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Where Fuel Cells Stand

Despite the recent buzz, they still have a couple of big obstacles

By JIM CARLTON

The recent media blitz around Silicon Valley-based Bloom Energy Corp. has raised the buzz level about fuel cells. But despite some encouraging signs, many observers remain skeptical about any imminent breakthrough.

Fuel cells—battery-like devices that convert natural gas, hydrogen or other gases into electricity—have long been seen as a promising technology. But also a flawed one. They're expensive to make, tend to degrade over time and lack the kind of infrastructure to effectively replace gasoline in vehicles.

When Bloom unveiled its Bloom Energy Server in February, the Sunnyvale, Calif., company claimed to have overcome the biggest hindrance, cost, by using a sand-like "powder" to help convert gases into electricity, rather than the precious metals that most other makers use. Bloom's initial roster of customers, including Wal-Mart Stores Inc., Google Inc. and eBay Inc., is impressive enough that some analysts say it may get the lift that has eluded competitors.

Edge in California

But even some supporters caution against too much optimism, given that Bloom has deployed its fuel cells only at a limited number of locations in California and hasn't yet demonstrated it can make the devices in mass volume. And while subsidies for using fuel cells in California can make the energy less expensive than power from the electric grid, fuel-cell use still costs more in many other states.

"It will have been a breakthrough if they have delivered on what they say they are in five to 10 years," says Ron Pernick, co-founder and managing director of Clean Edge Inc., a market-tracking firm in Portland, Ore.

Fuel cells are considered one of the cleanest energy sources because they convert fuels such as hydrogen and natural gas directly into electricity, without having to rely on the internal-combustion process that produces smog and other pollution. Electricity is generated when one of the gases is passed through a dense substance such as ceramic or molten carbonate.

There are two main uses for fuel-cell technology: mobile and stationary power. Some industry boosters have envisioned fuel cells eventually replacing gasoline in automobiles, but the lack of a refueling infrastructure has slowed development.

In 2005, President George W. Bush signed legislation to promote development of hydrogen fuel cells and infrastructure such as hydrogen filling stations. But the Obama administration in 2009 cut funding for that program, citing in part delays in getting that infrastructure in place. Administration officials directed the program to refocus on stationary uses, such as helping a power plant meet electricity needs during peak demand. Big auto makers such as Honda Motor Co. and Toyota Motor Corp. maintain fuel-cell programs for cars. Commercial uses of mobile fuel cells also have expanded to more marketable areas. Plug Power Inc. of Latham, N.Y., uses its fuel cells to power forklifts and other materials-handling equipment.

Stationary Front

But stationary power is where much of the commercial activity is taking place. Stationary fuel cells have run into problems, too. One of the biggest: the high cost of materials, which has made it hard for fuel-cell makers to turn a profit. FuelCell Energy Inc., which started commercial shipments of fuel cells in 2003 for large users such as utilities, remains in the red. The Danbury, Conn., company is able to sell a one-megawatt fuel cell for only about $3.2 million when it costs about $4 million to make, says John Roy, a senior analyst at Janney Montgomery Scott LLC in New York.

"What they really need is to get the volume up to get the price down," Mr. Roy says.

The good news for FuelCell Energy and other makers is that rising demand is helping to reduce costs. From 2007 to 2009, FuelCell's shipments tripled to 30 megawatts annually from 10, while costs dropped by more than half over the same time, says Dan Brdar, chief executive officer. The company has 50 megawatts of projects approved for California and Connecticut, and more business in the works in South Korea, he adds.

"For us, it is very straightforward," he says. "We get profitable when we get to 75 megawatts to 125 megawatts a year."

Demand is likely to grow as companies look to rein in rising power costs, while also cutting carbon emissions that many scientists link to global warming. In Ontario, Calif., Staples Inc. has almost completely weaned one of its distribution centers from the grid after installing three 300-kilowatt Bloom servers in December 2008, says Mark Buckley, vice president of environmental affairs for the Framingham, Mass., office-products retailer.

Mr. Buckley says that payback for the servers, whose price he would not disclose, will be in about four years from saved energy costs, and that Staples is in talks with Bloom to deploy fuel cells at more of its distribution centers. Bloom officials, who declined to comment for this story, have said that the refrigerator-size servers cost $700,000 to $800,000.

Officials at another Bloom customer, eBay, say the five Bloom servers it has used since last July at a campus in San Jose, Calif.—along with 3,248 solar panels—provide about 30% of the facility's electricity during peak power demand.

Officials of the online-auction company say one advantage of the Bloom servers is that they take up roughly the size of a parking space each, compared with more than a football field of rooftop space for the solar panels. Yet the Bloom servers provide about as much power as the solar panels, says Amy Skoczlas Cole, director of the green team for eBay. Energy savings from the fuel-cell servers should offset their costs in three years, she says.

Degrading Issue

But a disadvantage of fuel cells compared with other clean-energy sources is that they tend to degrade over time, like a battery. The fuel-cell "stacks" that serve as the engine of the servers often have to be replaced in 40,000 hours or less, or five years and under, says Dan Rastler, program manager for energy-storage research at the Electric Power Research Institute, an independent group in Palo Alto, Calif. To help attract early customers, Mr. Rastler says, many fuel-cell companies agree to service the products as part of their contracts—an offer, he adds, that weighs down on the companies' ability to make money.

Yet even on that front, the industry is making progress. UTC Power, a unit of United Technologies Corp., in 2009 introduced the PureCell Model 400, which doubles the replacement life for its phosphoric-acid fuel-cell stacks to 80,000 hours, or about 10 years. UTC, based in South Windsor, Conn., provides fuel cells for stationary and mobile uses, says Mike Brown, a vice president.

Analysts say the industry still needs to show that fuel cells can be mass-produced economically and reliably. Many predict that they eventually will be, but that applications will continue to be more limited than solar or wind for some time.

"They are a great adjunct to the grid, but not a replacement for the grid," says Harry McDonald, professor of computational engineering at the University of Tennessee in Chattanooga.

Top: A FuelCell Energy installation at a Pepperidge Farm bakery in Connecticut. Above: KR Sridhar, Bloom Energy's CEO, holds one of his company's fuel cells, which use a sand-like substance to generate electricity.

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