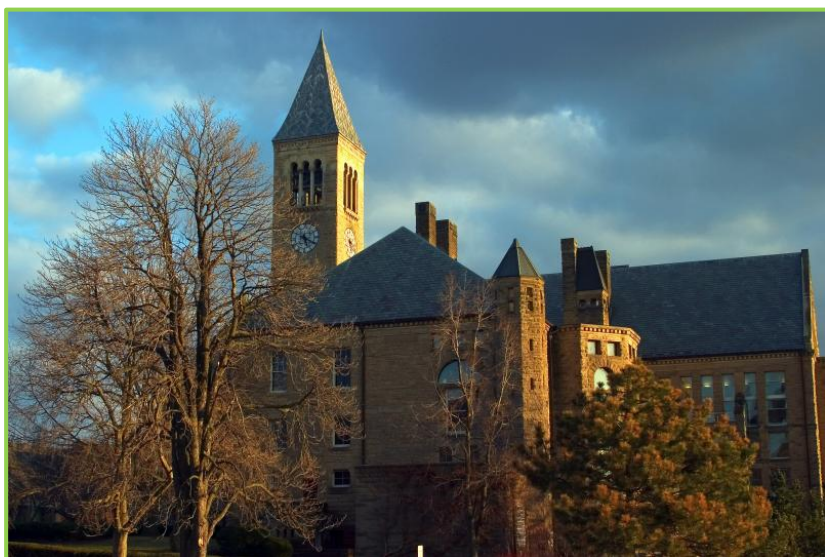


U.S. DOE

CLEAN ENERGY  
APPLICATION CENTER

# Cornell University

## 38-MW CHP & District Energy System



Cornell University operates a highly efficient CHP plant to provide energy for its Ithaca campus.

### Site Description

Cornell University's Combined Heat and Power (CHP) and Cooling Plant provide a campus of 37,000 students, faculty and staff with efficient heating, cooling and electricity. A 7.5 MW campus CHP plant has delivered heating and electricity to campus buildings since 1922 and an innovative Lake Source Cooling system was added in 2000 to provide renewable cooling. In 2008, the campus completed an expansion of its existing CHP facility, adding 30 MW of additional capacity and replacing coal with natural gas as the primary fuel. The new CHP plant uses 29 percent less fuel than the average power plant and has an overall operating efficiency of 78 percent. Cornell earned the Environmental Protection Agency's Energy Star award in 2011 in recognition of these achievements.

### Quick Facts

**LOCATION:** Ithaca, NY

**MARKET SECTOR:** College/University

**FACILITY SIZE:** 14 Million sq. ft.

**CAPACITY:** CHP – 38 MW; Steam – 843,000 lbs/hr; Chilled Water – 26,000 Tons (includes 20,000 Tons from Lake Source Cooling); Thermal Energy Storage (TES) – 4,000 Tons

**EQUIPMENT:** Two Dual-Fuel Solar Titan 130 Combustion Turbines with Inlet Air Cooling, Two Dual-Pressure Rentech HRSGs, Three Package Boilers, Two Carrier Electric Centrifugal Chillers

**FUEL:** Primary – N. Gas, Secondary – #2 Fuel Oil

**USES OF THERMAL ENERGY:** Space Heating and Cooling, Process Steam, Domestic Hot Water

**CHP TOTAL EFFICIENCY:** 78 %

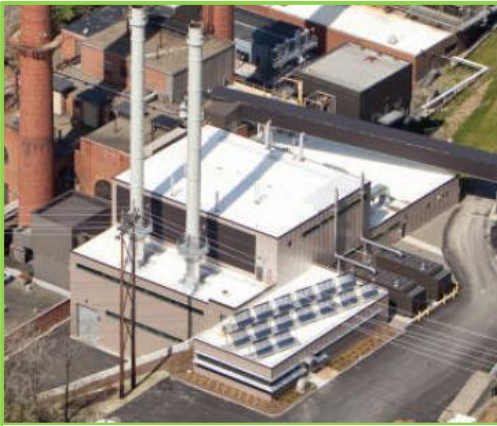
**ENVIRONMENTAL BENEFITS:** Conversion from coal reduced CO<sub>2</sub> emissions by 89,300 tons per year.

**NOTE:** Cornell utilizes Deep Lake Water Cooling from Lake Cayuga to provide over 65% of campus cooling.

### Reasons for District Energy & CHP

Cornell University signed the American College and University Presidents Climate Commitment in 2007, pledging to achieve a carbon-neutral campus by 2050. Modernizing the campus CHP plant was one of Cornell's first steps toward implementing its award-winning Climate Action Plan. The new CHP plant significantly cuts campus carbon emissions by increasing efficiency, replacing coal with natural gas and reducing fuel consumption. The District Energy network is an asset that gives the university increased flexibility to add renewable fuel sources such as biofuels and geothermal in the future, as market conditions and environmental factors evolve. Cornell's CHP plant and District Energy system reduce overall fuel consumption costs and improve the security and reliability of the campus' energy supply.

## Conversion from Coal to Natural Gas



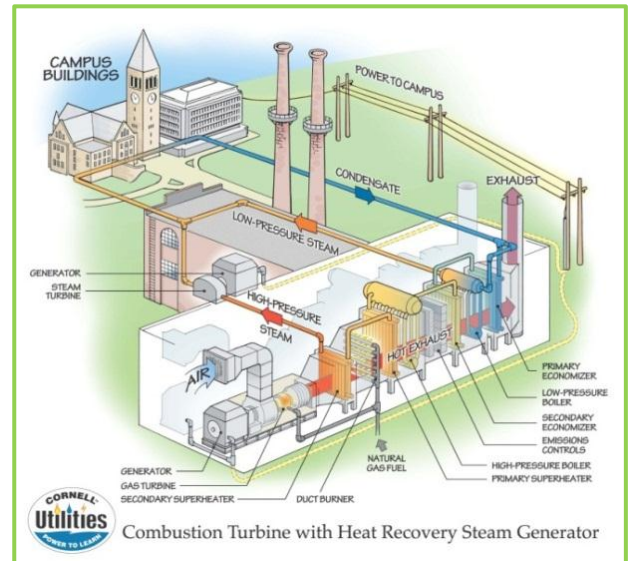
Cornell's CHP plant.

In 2008, Cornell expanded and upgraded its CHP plant by adding 30 MW of new capacity and converting the entire existing system from coal to natural gas. The new central plant eliminates 89,300 tons of carbon dioxide emissions per year, about 25 percent of the University's total carbon footprint. Since 1922, the original central plant consumed 65,000 tons of coal per year to supply the campus with 400,000 lbs/hr steam and 7.5 MW of electricity. After the plant upgrades in 2008, on-site coal consumption has been eliminated and coal usage associated with purchased electricity has been reduced by 80 percent. Cornell's new CHP plant was awarded the EPA Energy Star award in 2011 in recognition of its "outstanding pollution reduction and energy efficiency qualities."

## District Energy & CHP Equipment and Operation

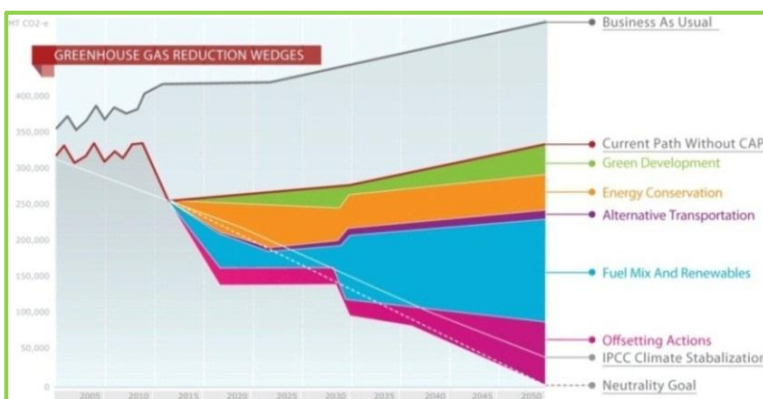
Cornell's highly efficient campus CHP plant uses two combustion turbines burning Natural Gas or Ultra Low Sulfur Diesel to produce steam and electricity. The plant also runs two Heat Recovery Steam Generators to optimize total efficiency. Overall, the system runs at approximately 78% efficiency and produces enough electricity to meet 85% of the campus demand.

Cornell's CHP plant supplies enough steam to meet the campus' summer energy needs and operates additional boilers to produce more steam during the winter. The CHP plant recovers the waste heat from the electricity generation process and uses it to make steam and chilled water that is transported through underground pipes around the campus to heat and cool buildings.



Cornell's CHP Plant and District Energy system.

## Environmental Benefits



Cornell's projected greenhouse gas reductions.

By upgrading the central plant and converting to natural gas, Cornell University's new, highly efficient CHP/District Energy system eliminates the need for coal and improves overall system efficiency. The plant upgrades and conversion from coal reduced carbon dioxide emissions by 89,300 tons per year. District energy and the innovative Lake Source Cooling system provide an efficient, carbon-free source of cooling and Thermal Energy Storage provides additional cost-effective, clean chilled water capacity.

Cornell's District Energy infrastructure will continue to help the university deploy additional renewable and clean technologies such as biofuels and geothermal as it works to reduce its environmental footprint and complete its Climate Action Plan.

## For More Information

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