



New York State Energy Research and Development Authority

East Rochester High School Fuel Cell Demonstration Project

DG/CHP Program

Project Profile

Combined heat and power for
Educational Facility



Overview

The East Rochester Union School District serves approximately 1,300 students in pre-kindergarten through 12th grade. All of the district's students attend classes in the same building complex. The facility is in use year round and serves as a community shelter during emergencies. An in-depth energy audit identified numerous energy conservation measures that culminated with the installation of a 200 kW fuel cell during the 2006 - 2007 school year.

The fuel cell operates continuously at near full capacity. Recovered waste heat is used to produce domestic hot water (DHW) and offset the building space heating load during the winter months.

The Application

Annual expenditures on energy can exceed the costs schools incur for books and computers combined. Finding opportunities to conserve energy yields benefits beyond direct cost savings, especially since funding would otherwise be obtained from local taxpayers. The opportunity to apply technologies that contribute to the school's educational mission provides an even greater incentive to reduce consumption.

Fuel cells are particularly attractive in these circumstances. Features including low noise and vibration levels, minimal visual exhaust and compact size all compliment educational needs. This was of particular importance to the East Rochester School District which considers part of its responsibility is to create surroundings that foster innovation and a respect for the environment.

Quick Facts

Location:
East Rochester, NY (RG&E)

Installation Date:
February 2007

Operating Experience:
36 months (as of Feb 2010)

CHP Equipment:
UTC Power PureCell™
Model 200

Generating Capacity:
200 kW

Heat Recovery Application:
Domestic hot water (DHW)
production and seasonal
space heating

Design CHP Efficiency:
≤ 80% (LHV)

Type of Fuel:
Natural Gas

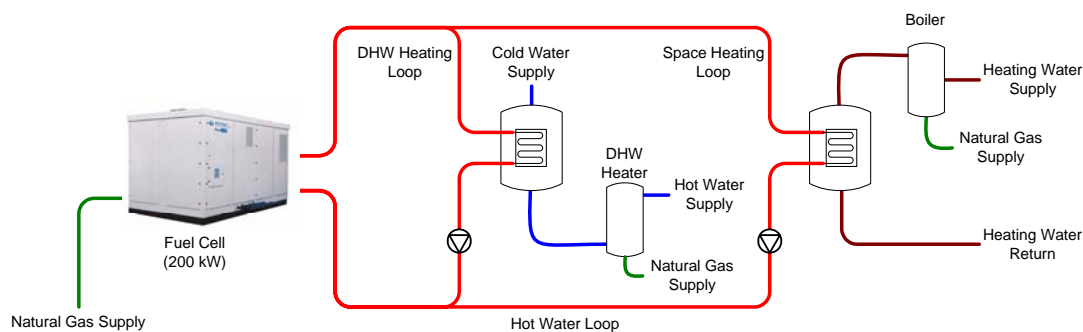
Annual Utility Savings:
~\$80,000 per year (estimated)



View from School Hallway of the Installed Fuel Cell

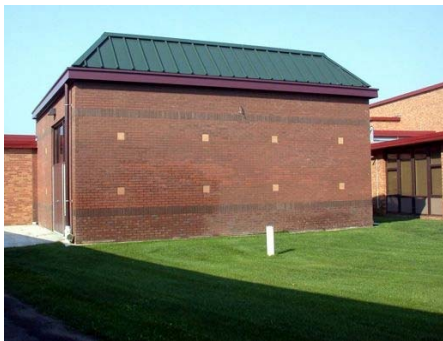
CHP System and Equipment

The school's CHP system is configured on a 200 kW phosphoric acid fuel cell that operates in a temperature range of 300 to 400°F. A reformer, included with the fuel cell, strips hydrogen from natural gas to fuel the process. The hydrogen is subsequently mixed with atmospheric oxygen to produce electricity at a conversion efficiency of 35%. The system's electrical output is maintained near its rated value because of the school's consistent demand. The fuel cell can operate in parallel with the utility or automatically switch to a grid-isolated mode in case of emergency. No electricity is exported to the grid. Up to 900,000 BTU/hr can be recovered as a byproduct of the generating process. The heat is being used for space heating and DHW production. Separate hot water loops and heat exchangers serve each load.



Economics and Environmental Benefits

Hourly data have been collected from the site since August 2008 and are available on NYSERDA's DG/CHP web site. Performance data from 2009 indicate the CHP system produced more than 60% of the electricity that was consumed at the school. The demand for utility supplied power was reduced to as little as 230 kW during the summer months. The school district anticipates saving up to \$80,000 in annual energy costs depending on the weather and level of activity at the site. Fuel cells produce a minimum amount of pollutants; nitrogen oxide emissions are typically an order of magnitude less than what other combustion based technologies produce. Documentation provided by the manufacturer suggests carbon dioxide emissions could be reduced by up to 1.5 million pounds per year in comparison to producing the same amount of electricity by traditional means.



Fuel Cell Building



Pre-Packaged Fuel Cell Module

Summary of Benefits

- Offsets 200 kW of electric demand
- Uses recovered heat to offset hot water and seasonal space heating loads
- Saves school district as much as \$80,000 annually
- Provides unique educational opportunity for students

“It's school districts like East Rochester that will lead the way in creating sustainable buildings and operations for future generations.”

~ Allen Rossignol,
President, Edge
Architecture

Web Links and Further Information:

Edge Architecture
– Project Developer

www.edge-architecture.com

Fuel Cell Manufacturer

www.utcpower.com

Other DG/CHP Resources

chp.nyserda.org

Prepared for NYSERDA by:
CDH Energy Corp.
Cazenovia, NY 13035
315-655-1063
www.cdhenergy.com
dgchp_data@cdhenergy.com