

**Major Business News**

**Think Small**

***Distributed generation may be the key to making deregulation work***

By ROBERT GAVIN

Imagine a future where anyone can produce and sell power: homeowners with rooftop solar panels; businesses with microturbines (scaled-down jet engines) running on cheap and plentiful methane gas; and even motorists who, after arriving at work in their fuel-cell-driven cars, plug into a distribution network to sell power the fuel cells keep making.

In this scenario, power marketers, using the Internet, link and control these and any number of other energy sources, bringing them on and off the electrical grid to match demand with market prices. For example, a power marketer could have contracts with several businesses that have microturbines or diesel generators, or with homeowners who have solar panels. These scattered sources could be grouped together via the Internet, and maybe on a very hot day in California when supplies might be tight and wholesale prices high, the power marketer could sell the power on the grid.

Consumers, in turn, are presented with a wide variety of choices: Depending on where the best deal is, they might buy from a traditional utility, a local power marketer or their next-door neighbors. Or they might make enough power themselves to avoid buying from anyone.

This vision of the future comes courtesy of distributed generation -- small-scale power production that is located closer to the user.

Distributed generation -- also known as micropower -- accounts for some 5% of the nation's electricity, about the same level as three years ago, according to the Department of Energy. Right now the main source is natural-gas or coal-fired cogeneration plants that, along with producing electricity, also provide steam for heating and manufacturing processes.

Over the next 15 years, the Energy Department estimates, distributed generation could account for 10% to 20% of new generating capacity. Proponents say that with so many sources of power production, competition among producers will flourish, forcing them to offer the lowest possible prices to consumers, thus driving them to develop better and more efficient production. That competition, choice, innovation and lower costs would realize the promises of electricity deregulation, say the proponents.

**The Telecom Parallel**

Tom Starrs, an energy consultant in Vashon, Wash., likens the current developments in distributed generation to the changes in telecommunications 20 years ago, when the breakup of AT&T Corp. launched that industry's reshaping. What followed was a burst of technological and entrepreneurial

innovation that today offers consumers, whose choices once were limited to the color of the phone they would rent from a local monopoly, a wide variety of products and services.

"Distributed generation is a comparable revolution that is just starting, caused by profound regulatory changes and profound technical changes," Mr. Starrs says. "The historical paradigm of a large central power plant making all the power and distributing it all downstream is going to change."

As businesses install diesel- and gas-fired generators to avoid peak prices and homeowners add solar panels to blunt escalating electricity rates, utilities also are testing a variety of distributed technologies to find ways to add capacity while avoiding the long, difficult process of siting new transmission lines and power plants.

For most consumers today, buying power from the local utility is still cheaper than installing their own system. That's because without subsidies, even the most efficient distributed technologies generally can't match prices that nationally average about eight cents a kilowatthour. Unsubsidized photovoltaic systems, for example, can produce power for about 22 cents to 40 cents a kilowatt-hour, according to the National Renewable Energy Laboratory, a division of the Energy Department.

But several factors are coming together to make distributed generation practical for wider use, starting with energy shortages, rising prices and improving technology. Energy-squeezed states are subsidizing distributed technologies as a way to bring on new power supplies to help avoid shortages, cut peak demand and moderate prices.

### **Hot, Sunny Days**

The California Public Utilities Commission, for instance, recently approved a \$125 million incentive program to encourage businesses and homeowners to install their own generating capacity and take less power from the grid. New York has started a nearly \$4.8 million pilot program that pays as much as half the cost of installing photovoltaic systems, which have the advantage of producing the most power when demand and prices are highest: hot, sunny days.

"Peak-shaving is the perfect role for photovoltaics," says Tom Leyden, vice president of PowerLight Corp., a solar-energy company based in Berkeley, Calif., that is installing the systems under contract with the state of New York.

But beyond the energy crisis, factors that will continue to boost distributed generation in the long term are the digital economy and a continual deregulation of the electricity markets, which can mean prices fluctuate by the hour, making distributed generation more cost effective at certain points. Businesses with installed generation would get the flexibility to switch onto and off the grid, depending on prices. In Texas, for example, under a pilot program with TXU Corp., a Dallas-based utility, LaQuinta Inc., a motel operator, also based in Dallas, installed a natural-gas-fired microturbine at its Irving motel in the summer of 2000. By running the microturbine during peak afternoon and evening hours, LaQuinta saved at a rate of about \$20,000 annually.

When the price of natural gas spiked near the end of last year, the microturbine was no longer competitive with TXU's rates. Now, LaQuinta is moving the turbine to one of its California properties. "With the prices in California, we figured we could get the greatest return on our investment," says Mike Milburn, the corporate energy manager.

## Halting the Shutdowns

Businesses also look to distributed generation as an answer to outages. While the power grid is said to be 99.9% reliable -- which translates into only a few hours a year of outages -- that's not good enough for these companies whose computers can crash from a momentary fluctuation. By adding generation to back up or supplement power from the grid, firms can cut exposure to outages from a few hours a year to few seconds.

Near Rochester, N.Y., Harbec Plastics Inc., a maker of precision plastic parts for automobile, computer and medical-device manufacturers, recently completed the installation of 25 microturbines, providing a capacity of 750 kilowatts. The reason: The company's computer dependent manufacturing process was losing hours, and sometimes days, because of shutdowns caused by fluctuations in the power delivered through the grid. In one month alone, the company estimates, those shutdowns cost \$16,500 in lost production.

The microturbines will allow Harbec to leave the power grid altogether, since the company installed enough to power its operations, plus plenty of backup generation.

And Harbec Plastics isn't alone in making such a move: [Capstone Turbine Inc.](#), a microturbine maker in Chatsworth, Calif., sold 790 units last year, up from 211 in 1999. And the company says it sold 728 units in the first half of this year, nearly matching its total for all of 2000.

Among the utilities looking to distributed generation as a way improve reliability and expand capacity without building new power plants and transmission lines is Washington's largest investor-owned utility, Puget Sound Energy, a unit of Bellevue-based [Puget Energy Inc.](#) The company plans to begin installing five-megawatt gas-fired turbines at substations near neighborhoods with growing demand -- at the rate of about one a year, starting later this year. In New York, Long Island Power Authority, a municipal utility, recently said it would connect 75 fuel cells -- providing enough capacity to power about 100 homes -- to test the still-emerging technology as a way to add capacity and reliability.

But how fast the market will change remains unclear. Distributed generation faces technical, regulatory and political hurdles, starting with the challenge of making different generating technologies, scattered throughout the system, blend into the transmission grid. "A photovoltaic system, a fuel cell, a microturbine, all can have a different electrical nature that can feed into the system," says Chuck Linderman, director of energy supply for the Edison Electric Institute, a Washington, D.C., group that lobbies for investor-owned utilities. "How many machines can you put on the system without changing the harmonics that maintain electric stability?"

## Frequent Delays

A National Renewable Energy Laboratory study of barriers to distributed generation found that these technical concerns have been used by utilities, which stand to lose customers, to delay small-scale power projects. In a review of 65 distributed-generation projects, the study found only seven that weren't delayed by a local utility's technical and administrative requirements, such as costly engineering studies required by utilities and high fees for interconnection, transmission, and access to the grid for backup supplies.

In one Maryland case, a 700-kilowatt steam turbine to power an office building was delayed more than a year by the local utility's interconnection requirements. (The study named neither the power developer

nor the utility.) The utility, which had little experience with distributed generation before the developer approached it in 1997, told the study's authors that it subsequently streamlined procedures to avoid such lengthy delays.

These issues are being addressed. A group of utilities, regulators, distributed-generation manufacturers, and technical experts is developing national interconnection standards under the auspices of the Institute of Electrical and Electronics Engineers, a professional group based in New Brunswick, N.J. Meanwhile, regulators in Texas, where the electricity market will be deregulated next year, have adopted rules making it easy to bring distributed generation online, while California and New York regulators are in the process of adopting such rules.

More problematic are political issues, particularly the future of deregulation. With the debacle in California, there is increasing pressure to reregulate the industry, a move proponents of distributed generation fear will thwart the innovation needed to make a decentralized power system work. Hugh Holman, a power-industry analyst with CIBC World Markets Inc., a Toronto-based investment bank, says a return to regulated markets would remove the two elements critical to distributed generation's development: consumer choice and price signals. Regulatory actions, meanwhile, have already had an impact on distributed generation: Recent federal price caps imposed on Western wholesale prices have pulled the plug on some 300 megawatts of small diesel generators.

"Do we innovate, or keep the lights on?" asks Carl Weinberg, an energy consultant and former director of research for PG&E Corp. of San Francisco. "In the long run we want a clean, affordable electricity supply coupled to efficient, smart customers. All those are technically achievable. Whether they're politically achievable, I don't know."

## Power Shopping

*A variety of distributed-generation technologies are available or under development. Costs of producing power can vary widely, depending on location, size, use and fuel prices, but here are estimates:*

<b>Technology</b>	<b>Description</b>	<b>Cost*</b>
<b>Photovoltaics</b>	(solar panels) Converts sunlight into electricity	22-40 cents
<b>Wind turbines</b>	Wind blades power electricity-producing turbines	4-28 cents
<b>Diesel generators</b>	Similar to truck engines, also run on natural gas	7-12 cents
<b>Microturbine</b>	Scaled-down jet engines that run on natural gas, methane or waste gases	7-10
<b>Fuel cells</b>	Chemical reaction produces electricity and water	No commercial production

*Per kilowatt-hour, without subsidies. For comparison, the average U.S. retail electricity price earlier this year 6.9 cents per kwh.*

*Source: Department of Energy; National Renewable Energy Laboratory; American Wind Energy Association; manufacturers.*