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Technologies that could transform how industries use energy

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Energy accounts for a sizable share of company operating costs. Our new report details 33 technologies to improve energy efficiency—and your bottom line.

As the world grows, in both wealth and population, so will the demand for energy: global primary-energy consumption is on course to increase by 25 percent between now and 2030. At the same time, concerns over pollution and climate change are forcing businesses and governments to think hard about how they produce and use energy. Energy efficiency, which is sometimes called the “fifth fuel” (after coal, gas, nuclear, and renewables), can play an important role in helping the world meet its demand for power and mobility.

Since the turn of the 21st century, energy costs have risen steadily. Even when prices have fallen, as happened most dramatically with oil from 2014 to 2015, such rapid swings can be difficult for companies to cope with. Moreover, when costs are low, there is a tendency to question whether energy-efficiency measures are worth the effort. The answer is yes, many are—and not just because energy efficiency offers protection against price volatility.

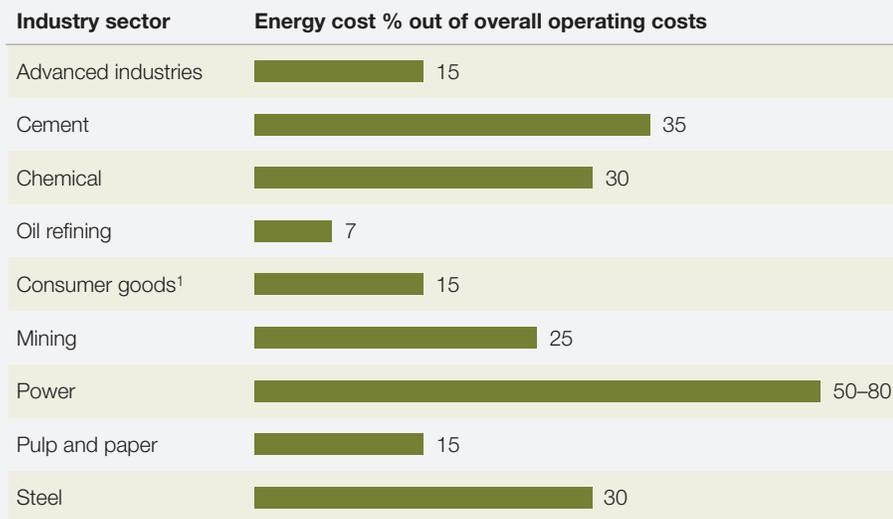
Energy forms a sizable share of operating costs (Exhibit 1). Globally, the chemical, cement, and metals and mining sectors, for example, spend about one-third of their operating budget on energy. Those figures are typically higher in developing regions, where the cost of labor is lower.

Our research shows that while operational improvements can reduce energy consumption by 10 to 20 percent, investment in energy-efficiency technologies can boost that to 50 percent or more. For example, the cost of clean-room-environment control could be reduced from 50 percent of energy consumption to a fifth of that, and there are also sizable gains to be made in cement, refining, and steel. We have identified real-life examples in multiple industries where companies have significantly reduced energy costs and recouped their investment in three years or less (Exhibit 2).

In short, it is not an impossible dream for manufacturing, which accounts for half of global energy consumption, to meet energy demand in a way that is both economically and environmentally efficient. Innovative technologies could significantly reduce energy consumption and save industry more than \$600 billion a year.

Exhibit 1

Energy forms a sizable share of operating costs.



¹Including cosmetics, food and beverage, and pharmaceuticals.

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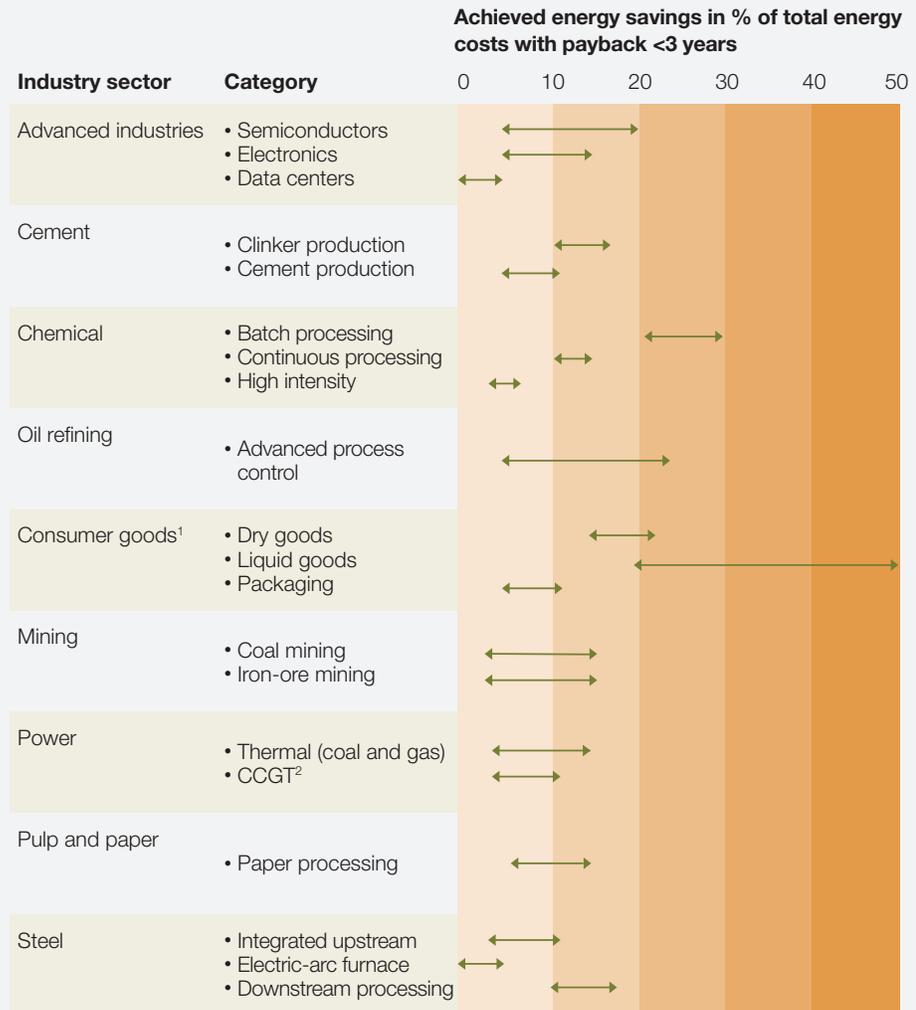
Our report, *Greening the future: New technologies that could transform how industry uses energy*, details 33 innovations that could help industry significantly improve energy use. These innovations span nine categories: advanced industries, cement, consumer goods, mining, oil refining and chemicals, power, pulp and paper, steel, and those that can be used generally. Most of these technologies are already available—the challenge for companies is to figure out which ones to use, how to put them into practice, and how to renew them so that they continue to work year in and year out.

Our five core principles of resource productivity are used to help make sense of what technologies to use and how to put them into long-term practice:

- **Think lean.** Build a resource-productivity strategy within the organization. Lean thinking and green thinking are based on the same fundamentals and work together well. For instance, an Indonesian power plant reduced its cost per megawatt by 7 percent in four months by creating performance indicators and then tracking them systematically.
- **Think limits.** Use the theoretical-limit concept—an analysis that identifies the lowest amount of energy required for a given process—to set ambitious but realistic goals. This fosters the kind of creative thinking that can deliver substantial resource-productivity improvements. One Chinese iron-and-steel enterprise reviewed its theoretical limits and analyzed its key sources of operational loss; on that basis, it changed its operations to use waste heat to generate additional power, significantly cutting its production costs.
- **Think profit per hour.** Review the full profit equation when making changes. Evaluate trade-offs such as throughput, yield, energy, and the environment as a whole—changes in one will likely affect the others. Profit should be the main factor in making final decisions. By

Exhibit 2

Operational-improvement efforts have typically led to energy savings of 10 to 20 percent.



¹Including cosmetics, food and beverage, and pharmaceuticals.

²Combined-cycle gas turbine.

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applying advanced statistical analysis, a pharmaceutical company was able to increase its yield by 20 percent while using the same amount of energy.

- **Think holistic.** Making and sustaining change is not only a matter of technical improvement; it also means changing mind-sets, behaviors, and the management system throughout the organization.
- **Think circular.** Consider your product as a future resource that can be used repeatedly, moving from the usual linear supply chain toward supply circles. A global data-services company applied the “think circular” principle by using analytics to design a facility that streamlined energy to its most important function. This resulted in more capacity and less capital expenditure.

Around the world, and across sectors, getting smart about energy should be seen as a strategic imperative. The chance to do better is there for the taking. ▣

This article is an edited extract from *Greening the future: New technologies that could transform how industry uses energy*, on [mckinsey.com](https://www.mckinsey.com).

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