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Fuel cells provide emergency power without blowing smoke

by Jeff Willis in conversation with Jennifer Wegner

When the electricity goes out, managers at many commercial buildings crank up an old-fashioned generator that runs on natural gas or even diesel fuel.

But some commercial building owners have made strict promises to avoid burning fossil fuels—even during emergencies. Others have made Environmental, Social, and Governance (ESG) pledges to investors and customers and have promised to operate "net-zero" buildings[1] that don't add to the amount of carbon dioxide in the atmosphere. Some property owners in cities like New York[2] or Boston[3] are compelled by local laws requiring commercial properties[4] to "decarbonize"[5] in the next ten to twenty years or face steep fines.

A small but growing number of these property owners have installed hydrogen energy fuel cell[6] systems. These systems[7] can generate power in emergencies by turning hydrogen fuel[8] into electricity.

"These are not going to be your run-of-the-mill clients that are looking for the least-cost facility," says Jeffrey Willis, Principal and Mission Critical market sector leader for Page. "These are people with definite intentions. They either have ESG goals they're trying to attain -- or it is tied to their brand."

We caught up with Willis to ask how hydrogen energy systems work in the real world.

(This interview has been edited for length and clarity.)

What is a hydrogen energy system, and why would I want one in my building?

JW: You're likely talking about fuel cells used as a reserve power source. Hydrogen energy fuel cells can provide electricity during emergencies when power grid fails.9Hydrogen is a limitless source of

fuel. It is all around us, whether in its pure form of H2, a gas in water, or H2O. It's going to be with us forever. We're not creating more of it or releasing more into the environment. It's already there.

What kind of buildings would be best served by this system?

JW: They are going to look just like conventional buildings. They should be low-energy-intensity. So, a suitable use for this is office buildings. Buildings that are high-intensity energy users would have to store much more hydrogen on-site to provide that fuel source to run your fuel cell. That gets into the geometry of the site, the setbacks of the site, and what you're potentially able to do because of the zoning. A property that needs less electricity in emergencies — like an office building — is a simpler use case.For the most part, hospitals are going to be looking for the least-cost option for backup power sources due to the regulatory and reimbursement environment. That’s pretty much going to be diesel and natural gas-fired generators.If you can get large supplies of hydrogen, data centers present an interesting use case. The Biden administration has $7 billion10 set aside for seven to nine hydrogen hubs across the United States, which would allow for more hydrogen transportation without using over-the-road delivery and potentially bring that energy source to more locations.

Rendering of hydrogen fuel cell as a backup power source for a commercial office property.

So, the main use case for hydrogen fuel cells in a

commercial property is to provide emergency power without a plume of diesel smoke coming out the top of my building—is that overstating it?

JW: No, it's a good way of looking at it—especially if your building is right next to an apartment building. The last thing you'd want is a diesel generator creating this plume of exhaust. If you have a client who needs backup power and doesn't have much space for diesel exhaust to get up above the building, certainly a fuel cell would get you there.

How often does the power go out in a big building? Would a diesel generator only have to run – and produce smoke – a few times a year?

JW: No. With diesel generators, you're running them weekly to ensure they function. Typically, you'll find that they run at 6:00 p.m. on Monday night for 30 minutes or Saturday afternoon.

What's the smallest building where this would make sense? And what's the smallest fuel cell system you can imagine? Could you run a calculator with it?

JW: You really wouldn't want to go to those extremes. The smallest building would probably be a single-story, 5,000- or 10,000-square-foot building. A certain amount of technology goes into this. There are operational costs. There are maintenance costs.The hydrogen fuel cell also needs hydrogen storage somewhere. Most communities do not have hydrogen pipelines running through them—it's not like natural gas. So, there's going to be some sort of storage tank.

A rendering of a hydrogen fuel cell as a backup power source for a multifamily housing unit.

What does that system look like? Is it about the size of a

refrigerator?

JW: You could equate it to a large refrigerator. They can be stacked to get more power out of the system. It's usually going to be in an unenclosed area—sheltered certainly but not contained within a facility because, again, hydrogen. There are limits to how much hydrogen you want to put in a facility.

So you want it to be somewhere where, in the worst-case scenario, if there is an uncontrolled ignition of the hydrogen, it just damages a shed on the rooftop?

JW: Or a shed outside the building, which is adequately marked and set back from vehicles.

How does the cost compare to other systems that generate emergency power? Does an owner’s investment in a fuel cell system ever pay for itself?

JW: Typically, people who elect to install a hydrogen energy system instead of a diesel generator are not looking for a payback on their investment. They're looking at it for other reasons.These would be customers or clients looking for ‘net zero’ or ‘near net zero’ facilities, in which the energy used at the building is so little that it can be offset by modest energy production. Or the client has a building subject to regulation, such as a “nonattainment zone” set by the U.S. Environmental Protection Agency. Or there might be some other externalities that go along with your neighbors. That's when you start looking at these alternative technologies because they offer you something that conventional generators don't.

Cities like New York City and Boston have mandated that developers “decarbonize” their buildings so that they don’t burn fossil fuels – or face heavy fines. Does the idea of a payback from investing in a hydrogen energy system start to become relevant in places like that?

JW: Potentially — especially if the jurisdiction starts taxing the amount of carbon you emit.

For users in other jurisdictions, why would they pay for a hydrogen energy system for emergency power when they

could get a diesel generator?

JW: It's really those people who want to market their properties, businesses, or nonprofits as friends of the earth.

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