

The Coming Fuel Cell Revolution

By Gary M. Stern

MOST UTILITY EXECUTIVES are not attending meetings about fuel cells. Fuel cells are on the back burner at most utilities, which focus on day-to-day issues and generating more revenue. Yet some industry experts are cautioning utility executives to pay attention to fuel cells or pay a price in the future.

Scott Samuelsen, director of the National Fuel Cell Research Center at the University of California-Irvine, jointly funded by the university and the U.S. Department of Energy, said utilities that ignore fuel cells "are overlooking the proposition of being in business in the next 10 to 12 years." Just as Toyota and Honda played a leadership role in new automotive technologies and became industry leaders, so will utilities that adopt fuel cells. "So far, we haven't seen that mindset in any utility," he said.

One insider noted that resistance to fuel cells and new technologies is endemic to utilities.

"Fuel cells are a new technology and just beginning to gain market traction. Telecommunication companies are quicker-moving in trying out new technologies," acknowledged Sandra Saathoff, director of marketing and communication at ReliOn, the Spokane, Wash.-based manufacturer of fuel cells. ReliOn in 2003 was spun off by Avista, which has a minority stake in the company.

Stated simply, fuel cells are electrochemical devices that take fuel—natural gas or hydrogen—and air and electrochemically convert the fuel into direct current power without the use of combustion. Because of the lack of combustion, it emits no noxious oxides.

As more and more states like New York and California demand that utilities use renewable energy, fuel cells move to the forefront. "Fuel cells are emerging as the most attractive alternative strategy to conventional ways of generating electric energy through central power plants. There is almost zero emission of criteria pollutants," Samuelsen said. He attributed utilities' slowness in adopting fuel cells to their wanting to see a five-year track record of reliability, its initial high cost and a lack of regulatory policy from most states encouraging alternative energy.

Innovative fuel cell companies are making gains in the marketplace. FuelCell Energy, a public company based in Danbury, Conn., specializes in producing 250-kilowatt fuel cells targeted at commercial and industrial customers. Starting in 2001, it sold three 250-kilowatt fuel cells to the Los Angeles Department

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Photo courtesy of the California governor's office.

of Water and Power. One fuel cell was installed at the energy company's headquarters; another at a downtown Los Angeles substation; and one at Terminal Island, its wastewater treatment facility. Steve Eschbach, FuelCell Energy's director of investor relations and communication, said LADWP benefited because of fuel cells' ultra-clean technology and higher efficiency, since they operate at 45 to 47 percent capacity compared to 33 percent for electric power plants.

FuelCell Energy also sold 250-kilowatt fuel cells to PPL Energy Plus for use at the Sheraton Parsippany and Sheraton Edison in New Jersey. Since fuel cells can cost \$4,000 per kilowatt to acquire, the \$1 million cost of each was underwritten by the New Jersey Clean Energy Fund, which paid 60 percent of it. The fuel cells Sheraton used provide "baseline power and supplement peaking and load following power," Eschbach said. Sheraton decided to use fuel cells because it "has a green mandate and wants to reduce energy costs," he added. Fuel cells operate at peak power during the morning rush, slow down during late morning, and then pick up again in late afternoon when guests check in.

FuelCell Energy recognizes that if it wants to increase business, it must reduce costs. "We've reduced our costs from \$8,000 a kilowatt in 2003 to \$4,600 a kilowatt in 2006," Eschbach said. It achieved cost saving by engineering refinements and introducing cheaper materials. It aims to reduce its costs by 20 to 25 percent a year and hopes that the Energy Policy Act of 2005, which introduced fuel cells for investment tax credits, takes off.

California Gov. Arnold Schwarzenegger tours a 1 megawatt plant installed by FuelCell Energy at the Sierra Nevada Brewing Co. with its founder, Ken Grossman.

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Power from fuel cells costs around 12 cents a kilowatt-hour, depending on location, competitive with electric costs of 14 cents a kilowatt-hour, Eschbach said. Samuelsen from the National Fuel Cell Research Center explained that competitive pricing stems from "waste heat that is recovered and used and when natural gas pricing is not exorbitant."

But not everyone thinks that the cost of fuel cells is affordable. "The technology isn't ready for prime time because of cost," noted Dan Rastler, technical leader of the distributed energy resources program at the nonprofit Electric Power Research Institute (EPRI) in Palo Alto, Calif. As natural gas prices spike, he would like to see government regulators provide more incentive for energy efficiency to help reduce the cost of fuel cells. Even Cynthia Mahoney White, the manager of public relations and marketing at Plug Power, a public company and fuel cell manufacturer, which launched in 1997 and is based in Latham, N.Y., admits that cost savings from fuel cells aren't there yet. "It's about supply and demand," she said.

Plug Power has a different business plan than competitor FuelCell Energy. Because its fuel cells are 5 kilowatts, it concentrates on selling back-up power to utilities and telecommunication companies. "Utilities spend millions on backup power," White stated. Plug Power's 5-kilowatt GenPower fuel cell for backup power costs from \$15,000 to \$50,000, depending on the storage unit for hydrogen and installation and service costs, she noted. Its fuel cells also support communication systems and can provide power for a black start when there is no power, she added.

Terrorism has enhanced market interest in fuel cells, White suggested. The World Center terrorist attack was a wake-up call for the United States and for utilities, which recognize the need for reliable backup power. "When 9/11 happened, no one was ready. No one had backup continuous power. People are much more aware of how vulnerable we are," White declared.

Detroit Edison, which owns 14 percent of Plug Power, has tested and introduced its fuel cells for back-up power. It piloted fuel cells in 2001 as backup power in a substation, explained Haukur "Hawk" Asgierrsson, a supervising engineer in distributed resource planning for Detroit Edison. After the test proved successful, Detroit Edison in 2005 installed a fuel cell as backup power in one of its substations.

Even Detroit Edison is moving cautiously into using fuel cells. Of its 600 substations, it uses fuel cells at only one of them. "It's still in development," Asgierrsson noted. At this point, he added, fuel cells cost the same as normal battery-driven back-up generators, though he envisions that using fuel cells at larger stations will be cheaper in the future.

Why are fuel cells more advantageous than batteries for back-up power? ReliOn's Saathoff replied that "batteries have a problem with temperature ranges. Fuel cells don't. Batteries require replacement every three to five years, and you need a Hazmat certificate to dispose of them. Fuel cells have no environmental issues, and their only byproduct is water, which evaporates or sinks into the ground."

Asgierrsson also envisioned that fuel cells could play a larger role at remote locations. Remote loads pay the same rates and yet are more costly to maintain and monitor. Indeed, Plug Power is researching fuel cells that will provide "prime power in a continuous run, targeting remote locations," White said.

As part of its 10-year \$355 million "Clean Energy Initiative," the nonprofit Long Island Power Authority (LIPA), which provides electricity for Nassau and Suffolk counties, is testing the use of fuel cells "to provide continuous power," said Dan Zaweski, its director of energy efficiency and distributed generation programs, based in Uniondale, N.Y. Ratepayers paid for this initiative, not government subsidies.

In 2005, LIPA piloted a fuel cell with a reformer built at a dozen residential apartment buildings, owned by two Long Island hospitals, Good Samaritan Hospital and North Shore University Hospital. The fuel cells, which can be hooked up to natural gas lines, supplement the power grid power and operate through a direct transfer switch. "It's part of our search for clean, alternative generation technology. Fuel cells produce substantially less sulfur oxide and nitrogen oxide," Zaweski noted.

LIPA will base fuel cells' effectiveness on whether they can provide sustained energy and avoid unplanned shutdowns. Although many customers approved of the pilot, Zaweski said some neighbors were concerned that stored hydrogen, which is flammable, could be a hazard. LIPA assured them there was no risk.

EPRI's Rastler is advising utilities to keep track of R&D on "higher temperature fuel cell systems, which have a wide range of uses, from residential to industrial. GE, Rolls Royce and FuelCell Energy are developing utility scale technologies, if they can meet cost targets."

Rastler reminds utility executives that "It took 30 years to use gas turbines for prime power. It'll take some time to bring fuel cell technology into the mainstream."

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Pacific Gas and Electric recently announced it has spliced its 10,000th solar power customer to the power grid, making it the leading utility in tapping solar power.

The utility has paid \$115 million in special financial incentives to those installing 230 solar projects totaling more than 30 megawatts worth of generation. It also offers incentives for wind, fuel cell or cogeneration units of 30 kilowatts or more.