PROJECT PROFILE

University of Massachusetts Amherst

16-MW CHP & District Energy System

UMass Amherst's highly efficient Central Plant produces steam, chilled water and electricity.

Quick Facts

LOCATION: Amherst, Massachusetts
MARKET SECTOR: College/University
FACILITY SIZE: 10 million sq. ft.
CAPACITY: CHP – 16 MW; Steam – 475,000 lbs/hr; Chilled Water – 4,000 Tons
EQUIPMENT: Solar Gas Turbine, Two Steam Turbines, Heat Recovery Steam Generator (HRSG), Three Package Boilers
FUEL: Primary – N. Gas, Secondary – Ultra Low Sulfur Diesel
USES OF THERMAL ENERGY: Space Heating and Cooling, Process Steam, Domestic Hot Water, Laboratory Autoclaves, Food Processing
CHP TOTAL EFFICIENCY: 75%
ENVIRONMENTAL BENEFITS: 26,600 tons of CO_2 per year
NOTE: UMass is the first public entity to have an approved facility for creating Alternative Energy Credits (AECs) from a Combined Heat and Power (CHP) system under the Massachusetts Alternative Portfolio Standard program.

Site Description

The University of Massachusetts Amherst (UMass Amherst) is the flagship public university of Massachusetts. In addition to educating nearly 30,000 students, the campus is known for its cutting-edge research. The new Central Plant supports the educational and research missions of UMass Amherst by providing a robust utility infrastructure. In 2008, the university completed a 16 MW state-of-the-art District Energy and Combined Heat and Power (CHP) plant to replace the coal-fired heating plant that had been operating since 1918. The new Central Plant satisfies all of the campus demand for steam and nearly all of the electrical demand while using 18 percent less fuel than the average power plant and operating at an overall efficiency of 75%. UMass Amherst earned the Environmental Protection Agency's Energy Star award in 2011 in recognition of these achievements.

Reasons for District Energy & CHP

The original coal-fired central heating plant on the UMass Amherst's campus was constructed in the early 1900s and expanded over the years to keep pace with growing campus demand. The drivers to transition from coal to natural gas included greater ease of obtaining permits for natural gas-based systems, the difficulty of managing and sustaining coal based systems and the potential for an improved emissions profile. The university decided to install a highly efficient natural gas combustion turbine-based District Energy & CHP system in response to the overall favorable climate for natural gas-based systems in Massachusetts.

District Energy & CHP Equipment & Operation

The new Central Plant uses a combustion turbine burning natural gas to produce steam and electricity. The plant also runs a Heat Recovery Steam Generator (HRSG) to use the exhaust heat from the gas turbine to produce steam for campus heating and cooling, a process that optimizes total system efficiency. Overall, the system runs at approximately 75% efficiency.

The new Central Plant supplies all of the steam and nearly all of the electricity needed by the Amherst campus of over 200 buildings and nearly 10 million square feet of building space, importing electricity only during peak demand.

Heat Recovery Steam Generator

Environmental Benefits

By cogenerating electrical and thermal energy to satisfy campus energy demand, UMass Amherst's Central Plant prevents approximately 26,600 tons of CO_2 emissions annually, equivalent to the emissions of more than 4,600 cars. The university is the first public entity in the state of Massachusetts to qualify to receive Alternative Energy Credits (AECs) from a CHP system under the state's Alternative Energy Portfolio Standard (AEPS). The Massachusetts Green Communities Act of 2008 introduced the AEPS, a program to incentivize greater efficiency in which energy-generating facilities receive credits to reduce carbon emissions. The university earns enough revenue from the AECs to offset 50-66% of the new Central Plant's annual fuel, operations and maintenance costs and reduce investment payback by about 25%.

The Central Plant uses the latest pollution control technologies to reduce harmful pollutants, including an advanced combustion turbine and low NOx burners. These advanced pollution controls, combined with the switch from coal to natural gas, reduce the University's output of harmful Sox, NOx and Carbon Monoxide by approximately 97%. Additionally, the university obtains nearly 200,000 gallons of effluent per day from the local wastewater treatment system and recycles it to generate steam. The effluent replaces the drinking water that would typically be used in a central plant, conserving potable water supplies and reducing costs.

For More Information

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