U.S. DOE

NORTHEAST

CHP Technical Assistance Partnerships

PROJECT PROFILE

Smith College Energy Center

3.5-MW CHP Plant

Project Overview

The Smith College Cogeneration Plant has been in operation since 2008 and is housed in the existing central power plant originally constructed in 1946. Its power process systems include a Solar Centaur® 40 combustion gas turbine, a Rentech heat recovery steam generator (HRSG), a 65,000-lb/hr low-emissions packaged boiler, control room and auxiliary equipment. The HRSG utilizes the exhaust heat from the gas turbine to produce steam for heating in the winter and also to power steam absorption chillers, which supply the campus with chilled water. Two existing 55,000-lb/hr, oil/gas-fired, packaged Keystone boilers, provide backup and additional steam capacity to meet campus demand. A 10-inch main steam transmission line connects the plant to the 110 buildings on campus through 5 miles of underground piping. When the gas turbine is generating power at its full 3.5 MW capacity, the HRSG is capable of producing 20,000 lb/hr of 125 psig steam.

Quick Facts

LOCATION: Northampton, MA
FACILITY PEAK LOAD: 3.5 megawatts (MW)
EQUIPMENT: 3.5 MW Solar Turbine, Rentech HRSG, package boiler and two York absorption chillers.
FUEL: Natural Gas
USE OF THERMAL ENERGY: Heating, cooling & hot water for the campus.
USE OF ELECTRICAL ENERGY: Displaces campus loads previously supplied by the local utility.
AVERAGE CAPACITY FACTOR: 75 %
CHP IN OPERATION SINCE: September 2008

"For several years, Smith has sought ways to reduce and manage the college's environmental impact," said Former Smith College President Carol T. Christ. "This new cogeneration system is a significant step in Smith's efforts to remain at the forefront of environmental responsibility."

Reasons for Installing CHP

The energy requirements of Ford Hall, a new science and engineering facility, stimulated the rethinking of the existing power plant. It was determined that steam production could be increased and accomplished more cost-effectively through a combustion turbine based CHP system.

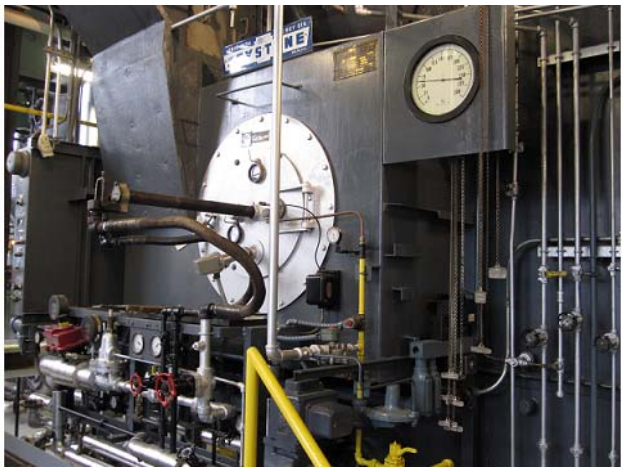
CHP Equipment Configuration & Operation

Prior to 1946, each building on campus was individually heated with coal. In 1946, the central campus heating plant was installed equipped with three 40,000-lb/hr, Edge Moor boilers designed to burn pulverized coal and oil. Two 55,000-lb/hr, oil/gas-fired, Keystone packaged boilers were added in the 1970s to accommodate the campus's growth. In 2005, to allow installation of the new CHP system, a mechanical dust collector was demolished, along with Smith's 1940s-vintage coal-capable boilers and coal and ash handling equipment. The turbine has the capability to operate on low sulfur distillate as a backup, but Smith College has chosen not to utilize that alternate fuel source at this time. Two York absorption steam chillers were added in the spring of 2010, replacing 1,000 tons of cooling capacity previously provided by electric chillers. During 2010, the CHP plant produced 210 million lbs of steam and over 8,000,000 kWh of electrical power to supply nearly 3 million gross square feet of building space.

Solar Centaur 40 Gas Turbine

Rentech Package Boiler

Control Room



Keystone Boilers

The Central Heating Plant uses the latest pollution control technologies including low NOx burners and aqueous ammonia injection. Advanced Selective Catalytic Reduction pollution control technologies reduced the output of NOx to less than 3ppm. In June of 2013, the plant was made capable of operating in Island mode, allowing it to supply power to the campus while disconnected from the grid. To increase plant stability and flexibility a 750 kW black start generator was installed, this enables the plant to operate without any support from the regional electric grid. As of December 2013, the plant began exporting excess generation to the grid.

Lessons to Share

- The addition of steam absorption chillers can help to increase CHP generation capacity by increasing the thermal load.
- It is essential to develop operational plans for gas delivery curtailments on cold days.
- Maintenance service contacts with qualified service providers can serve to maximize equipment life.
- It is important to include space and permits for peripheral equipment, gas compressor, treatment chemical storage, etc. in the project scope.

For More Information

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The Northeast CHP TAP is a U.S. DOE sponsored program managed by the Pace Energy & Climate Center located at Pace Law School and by the Center for Energy Efficiency and Renewable Energy located at the University of Massachusetts Amherst

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