95 period (Figure 18.12).

During the last 15 years, intensive work by industry and the Department of Energy's national laboratories has steadily increased the reliability of renewable energy systems while dramatically lowering their costs. Some of these systems are becoming commercially competitive with conventional power sources.

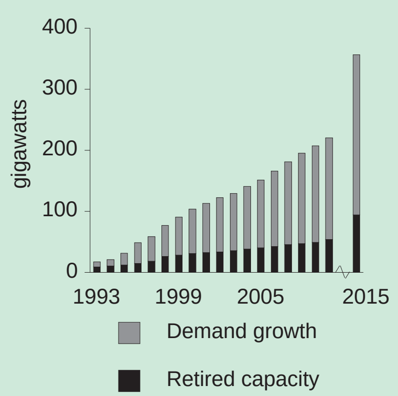
Today, the United States has regained its lead in world photovoltaic shipments, and the bioenergy industry is working to become a major new source of electric power (Figure 18.13). However, at present, total electricity generation from geothermal, solar, and wind resources makes up less than 1 percent of U.S. electricity generation.

Patterns of Energy Consumption

After the 1973 oil price shock, energy consumption fluctuated, influenced by dramatic changes in oil prices, changes in the rate of growth of the domestic economy, and such factors as concerns about the effect of energy use on the environment. The post-1973 low point of energy consumption, 71 quads, occurred in 1983, during a period of economic recession and very high oil prices. The highest level of energy consumption, 91 quads, occurred in 1995, when oil prices were low and the U.S. economy was growing (see Part III, Table 86).

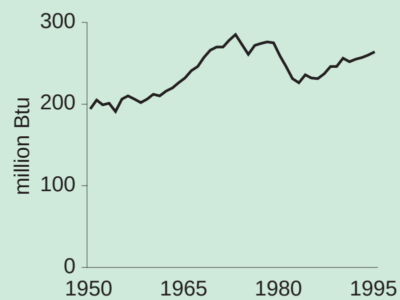
Electricity Use. Before the 1970s, growth in electricity consumption surpassed economic growth by nearly a factor of 2. During the 1970s and 1980s, higher costs drove up the price of electricity production, and the growth in demand for electricity decelerated. In the 1990s, the rate of demand growth is continuing to lag behind economic growth.

Figure 18.14 Projected Need for New U.S. Electricity Generating Capacity, 1993-2015



Source: Energy Information Administration (EIA), *Annual Energy Outlook 1996* (EIA, Washington, DC, 1996).

Figure 18.15 U.S. Energy Use per Capita, 1950-1995



Source: See Part III, Table 86.

EIA estimates that 252 gigawatts of new generating capacity will be needed between 1994 and 2015 to satisfy electricity demand growth and to replace retiring units (Figure 18.14). Between 1994 and 2015, 84 gigawatts, or 12 percent, of current generating capacity is expected to be retired, including 36 gigawatts of nuclear capacity (mostly after 2010).

Energy Use per Capita. Energy use per capita, which generally declined from 1970 through the mid-1980s, increased in the mid-1980s as energy prices dropped (Figure 18.15).

It appears that energy use per capita may have begun to stabilize. In its *Annual Energy Outlook 1996*, EIA predicts that per capita energy use will remain nearly stable through 2015, as increasingly efficient technologies offset growing demands for energy services.

Per capita demand for electricity is expected to increase over the next decade, while per capita demand for

Wind Turbines at Tehachapi, California. Government is working closely with industry to research and develop new, improved wind turbine technology.

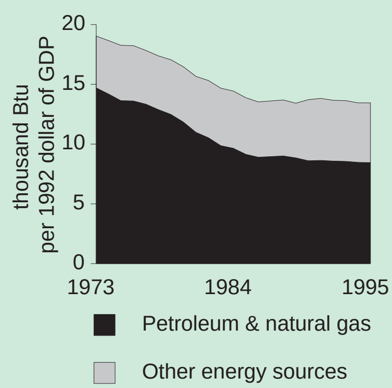
Photo Credit:
U.S. Environmental Protection Agency

other energy sources is expected to remain flat.

Energy Intensity. As technology has become more efficient and the U.S. economy has shifted away from energy-intensive industry, the amount of energy that we use to produce a dollar's worth of GDP—the energy intensity of the economy—has declined (Figure 18.16), as it has in most other industrialized countries.

The reduction in energy intensity that has occurred over the last two decades has been driven by energy efficiency advances on the demand side, high energy prices, and a shifting of the economy away from energy-intensive industry. People and companies often found that it was cheaper to save energy than to buy it. Investing in efficient technologies allows them to reduce wasteful energy use and

Figure 18.16 U.S. Energy Use per Dollar of GDP, 1973-1995



Source: See Part III, Table 87.

get the energy services they need at lower overall cost.

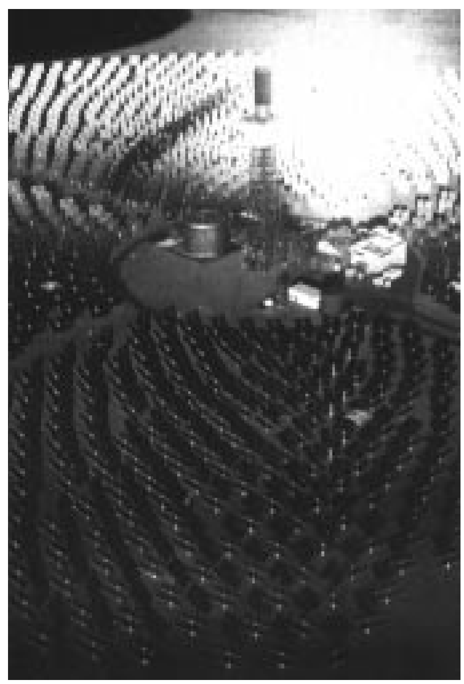
Many of the efficiency gains realized over the past 20 years were assisted by government policies to encourage, facilitate, and in some instances, require investment in cost-effective efficiency technologies. By continuing to address barriers to economically desirable investments in energy efficiency, energy efficiency policies and measures continue to produce significant economic payoffs for all Americans.

According to DOE estimates, U.S. energy efficiency and conservation efforts from 1973 through 1991 curbed the pre-1973 growth trend in primary energy use by about 31 quads—a 27 percent reduction. This saves the economy about $275 billion annually, which is equal to about half of the nation's $522 billion annual energy spending. Of the 31 quads in savings, it is estimated that about 56 percent comes from industry, 21 percent from residential buildings, 5 percent from commercial buildings, and 18 percent from transportation.

This has substantially reduced the environmental burdens associated with using energy. However, low expected energy prices could lead to a continued slowing of this trend. The gains in reducing environmental degradation through reductions in energy intensity could be lost if low prices lead to increasing energy use per dollar of GDP.

Industrial Energy Use. Of the three end-use sectors, the industrial sector proved initially to be the most responsive to the turmoil in energy markets after the 1973–74 embargo. In 1979, industrial consumption of energy reached the then-record level of 33 quads (gross consumption). In 1983, industrial consumption declined to a 16-year low of 26 quads. Despite slow economic growth in the early 1990s, industrial energy consumption trended upward and reached 34 quads in 1995, the highest level recorded to that date (see Part III, Table 85).

Industry uses about 38 percent of the nation's primary energy for fuel and feedstocks, for which the manufacturing sector alone spends about $100 billion per year.

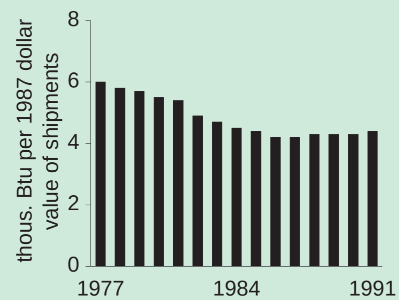


Solar Two, built in Barstow, California, is the most advanced solar thermal, central receiver power plant in the world. It will serve as a model for commercial solar power plants, generating as much as 200 megawatts of electricity.

Photo Credit:
U.S. Department of Energy

Between 1977 and 1991, industry reduced the amount of energy required for every dollar of output by 36 percent (Figure 18.17), with about two thirds of these savings coming from improvements in energy efficiency. When energy prices began to fall in the mid-1980s, the rate of efficiency improvement slowed. Between 1970 and 1980, energy intensity declined by 2.5 percent per year, but the rate of decline has dropped below 1 percent in recent years.

Figure 18.17 U.S. Industrial Energy Use, 1977-1991



Source: See Part III, Table 89.

Energy Use in Buildings. Energy use in buildings has changed substantially in both form and function during the past several decades. Total building energy use in the United States has increased, primarily because there are more people, more households, and more offices. Building energy use currently accounts for 35 percent of total primary energy demand, 42 percent of total energy costs, and 35 percent of all U.S. carbon emissions. Energy use per unit area (commercial) or per person (residential) has roughly stabilized over the past decade owing to a variety of efficiency improvements. About one half of the improvements were in space heating and cooling, one fifth in lighting, and one tenth in water heating.

Because utility bills are a substantial part of family budgets, residential building energy use affects what kind of housing people can afford. Energy use in the commercial sector represents a cost to business and can have a substantial bearing on employee productivity.

Energy Use in Transportation. Transportation energy use as a percentage of total energy use has remained relatively constant, accounting for just over one fourth of U.S. energy consumption. Cars and trucks alone account for about 20 percent of total U.S. energy use. Almost two thirds of total U.S. petroleum consumption is in the transportation sector.

Since 1949, transportation energy consumption has increased at an average annual rate of 2.4 percent, though growth has not been uniform. Energy use in transportation has risen slowly over the past 15 years. Corporate average fuel efficiency (CAFE) standards for light duty vehicles became effective in 1975, and the efficiency of the light-duty vehicle fleet improved significantly between 1975 and 1985.

According to data compiled by the Federal Highway Administration, both total vehicle-miles traveled in the United States (2.36 trillion vehicle miles in 1994) and average yearly miles traveled per vehicle (11,697 in 1994) are growing steadily. Fuel consumed, estimated at 140.5 billion gallons in 1994, also is rising, as is average annual fuel consumption per vehicle, which dropped from

830 gallons per vehicle in 1970 to 677 gallons in 1990, but has since risen to 705 gallons in 1994. Energy use in vehicles is expected to continue to rise throughout the beginning of the 21st century. (For more information on efforts to mitigate the impacts of transportation on the environment, see Chapter 19, "Transportation.")

RECENT DEVELOPMENTS

In the 1994–95 period, Congress and the Administration have addressed a number of energy-related issues, including changes in approach to the Strategic Petroleum Reserve, export of Alaskan North Slope oil, and regulatory changes in the electric utility industry.

Strategic Petroleum Reserve

Authorized in 1975 and intended to provide some protection in the event of another oil embargo, the Strategic Petroleum Reserve (SPR) holds (as of August 1996) about 584 million barrels.

During the 1990s, a number of developments have affected SPR policy, including the need to cut federal spending and the emergence of unregulated and relatively efficient oil markets. A defacto consensus emerged that the SPR was at an adequate level to fulfill its mission and that further filling was unneces-

This sanitation truck in New York City powered by compressed natural gas as part of a Department of Energy managed trial and evaluation project.

Photo Credit:
U.S. Department of Energy

sary. In early 1994, the Administration proposed, and Congress agreed, to suspend further purchases of oil for the SPR.

The priorities now are maintaining the reserve's readiness and upgrading an aging infrastructure. The President's FY 1996 budget request proposed using unspent oil acquisition funds, $25 million in new authority, and an additional $100 million from the sale of 7 million barrels of SPR oil to finance the transfer of 73 million barrels from the storage site at Weeks Island, Louisiana, where a sinkhole had developed. The sale proved controversial, with some members of Congress arguing that this was an inadvisable precedent. Owing to the higher price of crude oil, the sale of 5.1 million barrels was sufficient to generate $96.4 million in revenues.

In April 1996, Congress and the White House completed action on legislation (HR. 3019) that would authorize the sale of $227 million in SPR oil during FY 1996. The intent of the amendment was to provide an offset against the proposed restoration of cuts in education programs. The sale was largely completed by mid-1996.

Export of Alaska North Slope Oil

On November 28, 1995, the President signed legislation (S. 395, PL 104-58) that authorized the export of Alaska North Slope (ANS) crude oil subject to a national interest determination. Along with the National Economic Council (NEC), CEQ led the interagency environmental review associated with the lifting of the 23-year ANS crude oil export ban. A June 1994 report by the Department of Energy projects that lifting the ban will increase domestic production by as much as 110,000 barrels per day, raise significant revenue for the federal government and the states of Alaska and California, and expand net U.S. employment by up to 25,000 jobs.

On April 28, 1996, the President determined that ending the export ban was in the national interest, subject to four important environmental conditions:

- Tankers exporting ANS crude oil must remain outside of the 200-mile Exclusive Economic Zone, ensuring that tankers will remain far from environmentally sensitive areas along the Aleutian Islands.
- Tankers carrying ANS oil for export must be equipped with satellite communication systems to monitor their position.
- ANS export tankers must be inspected annually to ensure they are kept in safe working order.
- ANS export tankers are required to exchange their ballast water in deep ocean water prior to entering Prince William Sound.

In addition, all exports must be carried on U.S.-flagged tankers.

The interagency review group found no likelihood of adverse impacts from ANS exports on the state of Washington's consumers, refiners, or environment. However, the increasing volume of vessel traffic projected to occur as a result of other factors, such as the growing international trade between the state of Washington and Pacific Rim nations, has increased public concerns about existing vessel safety procedures and resources. As a result, at the same time that President Clinton made his national interest determination regarding ANS exports, he also requested that the Coast Guard study the private sector efforts for vessel assistance in Puget Sound and report to the Secretary of Transportation. In addition, the President directed the Secretary of Transportation to determine by December 31, 1996, the need for additional, cost-effective measures to protect the marine environment and prevent shipping accidents in Washington.

Electric Utility Restructuring

Regulation of the electric utility industry historically worked on the assumption that unified control of generation, transmission, and distribution was the most efficient means of providing service. About 75 percent of all Americans are still served by a vertically integrated, investor-owned utility.

The states and the federal government share in the regulation of the industry. State regulatory commissions have authority over intrastate activities, including wholesale and retail rate-making, and often over investment and debt. Federal regulation focuses on transmission and sales for resale of electric energy in interstate commerce.

Beginning in 1978, with the enactment of the Public Utility Regulatory Policy Act (PURPA), laws were passed to encourage energy efficiency and alternative sources of power. PURPA required utilities to buy all power produced by qualifying facilities at their "avoided cost," or the amount it would cost the utility to produce the power.

The 1992 Energy Policy Act removed regulatory barriers and promoted greater competition in the electricity supply industry. In March 1995, the Federal Energy Regulatory Commission (FERC) issued two proposed orders (No. 888 and No. 889) that are intended to promote competition in wholesale electricity markets by eliminating discriminatory pricing and access to transmission facilities and services. These orders were published in final form on April 19, 1996.

On May 13, 1996, the EPA Administrator referred Order No. 888 to CEQ for action under the National Environmental Policy Act (NEPA). The referral was based primarily on EPA's concerns that under certain circumstances the open access rule could lead to increases in air pollution in the future that could have impacts that are unsatisfactory from the standpoint of public health, welfare, or environmental quality.

(The CEQ regulations implementing the environmental impact statement assessment provisions of NEPA provide for a referral process for resolving federal agency disputes when there are "interagency disagreements concerning proposed major federal actions that might cause unsatisfactory environmental effects." The CEQ regulations implementing NEPA provide that rulemakings can be such "major federal actions.")

Because EPA determined that there was no immediate environmental threat from adoption of the rule, the agency proposed that the FERC rule be allowed to proceed without delay, but that a set of actions to address future potential emissions be undertaken by the states, EPA, and FERC.

In response to the EPA referral, FERC made important commitments to take future actions to protect clean air, if necessary. On June 14, 1996, CEQ notified the heads of both FERC and EPA of CEQ's conclusion that the referral process and subsequent responses had successfully resolved the disagreements between EPA and FERC.

FUTURE CHALLENGES

The Clinton Administration's national energy strategy emphasizes the importance of a competitive economy, the quality of the environment, and national security in addressing energy issues.

Central to the Administration's approach is the concept of sustainable development and three associated strategic goals. The first is the need to maximize energy productivity to strengthen our economy and improve living standards. The second goal is to prevent pollution and thereby reduce the adverse environmental impacts associated with energy production, delivery, and use, including emissions of pollutants and greenhouse gases. The third goal is to keep America secure by reducing our vulnerability to global energy market shocks. (Further discussion of these goals appears in *Sustainable Energy Strategy*, Executive Office of the President, 1995).

In keeping with these goals, the Administration is pursuing a wide range of programs that fall into several categories. These strategic components of a sustainable energy policy include increases in the efficiency of energy production and use; development of a balanced domestic energy portfolio, including renewables; investment in science and technology advances; reinvention of environmental protection; and development of international markets.

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