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Are Fuel Cells the Solution to American Cities' Energy Woes?

The Juice
A Closer Look at the New Energy Economy
June 27 2014 12:00 PM

Thinking Local

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Importing electricity to New York City produced by coal-burning plants in Pennsylvania is wasteful and inefficient.

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America's cities import lots of things: food, building materials, electricity. That's something of a problem. The best way to ensure the electricity is always there to run New York City's elevators and power its hospitals is to generate the electricity as closely as possible to where it is actually used. Importing

electricity to New York produced by coal-burning plants in Pennsylvania is wasteful and inefficient—about 6 percent of electricity gets lost in transmission and distribution. It also undermines reliability: The longer electrons have to travel, the greater the potential for a falling tree or failing piece of equipment to knock out power.

But locating generation close to where it is needed is difficult. Land in urban areas tends to be both expensive and scarce. Nobody wants coal-burning electricity plants (or even natural-gas burning ones) to undermine property values. And it's tough to do renewables at scale in cities. Solar installations of meaningful size tend to occupy tons of open space, like in the deserts of the southwestern U.S. Imagine trying to plant wind turbines in Manhattan.

Fuel cells, however, are a relatively new solution that quietly packs a big punch in a very small package. And they are slowly making their way into American cities.

This week, I visited the largest fuel cell power plant in the U.S. It's in Bridgeport, Connecticut, which has fallen on hard times. The city's landscape is dominated in part by the Bridgeport Harbor Generating Station, a 47-year-old beast of a coal-burning plant that hulks by the water and has a capacity of 400 megawatts. But under Mayor Bill Finch, Bridgeport is quietly becoming something of a demonstration site for urban energy innovation. It is covering an old landfill in solar panels, for example.

Here, on a 1.5-acre formerly polluted and abandoned lot adjacent to an ice cream distributor, FuelCell Energy, a company based in Danbury, Connecticut, has constructed a group of fuel cells with a combined capacity of 15 megawatts: enough to power about 15,000 homes. The plant—a collection of boxy modules that comprise the largest fuel cell plant in the U.S.—is owned by Dominion Resources, which sells the power to Connecticut Light & Power.

The Bridgeport plant isn't disruptive to the landscape, the city, or the environment.

Here's how it works. When fuel—in this case, natural gas—passes through the cells, it triggers electrochemical reactions that produce electricity, heat, and water. It's a quiet, environmentally friendly process. It produces only the tiniest trace amounts of nitrogen oxide and sulfur oxides. When hydrogen is used as the fuel, it generates almost no carbon dioxide. Fuel cell plants that use natural gas, as this one does, produce about 60 percent fewer emissions than coal-powered plants.

The last several years have been a boom time for alternative energy—giant wind farms dot the plains and utility-scale power plants have been planted in the desert. Fuel cells haven't received quite as much attention, but they should be getting more. Unlike wind and solar, which are intermittent (the sun doesn't shine at night and the wind doesn't always blow), these plants can run 24/7.

Bloom Energy, based in Silicon Valley, has completed small-scale installations for Honda, Softbank, Macy's, and Verizon, among others, while FuelCell has plants up and running or under construction in 50 locations in nine countries. Universities, which have historically maintained their own power systems and can rely on fuel cells to generate both electricity and heat, have been among FuelCell's largest customers. Central Connecticut State University has a 1.4-megawatt plant that provides a large chunk of its energy needs, and the company is constructing a plant for the nearby University of Bridgeport. FuelCell's largest single plant is a 59-megawatt facility in South Korea.

The construction of this plant was enabled by some small subsidies, but they were no larger than those received by companies building headquarters in the state, like ESPN. The $65 million cost was defrayed in part by a $1 million state grant and a $5 million loan from the state Clean Energy Finance and Investment Authority. Dominion Resources provided the rest of the financing.

Other subsidies and incentives help lower the cost of the electricity produced here. FuelCell says it costs between 13 cents and 14 cents a kilowatt-hour to produce electricity at this plant. But Dominion Energy, which owns it, receives a 30 percent federal tax credit for the electricity produced here. That enables it to

sell the power into the grid at roughly the same prices CL&P pays for electricity generated by other sources.

So, yes, there are subsidies. But the plant is not very disruptive—to the landscape, the city, or the environment. The site takes up a patch roughly that of a home in a leafy Fairfield County suburb. The electricity produced goes directly into underground wires that feed substations in Bridgeport, which cuts down on transmission costs. It is relatively cheap to operate, and the process, which doesn't involve combustion, is quite safe. The likelihood of a fire, an explosion, a spill of coal ash, or contaminated water is extremely low to nonexistent. I was able to walk up to the softly humming containers housing the fuel cells and lean against them. There are no huge smokestacks here, either. The pipe and ductwork, at its peak, reach about 25 to 30 feet into the air.

There's another benefit. People who operate these plants have essentially no regulatory risk. Because of the microscopic amounts of nasty emissions, fuel cell plants are exempt from California's cap and trade regime. "If you're in an area that puts a premium on clean, it makes a lot more sense," Kurt Goddard, vice president of investor relations at FuelCell Energy, told me. The owners won't have to install new equipment to comply with emissions limits down the road.

Even as the U.S. continues to rely on coal for nearly 40 percent of its electricity generation, a low-carbon energy sector is slowly sprouting. You just have to know where to look for it.

Daniel Gross is a longtime ***Slate*** contributor. His most recent book is ***Better, Stronger, Faster*** . Follow him on Twitter.