SOUTHEAST CHP APPLICATION CENTER

CLEAN HEAT & POWER

UNC Chapel Hill

32 MW Cogeneration Plant

CHP Facts

Location:
UNC Chapel Hill, NC

Generation Equipment:
32 MW Steam Turbine
Two - 2 MW Diesel Generators
Two - 250,000 lb/hr Circulating Fluized Bed Boilers
One - 250,000 lb/hr Gas-fired Packaged Boiler
50,385 Ton Cooling Capacity with 19 electric and 5 absorption chillers

Output:
36 MW

Installation Date:
1992

Fuel:
Coal, Gas, Fuel-Oil, Diesel

Project Overview

Underneath the University of North Carolina at Chapel Hill runs more than 45 miles of steam pipe and 22 miles of chilled water pipe. UNC Chapel Hill uses district heating and cooling on campus and at the Hospital. The energy facilities at UNC provide steam, chilled water and electricity to 175 buildings within the campus. There is one cogeneration facility where steam and electricity are produced, one steam plant for peak steam production and added reliability, and five networked chiller plants.

Cogeneration System

The steam is used for heating, humidification, domestic hot water, sterilization and for making distilled water. The cogeneration facility creates and distributes this steam while producing up to one third of the required electricity for the campus.

The electric distribution is managed by UNC, which receives power from Duke Energy and the cogeneration plant, then delivers it to the campus through 3 sub stations.

Prepared For
United States
DOE

Chilled Water System

The chilled water system primarily uses electric centrifugal chillers, but when the price of electricity rises in the summer, absorption coolers can be used as an alternative. The water is supplied at 45º F, and returns at 59º F. A recent addition to the chilled-water system is a 55,000 ton-hr thermal energy storage tank. The tank provides additional reliability and peak loading capability.

CHP Operation

The district heating system provides steam to the campus and hospital at 40 and 150 psi. The steam is extracted from the turbine at the second and last expansion stage. This steam turbine is capable of providing up to 32 MW of electricity to the campus.

All of the systems are monitored and controlled by an advanced digital control system (DCS) and are integrated to provide the greatest efficiency. The system controls the boilers and chillers remotely and runs an algorithm to choose the most efficient arrangement of equipment to have online.

Upgrades

Since the installation in 1992, the UNC energy facilities have gone through intensive upgrades. The original 28 MW steam turbine was replaced with a 32 MW steam turbine. The condensing unit was upgraded to provide increased turbine capacity. Numerous upgrades to substations have taken place over the years increasing the safety and reliability of the system and adding the capability to switch transmission lines. Additional upgrades have taken place to insure that noise stays below 45 dB. A new peak demand steam plant was constructed in order to raise reliability to 100% and add more peak capacity.