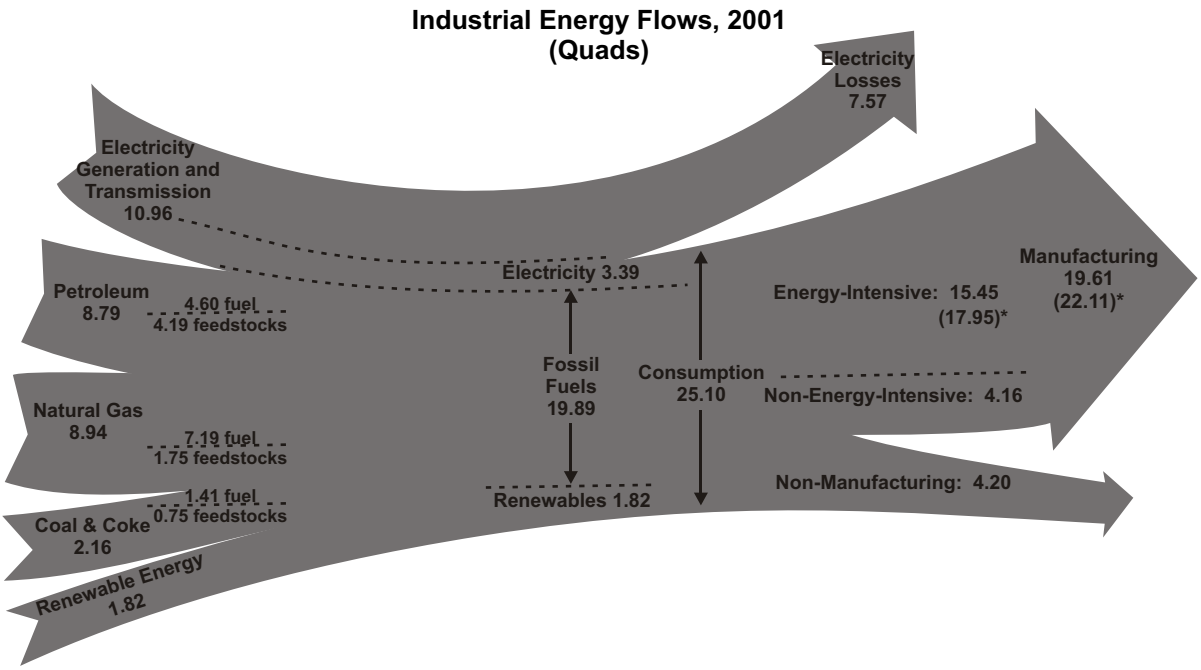


Sources: EIA AEO 2003, EIA MECS 2001.

* EIA AEO 2003 does not include 2.5 quads of non-fuel energy in the petroleum refining sector (used to make asphalt, lubricants, solvents, waxes, etc.) that is reported in EIA MECS 2001.

Current Situation

Energy Profile of the Industrial Sector

Industry is the largest and most diverse energy-consuming sector in the United States. In 2001, industry consumed 32.3 quads, or over one-third of the 96 quads consumed in the United States. Roughly 8 quads are lost during power generation and transmission before electricity arrives at industrial plants. Natural gas, petroleum products, and electricity comprise the major energy sources used to heat and power U.S. factories, farms, mining, and construction operations. In addition to heat and power, industry used about 7 quads of fossil fuels as feedstock to produce industrial materials and products such as chemicals and plastics. Industry's energy expenditures for heat and power totaled $80 billion in 2001.

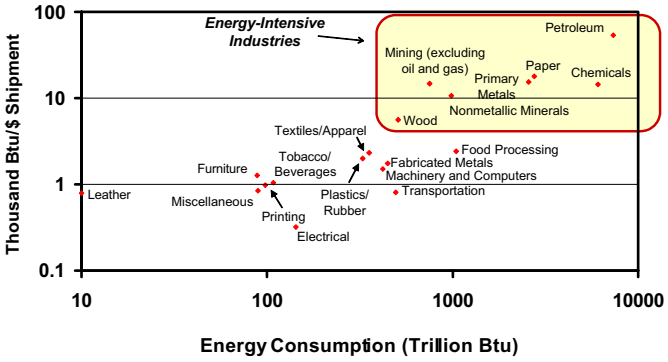
Unlike other sectors, energy use in industry is often determined by the specific industrial process in use. For example, the aluminum industry uses large amounts of electricity for smelting while the glass industry uses large amounts of natural gas to melt silica in furnaces. These inherent variations inhibit a "one-size-fits-all" approach to energy efficiency. However, some important energy applications are common across industry, such as motor drives, steam systems, and compressed air. As a result, industrial energy efficiency opportunities exist in both process-specific and crosscutting energy systems.

Within manufacturing, 6 of the 21 major U.S. industries account for 85% of all energy use. These industries (as well as mining) use large amounts of energy to transform raw materials into higher-value industrial materials and end products. These industries also tend to be energy-intensive, using large amounts of energy per dollar of product output. **Energy intensity**[1] is the single most important indicator of energy efficiency in industry, and is dependent on market prices, economic risks, and other factors.

Key Trends

As the role of energy in industry changes, ITP must reshape its strategy. Changing market conditions, energy prices, and business concerns affect the ability and willingness of industry to pursue energy efficiency opportunities. The following trends have shaped the ITP strategy:

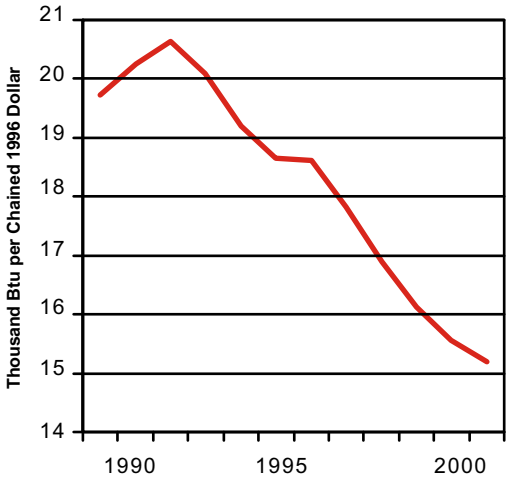
Industrial Energy Intensity vs. Energy Consumption



Sources: EIA MECS 2001, Bureau of EconomicAnalysis.

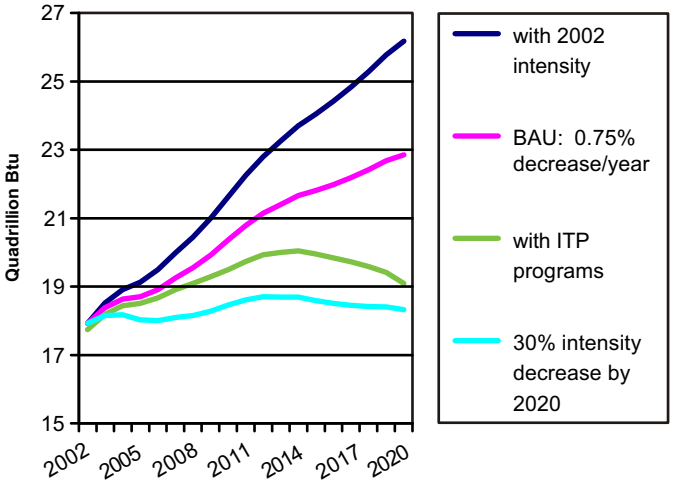
- **The industrial sector will continue to provide one of the biggest opportunities to increase energy efficiency in the United States.** Industrial energy intensity is projected to decline as companies become more energy efficient and the structure of the industrial sector changes. In 2001, industry posted its *lowest energy intensity since the formation of the Department of Energy* (15,200 Btu/dollar of industrial GDP [constant chained 1996]). This was significantly lower than what it was in 1970 and reflects the change in the economic mix of industries and the diligence of

Industrial Energy Use per Dollar of Industrial GDP



Source: EIA MER 2003, Bureau of Economic Anaylsis.

Projected Energy Use in Energy-Intensive Industries

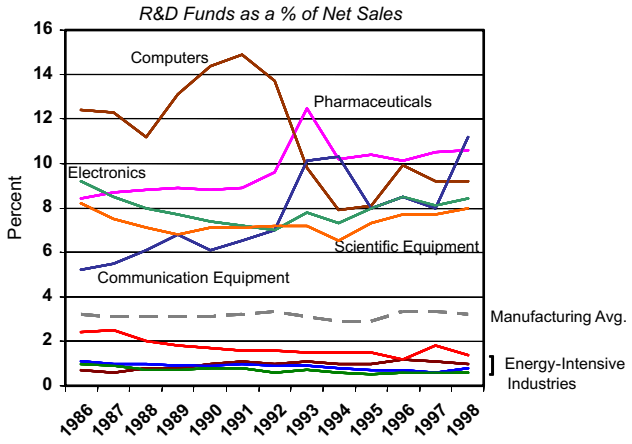


Sources: EIA AEO 2003, EIA MECS 2001, ITP.

[1] Energy intensity is defined as energy use per unit of product output (for example, Btu per dollar value of shipments).

private industry in assimilating energy efficiency technologies. The DOE Policy Office determined that more efficient manufacturing delivered the largest component of total U.S. energy savings from 1970 to 1988. (The change in the mix of industries and commercial building improvements were tied for the second largest component.) Although manufacturing output surged in the late 1990s, energy use grew at a slower rate despite relatively low energy prices. Energy use projections indicate that increased industrial efficiency will continue to be a major source of future U.S. gains in energy efficiency. This ability to increase output without a corresponding increase in energy use is a major strength of U.S. industry.

R&D-to-Sales Ratio in Manufacturing 1986-1998

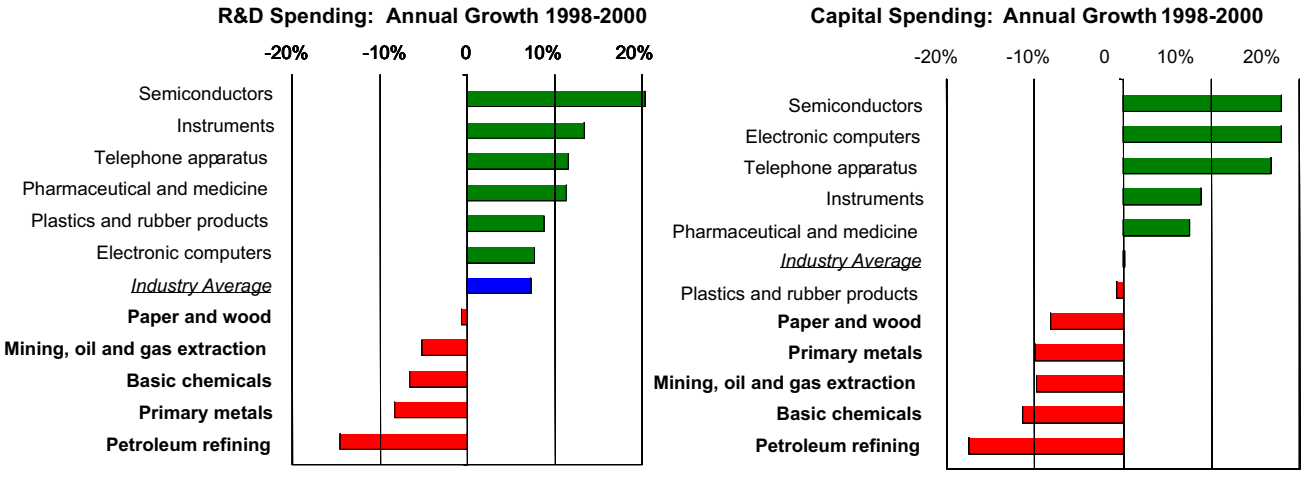


Source: NSF 2002.

- **Energy-intensive industries exhibit relatively low levels of R&D spending.** The energy-intensive industries have the *lowest R&D investment rate in the entire industrial sector*, with a 0.8% R&D/sales ratio. (This compares with an average of 4.3% for all of industry.) Between 1998 and 2000, R&D investments in the energy-intensive industries actually *declined* by 3.0% per annum in sharp contrast to the 7.3% per annum *increase* for all of industry. Over this period, the energy-intensive industries posted the poorest overall economic performance of all industry groups considering net sales, foreign sales, capital spending, employment, and R&D investment.

- **Industry is unable to accept the risks associated with undertaking complex, capital-intensive technology development and implementation.** Highly efficient, next-

Recent Trends in Corporate Spending for R&D and Capital Spending



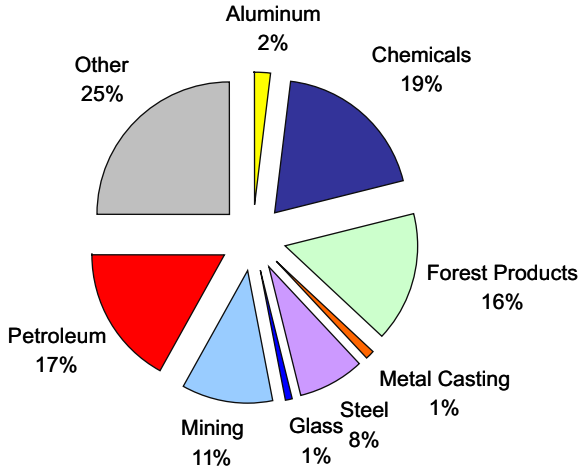
Source: USDOC 2002.
Bold = energy-intensive industries

generation process technologies in well-established, large-volume processes are usually technically complex and require enormous capital investment. They are promising but unproven, exhibit small near-term returns, and carry the risk of lost production. These technologies must compete for scarce capital in the energy-intensive industries, which scaled back their capital investments by 9.8% per year from 1998 to 2000. As a result, few companies are willing to be the first to deploy advanced production technology because the cost of failure could destroy the company or its competitive position. However, studies have concluded that societal benefits of investing in R&D far outweigh corporate benefits, implying that without federal assistance, companies will underinvest.

- **The U.S. materials and process industries face intense competitive pressures.** Strong cost competition from foreign producers and alternative materials as well as shareholder expectations of near-term profits are squeezing all corporate expenditures. Capital productivity has stagnated, resulting in low capital stock turnover and investment returns. Environmental and climate change factors are playing an increasingly important role in corporate decision-making. While energy continues to represent an important component of manufacturing costs, energy efficiency improvements may compete with other operational objectives. In response, companies have pursued strategies to cut costs and mitigate risk through mergers and acquisitions, leveraging R&D funds with private and public partners, globalizing and integrating R&D, and outsourcing technical components.

- **Energy markets and suppliers have restructured.** The businesses that supply energy to the industrial sector have changed dramatically as natural gas and electricity markets restructured. This transition from regulated to competitive energy markets has created greater price volatility, particularly for natural gas and electricity deliveries from the spot market. Conflicting legislative incentives and regulatory uncertainties regarding electricity and the environment have prompted many industrial firms to outsource their energy services and add back-up power generation capability.

Estimated Manufacturing and Mining Fuel Use, 2002*



* Includes 2 quads of renewable energy used mainly in the forest products industry.

Sources: EERE, EIA AEO 2003, EIA MER 2003.

Strategy

1. Focus on energy-intensive industries

ITP focuses its resources on a small number of energy-intensive materials and process industries that account for