NORTHEAST CHP APPLICATION CENTER

combined heat & power in educational facilities

Williams College

3 MW CHP Application

Project Profile

Addition built on central heating plant to house the CHP system

Quick Facts

Location:
Williamstown, Massachusetts

Installation Date:
2004

CHP Equipment:
Nebraska dual-fuel boiler
Dresser Rand steam turbine
Ideal generator
Powercon switchgear
Ewing controls

Additional Equipment:
Two dual-fuel boilers

Types of Fuel:
Natural gas
#6 oil (0.5% sulfur)

Thermal Applications:
Building heating
Domestic hot water
Process heat for dining hall

Payback Period:
5 years

Project Overview

Williams College, located in the Berkshires of western Massachusetts, was established in 1793 and now has 2,000 students. The college's central heating plant operates throughout the school year to provide space heating and domestic hot water for the 450 acre campus and process heat for the dining hall.

In 2000, the college began planning to upgrade the heating plant with the addition of a new boiler. Motivated by predictions of increasing electric rates, they decided to incorporate the boiler into a combined heat and power system that would generate electricity as well as steam. Installation of the new boiler and CHP system was completed in 2004.

The CHP system runs approximately six months per year during the heating season. In fiscal year 2005, the college generated nearly 6 million kWh. The average annual electricity consumption of the campus is 26 million kWh.

The college's electric utility rates have increased more than 50% since the system was installed, to the current rate of approximately 13 cents per kWh. It is expected that the energy cost savings will pay for the $2.7 million capital cost of the CHP system by 2009.

The system is also used for the ISO New England Demand Response Program. At times of high electric demand in the region, the College supplements generation by power plants to support the reliability of the electricity supply in New England.

The Williams College website provides more information about energy use and generation on campus, including live tracking of their current electric demand and the electric generation from the CHP system: www.williams.edu/resources/sustainability

Energy Overview

The Williams College central heating plant operates throughout the school year. In the summer months when the college is not in session and the central plant is shut down, hot water is provided by individual units, most of which are gas-fired. The college has considered addition of a smaller CHP system for use during the summer.

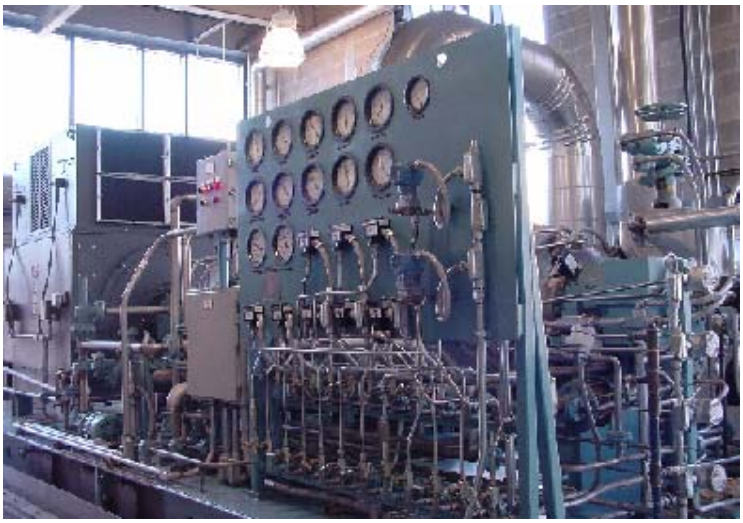
The central heating plant has three boilers. The new Nebraska boiler, with output capacity of 70,000 pounds per hour, generates steam at 450 psig for electricity production. Two older boilers, installed in 1965 and 1970, generate steam at 160 psig. Auxiliary turbines and regulating valves reduce the steam to the distribution pressure of 15-18 psig. The oldest boiler is now used for backup.

All three are dual-fuel boilers, which can be run on either #6 oil or natural gas, depending on fuel costs. Oil is used most often during the winter months, and Massachusetts air quality regulations require that natural gas is used between May and October.

The CHP system has electrical capacity of 3 MW. The maximum demand of the campus is 4.2 MW.

The system consists of a Dresser Rand steam turbine, Ideal generator, Powercon switchgear and Ewing controls. The project developer was Steam Plant Systems in New York, with electronics by van Zelm, Heywood &Shadford in Connecticut.

The plant previously had a smaller CHP system with a 500kW steam turbine, which was installed in 1987 and removed during installation of the new system.



Turbine generator

Benefits

- Reduced energy costs.
- Reduced the impact of increasing electricity rates.

Challenges

- Initial problems with emission levels when fueling the boiler with oil. This was resolved through system modifications by the boiler and burner manufacturers.

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