



University of Texas - Austin

50-MW Microgrid CHP System



PHOTO: WALLYG-FLICKR

Quick Facts

LOCATION: Austin, Texas
MARKET SECTOR: University/District Energy
FACILITY SIZE: 160 buildings, 17 million sq ft
FACILITY ELECTRICAL LOAD: Peak load of 50 MW, average load of 40 MW
EQUIPMENT: 2 natural gas-fired combustion turbines, 4 steam turbines
FUEL: Natural gas
USE OF THERMAL ENERGY: Steam & hot water
ANNUAL ENERGY COST SAVINGS: \$4.8M
ENVIRONMENTAL BENEFITS: CO₂ emissions reduced by 82,000 tons/yr
CHP IN OPERATION SINCE: 1929

Site Description

The University of Texas at Austin main campus is a dense urban campus with over 16 million square feet in 200 buildings serving 70,000 faculty, students and staff. The buildings are connected through a district energy system, with all utilities centrally generated on campus by the Utilities and Energy Management Department. The CHP-based microgrid provides the university independence and versatility in generating the electricity, chilled water and heating needs required on campus. Though the system is connected to, and operates in parallel with the surrounding city electrical grid, this connection is only for emergency backup to the microgrid. Eighty percent of the campus is research-oriented, operating 24 hours a day, 7 days a week, 365 days a year. The research facilities manage several hundred million dollars worth of research projects annually, demanding an uninterrupted supply of energy at all times.

Reasons for CHP

The University of Texas at Austin has operated a district energy system with CHP since 1929. The university highly values the following benefits of CHP:

- The centralized district energy system with CHP reduces energy costs for the university, saving \$4.8 million annually.
- The CHP system (along with other energy efficiency improvements) has helped the campus lower its CO₂ emissions to 1977 levels, while the campus has grown by over 40 percent since then.
- The CHP system ensures very high electrical reliability. The campus has had only four CHP system outages in 35 years, a reliability level of 99.9998%.



The University of Texas at Austin has run CHP since 1929 for cost savings, emissions reductions, and higher reliability for its research labs.

The CHP plant consists of two natural gas-fired combustion turbines, made by General Electric (43 MW) and Westinghouse (34 MW). In addition the central plant is equipped with four steam turbines with a combined generating capacity of 62 MW. The central utility/CHP plant supplies all of UT's electricity, chilled water (from electricity), and steam needs. The electrical system operates as a microgrid, automatically disconnecting from the grid as needed during grid power outages or when the grid's power quality is out of tolerance. The CHP system is operated in a combined cycle mode with each combustion turbine paired with a steam turbine. Normally only one combustion turbine and one 25-MW steam turbine are in operation at a given time. To optimize efficiency, the combustion turbines are run at maximum output, using the inlet air cooler in hot weather, and the HRSG steam output is matched with steam turbine generator output to meet the campus' electrical load.

Low-pressure (150 psi) steam is extracted from the steam turbine to meet the campus' needs for heating and hot water. Steam demand in winter is about 120,000 MMBtu/month, and 50,000 MMBtu/month in the summer. There are also back-up high pressure steam boilers, which are operated as needed to provide additional steam to the steam turbine to meet campus winter thermal and electric needs.

Lessons To Share

- It requires specially trained staff to operate and maintain a complex microgrid CHP system. The campus utilities staff have transformed from mechanics to technicians that operated a highly integrated system.
- The UT microgrid disconnects automatically from the grid on average four times per year due to out-of-specification power quality or power outages. Not having to rely on the grid as the primary power source and being able to seamlessly disconnect from it when needed provides an enormous benefit to the university.

"We've been able to produce twice the amount of energy, for twice the amount of square footage, with the same amount of fuel, for a 10-year period. Everyone could do that—I'm not the only one. These are all proven technologies that you can implement right now."

—Juan Ontiveras, Associate VP, Utilities, Energy & Facilities Management

For More Information

U.S. DOE SOUTHWEST CHP
TECHNICAL ASSISTANCE
PARTNERSHIP (CHP TAP)
Christine Brinker
720-939-8333
cbrinker@swenergy.org

UNIVERSITY OF TEXAS
Juan Ontiveros, P.E.
Associate VP, Utilities, Energy &
Facilities Management
512-232-4191
Juan.Ontiveros@austin.utexas.edu

MORE CHP PROJECT PROFILES:
www.southwestCHPTAP.org

PRODUCED OR UPDATED: 2015