CleanEnergyGroup

RESILIENT POWER CASE STUDY SERIES

FUEL CELLS IN HOSPITALS

Fuel Cells Help Provide Life-Supporting Services

Hospitals provide critical medical technology and support for their patients, such as life support, operating rooms, and refrigerated blood and medicine. They must be able to deliver these services even when the power goes out. Because of this, hospitals are required to have 24 hours of back-up power on-site. Most accomplish this with diesel-powered rooftop generators. But this technology is prone to failure, as was seen at hospitals and nursing homes in Louisiana during Hurricane Katrina in 2005 and throughout the Northeast during Superstorm Sandy in 2011.

At Johnson Memorial Center in Stafford, Connecticut, for example, 43 critically ill patients, including those in intensive care, had to be evacuated during Superstorm Sandy when the hospital's back-up diesel generator failed. New York University Langone Medical Center, in New York City, also had to perform a harrowing evacuation of 200 patients during Superstorm Sandy when its backup generators began to fail. Throughout the storm, critical units like the emergency rooms, labor and delivery rooms, and refrigeration lost power. Babies and critically ill patients were evacuated first, including 20 babies from neonatal intensive care, some of whom had to be placed on battery-powered respirators. Critically ill patients were carried down as many as 13 flights of stairs because elevators could not function without electricity, and nurses were manually squeezing bags of oxygen to replace respirators that were without power.

As a result of the widespread and catastrophic failure of diesel generators during recent storms, hospital administrators in the Northeast have looked for more reliable ways to provide emergency backup power, and several have turned to fuel cells. St. Francis Hospital in Hartford, Connecticut installed a 400-kW fuel cell at its Mount Sanai campus in 2012. This was its second fuel cell; a 200-kW unit was installed on its main campus in 2003, which was later upgraded to a 400kW unit. In 2013, Hartford Hospital installed a 1.4-MW fuel cell.

Technology Overview

The fuel cell at St. Francis Hospital's main building, a Power PC25 that was provided by UTC Power[1] of South Windsor, Connecticut, meets 10 percent of the facility's electrical needs. The newer PureCell Model 400 fuel cell at the Mount Sanai campus meets 42 percent of that building's electrical needs. Importantly, the fuel cells provide backup power to the operating

1 UTC Power is now operating as Doosan Fuel Cell America.

OVERVIEW

FACILITY TYPE
Hospital

TECHNOLOGY
Hydrogen Fuel Cells

FUEL
Natural Gas

CAPACITY
400kW–1.4MW

YEAR INSTALLED
2003–2013

LOCATION
Connecticut

PROJECT PARTNERS
Hartford Steam Company, Low Emission Renewable Energy Credits Program, UTC Power/Doosan, Fuel Cell Energy, Inc.

Superstorm Sandy caused power outages at hospitals across the northeastern United States, leading to the evacuations of hundreds of patients. Several hospitals have now installed fuel cells to provide backup power for critical services like operating rooms, labor and delivery rooms, intensive care, and refrigeration for medicine and blood.

room among other critical energy loads, but other, non-critical loads are dropped during grid outages. Both buildings are also heated by the by-product heat generated by the fuel cells. The fuel cells save the hospital $10,000 per year on electricity costs.

The 1.4-MW DFC1500 fuel cell at Hartford Hospital, which was provided by Danbury, Connecticut-based FuelCell Energy Inc., provides 60 percent of the hospital's power needs, and the by-product heat provides all of the building's space heat. When excess heat is generated, it is sent to a nearby school that is connected to the same heat distribution system. It was installed at no upfront cost to the hospital, and is owned and operated by Hartford Steam Company, which sells the electricity and heat to the hospital under a long-term power purchase agreement. Hartford Steam receives renewable energy credit payments for producing this clean power through Connecticut's Low Emission Renewable Energy Credits (LERC) program.

Environmental Benefits

Fuel cells create energy through an electrochemical reaction. Because no combustion is involved, fuel cells reduce the emissions of dangerous air pollutants. The fuel cells at St. Francis Hospital's two campuses are reducing annual emissions of nitrous oxides (NOx) by 826 pounds, and sulfur dioxide (SO2) by 3,201 pounds per year. Both of these pollutants contribute to acid rain and smog formation. Emissions of greenhouse gases by the hospital, which contribute to global climate change, have been reduced by 122 tons per year.

Four hospitals in Connecticut, including Hartford Hospital, use fuel cells to provide backup power to critical services like operating rooms, respirators, and medicine refrigeration. © BigStock Photos

The fuel cell at Hartford Hospital is reducing the annual emissions of NOx by 57,000 pounds, and SO2 by more than 3,000 pounds. It is also reducing the emissions of greenhouse gases by 6,700 tons per year. Particulate matter—tiny particles and liquid droplets emitted during combustion that can be inhaled deep into the lungs causing human health problems—is a harmful byproduct of fossil fuel combustion. The fuel cell at Hartford Hospital has reduced particulate emissions by 3,000 pounds, as compared to traditional power plants.

Fuel cells are able to provide critical resilient power and reduce harmful emissions at locations where health care is a primary concern.

Resilient power is distributed clean energy systems capable of islanding from the grid to supply power for critical services during power outages. With the Resilient Power Project, Clean Energy Group and Meridian Institute are advancing renewable energy technologies to strengthen communities against power outages and other harmful impacts of power loss and severe weather. *www.cleanegroup.org* or *www.resilient-power.org*.

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