



North Carolina State University

11 MW CHP & District Energy System

Project Overview

North Carolina State University completed a CHP project in the fall of 2012 as part of a major Performance Contract with Ameresco, Inc. that delivered two new CHP units, the replacement of three central plant boilers, a new 2000-ton chiller and other energy efficiency upgrades on the campus.

The CHP portion of the contract included the installation of two 5.5 MW combustion turbines and heat recovery steam generators at the Cates Utility Plant. The system supplies 30% of the North Campus' peak power demand and reduces purchased electricity, yielding utility cost savings. By recovering exhaust heat from the turbines for the existing district energy system, the campus reduces overall energy costs while advancing its goal of carbon neutrality by the year 2050.

The DOE Southeast CHP TAP team at NC State provided technical assistance to the NCSU Facilities team over the course of the planning and development process, including technical and cost reviews, as well as support on interconnection policies and requirements.

Quick Facts

LOCATION: Raleigh, North Carolina

MARKET SECTOR: University

IN OPERATION SINCE: 2012

GENERATING CAPACITY: 11 Megawatts (MW)

THERMAL OUTPUT: 100,000 lbs/hour steam

FUEL: Natural Gas and Distillate Fuel Oil

EQUIPMENT: (2) 5.5 MW Gas Turbines

(2) 50,000 lb/hr recovery boilers

(2) auxiliary duct burners

750 kW Black start generator

TOTAL PERFORMANCE CONTRACT: \$61 Million

ESTIMATED CHP SYSTEM COST: \$26 Million

FIRST YEAR SAVINGS: \$4.3 Million

20-YEAR SAVINGS: \$103 Million

JOINT PROJECT BY: NCSU, Ameresco, Inc.

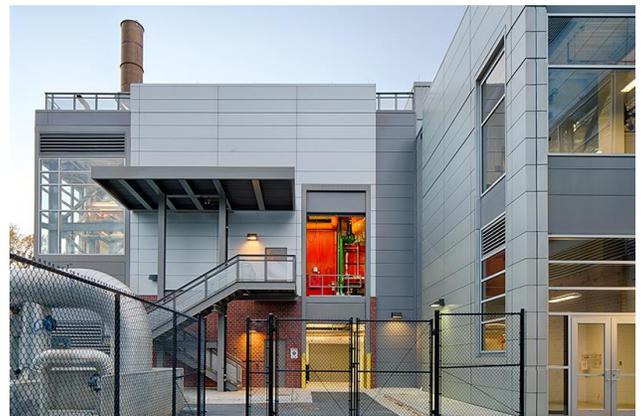
ENVIRONMENTAL BENEFITS: Reduces the

University's Greenhouse Gas Emissions by approximately 8%, or 33,000 metric tons CO₂ equivalent. Also reduces SO₂ emissions.

Reasons for Installing Combined Heat & Power

Incorporating a CHP system into NCSU's current district energy infrastructure provides the University with many benefits, including:

- Achieve higher efficiency for concurrent electricity and steam generation; a 35% increase compared to separate steam generation and electricity purchasing for a 73% overall CHP system efficiency
- Reduced operating costs for an incremental savings rate of approximately 6.6% for the campus
- Aiding in achieving LEED certification from U.S. Green Building Council for campus buildings
- Capability for operation during grid power outage



NC State's Cates CHP Plant

This project also has immediate and lasting local economic benefits, creating an estimated 55 construction jobs for 1 ½ years, 34 U.S. manufacturing jobs for 1 year, 4 University operations positions, and 4 maintenance positions.

Equipment and Configuration

- Two 5.5 MW combustion turbines with heat recovery steam generators (HRSG), each capable of producing 50,000 pounds of steam per hour.
- Each unit will normally utilize natural gas and switch to distillate (No. 2) fuel oil in case of interruption.
- One high efficiency 2,000 ton steam turbine chiller and one cooling tower to replace lower efficiency units.
- Plant auxiliary systems and controls to support the combustion turbine and HRSG operation.
- Trip transfer scheme in case of grid outage, with black start capability for turbines to restore power to campus.
- Existing utility plant building structures house the new equipment.
- Removal of one existing 100,000 lbs/hr steam boiler operating on residual (No. 6) fuel oil and natural gas.



Gas Turbine Units in NC State's Cates Utility Plant

Collaborative Business Arrangement

The State of North Carolina's Energy Conservation Finance Act enables state and local government agencies to enter into financing arrangements for guaranteed energy conservation measures. In January 2011, NCSU signed a \$61 million energy saving performance contract with Ameresco, Inc. for the CHP system and the other measures. Ameresco, an independent energy efficiency and renewable energy solutions company, provided a guarantee for savings of \$3.9 million within the first year and savings of \$10 million per year by the end of the project.

The project is financed by Bank of America, and the energy cost savings from the project will be applied to service the debt. Any savings over the guaranteed amount may be used for other energy conservation projects on campus.

For More Information

U.S. DOE SOUTHEAST COMBINED HEAT AND POWER TECHNICAL ASSISTANCE PARTNERSHIP

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Issued: 08/2015