

The coming energy revolution

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Smart-grid technology will bring huge savings to companies as varied as Cisco, PG&E, and Cargill, and to consumers, too. But who will foot the bill?

Food producer Cargill is taking a carving knife to its electricity bills. At a plant in Springdale, Ark., where the company handles about 50,000 turkeys a day, electricity bills run more than \$2 million a year. But Cargill thinks it can cleave \$680,000 from the total by using its own generators on high-demand days.

The secret behind this money-saving plan lies in what's known as the smart grid—a wholesale revamp of the system that distributes energy to homes and businesses around the country. Government bodies and utility providers are in the early stages of this multibillion-dollar upgrade to transform the existing grid into a two-way network where power and information flow in both directions between the utility and the customer, not just from the provider to the user.

Done right, the revamp will cut bills, reduce consumption, give users more say in the kinds of energy they use, and even let customers produce their own energy and sell it back to power providers. "What's going to happen with the smart grid is that we're going to create a network that's larger than the Internet," says Guido Jouret, chief technology officer for the emerging-technologies group at Cisco Systems (CSCO), one of the many companies working on the technology needed to modernize the electric grid.

A \$20 billion market in five years

The Electric Power Research Institute, a nonprofit research and design group, estimates that it will cost \$165 billion, or roughly \$8 billion a year for 20 years, to create the smart grid. The market for the gear needed to overhaul smart-grid communications alone may reach \$20 billion a year in five years, Cisco estimates. Other technology companies developing smart-grid software and hardware include IBM (IBM), Oracle (ORCL), Google (GOOG), and Siemens (SI).

The tech sector's interest is fitting considering the similarities between the energy-grid upgrade and the computing revolution of the 1980s that saw hulking, centralized mainframes give way to PCs. The existing U.S. power grid dispenses electricity but is limited in its ability to gather intelligence from end users—hence the monthly visit from a meter reader. Now utilities are replacing outmoded meters with so-called smart meters that foster a back-and-forth between customer and utility. In much the same way PCs opened the door to third-party software and services and use of the Internet, smart meters are paving the way for tools and services that make the system more responsive to shifts in energy demands.

Cargill is counting on smart-grid tech to lower its bills. Many utility vendors set rates for industrial customers based on peak-use patterns. So in a common practice known as peak-shaving, Cargill taps its own generators to keep its 365,000-square-foot Springdale plant cool on summer's hottest days rather than use energy from its electricity vendor, PowerSecure (POWR). The challenge is determining when peaks occur. PowerSecure keeps close tabs on Cargill's generators, as well as fluctuating electricity prices, and when it can tell that rates are on course to pass certain preset thresholds, it fires up Cargill's generators remotely.

Easier to opt for solar or wind

In the future, Cargill may choose to run its generators more often and sell power back to the utility when prices are high, says PowerSecure CEO Sidney Hinton. While Cargill's utility

provider doesn't currently purchase energy generated by customers, other utilities, including PG&E (PCG) in California, have begun buying solar energy generated by customers on corporate campuses and residential rooftops.

Another benefit is that customers may soon get more leeway in determining the nature of the power they purchase, more easily opting for renewable energies such as solar and wind, says Matthew Trevithick, a partner at venture capital firm Venrock. Companies that are actively trying to cut their carbon footprints, such as Coca-Cola (KO), may be able to specify the percentage of renewable energy they buy, opting to pay more for wind, for example, if it helps them meet go-green targets.

But questions abound over who will foot the bill for the grid's modernization. The American Recovery & Reinvestment Act has allocated \$4.5 billion in grants and loans through the Energy Dept. for the smart grid to enhance security and to ensure reliability of the electric grid to meet growing demand.

What of the remaining costs? Often, capital improvement expenses are passed along to customers. Before that, though, utilities need a green light from state regulators. "Certain states will go first because of cost," says David Leeds, an analyst specializing in the smart grid for Greentech Media. For instance, he says that in California, electricity costs 15¢ per kilowatt hour, compared with about 5¢ in Georgia.

Discounts for lower peak usage

California utilities are leading the way in smart-meter installation. Northern California's PG&E is the leader, spending \$2.2 billion to deploy 5.4 million smart meters, according to a Greentech Media report. Southern California Edison is No. 3, spending \$1.63 billion on 4.8 million smart meters. (Columbus (Ohio)-based American Electric Power (AEP), with a goal of installing 5 million meters, lands between the two California utilities.)

Utilities stand to benefit from smarter-grid technology, too—particularly during high-demand periods. When demand for electricity exceeds supply, such as on hot summer days when air conditioners are running, utilities must find additional power or potentially face blackouts. Some are forced to tap expensive, coal-burning power plants that are kept for just such a purpose. Alternatively, utilities can buy power on demand from the spot market. The problem in either scenario is that rates charged for electricity remain constant even when the cost of supplying it can surge. As a result, utilities may lose money on hot days even though consumers are using more power.

Many utilities have encouraged consumers to voluntarily engage in energy efficiency, but changing consumer behavior can be challenging. For example, Southern California Edison has used the slogan "Give your appliances the afternoon off" for decades to try to get customers to reduce the strain on the grid from 2 p.m. to 7 p.m., when millions of customers turn on large appliances such as clothes washers and dishwashers. While energy-efficiency programs have helped reduce consumption, the utility stands to make even bigger gains with the installation of smart meters.

Plants can keep going during storms

But as information on usage is extended further to the residence or business, customers will be able to see just how much energy their lighting, air conditioning, and appliances use. "The idea is that electricity costs more at peak-demand times, so if you showed those pricing signals to people, they can choose to shift usage to off-peak times," says Jeffrey Taft, global smart-grid chief architect at Accenture (ACN). The smart grid will also give utilities the ability to

automatically turn down business and consumer appliances on peak days. Customers would probably be given some sort of discount in exchange for letting the utility cut power to certain systems at key times of the day.

In Springdale, Ark., the local utility once faced a high-demand day and called and asked Cargill to fire up its generators and separate from the grid—and paid the company to do so. "In the long run it netted out a lower cost for us," says Cargill Engineering Manager Jim Edwards. Those generators have come in handy at other times, too. When there was a big ice storm in Northwest Arkansas this past winter, Cargill ran the generators for six days straight to keep producing turkey meat. "We were the only facility in this area to continue processing products," says Edwards. "If the plant had been closed for those six days, it would have lost about \$1.2 million."

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