

100 IN THE LOOP

A PUBLICATION OF THE HARTFORD STEAM COMPANY

HARTFORD STEAM TO TAP FUEL CELL BENEFITS

Ultra-clean technology gaining popularity

What do NASA, Coca-Cola, Google, WalMart and James Bond have in common? They've all used fuel cell technology. And The Hartford Steam Company is about to join their ranks.

Plans are now under way to use a fuel cell in combination with Hartford Steam's district energy system and combined heat and power (CHP) plant at Hartford Hospital. The fuel cell will have the capacity to generate 1.4 MW of ultra-clean electricity; the exhaust will be used in a heat-recovery unit to produce steam and enhance efficiency. The electricity will be used directly in the hospital; the steam will be used right in our steam system or in a steam turbine to generate even more electricity. The sale of electricity to the hospital under a long-term purchase agreement is expected to reduce the hospital's energy costs.

Announced in April, the project is scheduled for completion by the end of 2013. It's part of a program made possible through the State of Connecticut's Renewable Portfolio Standard and

Connecticut Light & Power (see sidebar).

"This is an exciting opportunity," says Derek Rudd, Hartford Steam's president and COO. "By using a fuel cell to generate electricity, we're adding even more reliability. Plus we're keeping electricity generation local rather than buying it off the grid."

The environment will benefit as well. Since the fuel cell will operate as combined heat and power, its efficiency could reach nearly 85%. The fuel cell will emit smaller quantities of carbon dioxide per kilowatt and near-zero criteria pollutants into the atmosphere compared to turbines or especially a conventional plant (see sidebar on back).

"We are interested in diversifying our CHP portfolio," explains Rudd, "and the low emission profile of this on-site power plant supports our sustainability and green initiatives."

Hartford Steam purchased the fuel cell from Connecticut-based FuelCell Energy Inc. and will be installing it adjacent to our CHP plant at Hartford Hospital. The Direct FuelCell® DFC1500 power plant will occupy only 2,250 sq ft – minimal for renewable power generation. FuelCell Energy will continuously monitor the fuel

RENEWABLE ENERGY JUMPSTART

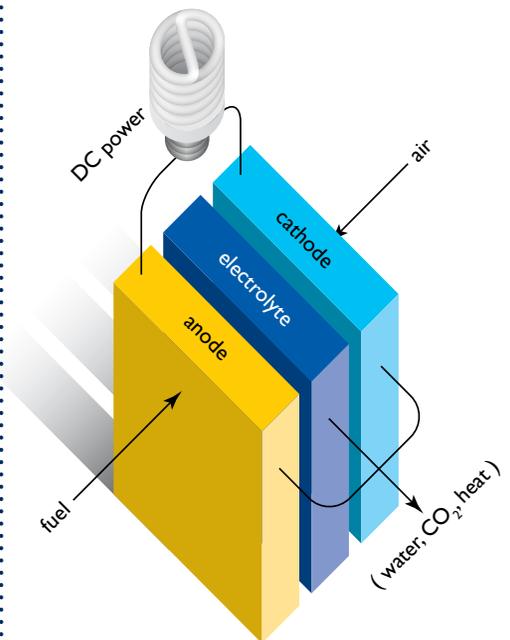
Fuel cells are especially attractive right now through a \$300 million program sponsored by the State of Connecticut's Renewable Portfolio Standard and Connecticut Light & Power. In April 2012, Connecticut's Public Utilities Regulatory Authority issued final approval for the state's zero emissions (ZREC) and low-emissions (LREC) renewable energy program. Administered by Connecticut Light & Power and United Illuminating, the ZREC/LREC program's goal is to jumpstart Connecticut's clean energy program.

Under the ZREC/LREC program, the two utilities accepted bids from renewable energy project developers, including projects using fuel cell technology. Hartford Steam applied for a project through the program and won our bid. As a winning bidder, we will receive a 15-year contract for the payment of a set price per megawatt-hour of output in the form of renewable energy credits – thanks to the high efficiency and virtual lack of pollutants from the fuel cell power plant.

Visit tinyurl.com/puraZREC for more information.

cell, plus we will monitor it 24/7 through our centralized plant control system. Its 1.4 MW electricity capacity is adequate to power the equivalent of approximately 1,400 average Connecticut homes.

Hartford Steam's fuel cell project is the latest in our efforts to further improve energy efficiency, reliability and achieve an even smaller carbon footprint – right along with some of the world's largest institutions.



Fuel cells, like the Direct FuelCell® plant planned at Hartford Hospital, electrochemically combine a fuel source – in our case, natural gas – with oxygen to produce electricity and heat, as well as water. The fuel is converted to energy using a non-combustion process that features anodes and cathodes with an electrolyte in between – similar to a battery. This highly efficient process emits virtually no pollutants, due to the absence of combustion.



FuelCell Energy manufactured this 1.4 MW fuel cell power plant now used at Central Connecticut State University. The unit is similar to what Hartford Steam will install at Hartford Hospital. FuelCell Energy Inc. President and CEO Chip Bottone says that hospitals are ideal locations for fuel cell power plants due to their desire for continuous, sustainable and environmentally responsible power generation.

ABOUT HARTFORD HOSPITAL

Founded: 1854

Provides: Major centers of clinical excellence include cardiology, oncology, emergency services and trauma, mental health, women's health, orthopedics, bloodless surgery and advanced organ transplantation. Owns and operates state's only air ambulance system and maintains city's only level-one trauma center. Has one of region's busiest surgical practices.

Capacity: 867 licensed beds main campus

Annual Visits: 95,181 outpatient, 95,567 emergency in 2010-2011

Research: Supports more than 660 research projects

Employs: More than 7,000 including more than 1,000 physicians and dentists within 17 departments

Main Campus: 80 Seymour Street, 53 buildings totaling 2.4 million square feet on 65-acre Hartford campus

Connected to Hartford Steam: Since 1998

Source: Hartford Hospital

Courtesy Hartford Hospital.



Hartford Hospital, Hartford Steam's largest customer, is one of the largest teaching hospitals and tertiary care centers in New England.

CHP PORTFOLIO GROWS

Hartford Steam's CHP plant at Hartford Hospital – the South End Plant – will work together with the new CHP fuel cell. The South End Plant currently has the capacity to produce 105,000 lb/hr of steam; 7.5 MW electricity; and 1,580 tons of chilled water. The CHP unit at our Main Plant is a 3.5 MW Solar Centaur gas turbine generator with a heat-recovery steam generator. It began operation in November 2009, harnessing heat that would otherwise be wasted and putting it to work to heat or cool our customers' buildings.

GREENER POWER PRODUCTION

Compared to conventional combustion-based power generation, Hartford Steam's new fuel cell power plant is expected to annually prevent the emission of

- more than 57,000 lb of nitrogen oxide;
- more than 128,000 lb of sulfur dioxide;
- more than 3,000 lb of particulate matter; and
- more than 6,700 tons of carbon dioxide – equivalent to removing more than 1,200 cars from the road.

NATIONAL GEOGRAPHIC COVERS CHP'S POTENTIAL

National Geographic magazine's June 2013 issue features a brief article called "Full Steam Ahead" extolling the virtues of combined heat and power – "energy savings, lower greenhouse gases, and less reliance on the commercial grid."

As the official journal of the National Geographic Society, the magazine has a long tradition of combining on-the-ground reporting with award-winning photography to inform people about life on our planet. Published in English and 38 local-language editions, the magazine has a global circulation of around 8 million.

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