SOUTHWEST

U.S. DOE

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

PROJECT PROFILE

Arizona State University

9-MW CHP System

CHP is a cornerstone of Arizona State University's sustainability, efficiency, and reliability

Quick Facts

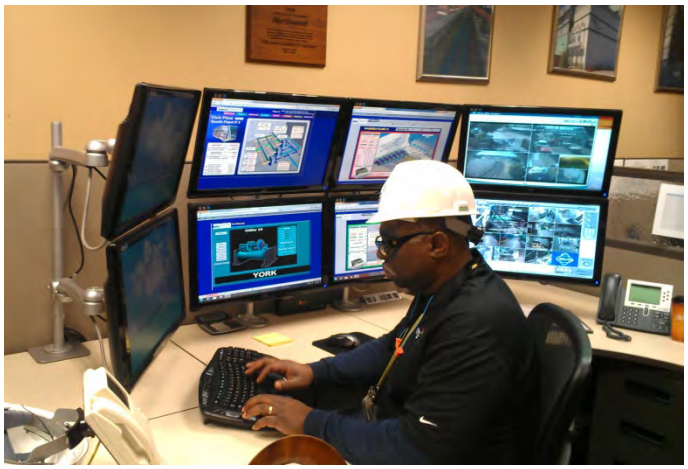
LOCATION: Tempe, Arizona
MARKET SECTOR: Colleges and Universities
SIZE: 16 million sq ft, 51,000 students
CAMPUS ENERGY PEAK LOAD: 36 MW
EQUIPMENT: 7-MW gas turbine, 2-MW steam turbine, Rentech HRSG
FUEL: Natural gas
USE OF THERMAL ENERGY: Steam distribution throughout the campus for heating, humidification, and more
TURBINE RELIABILITY: 99.99% average
CHP MEASURED EFFICIENCY: 70-75%
CHP IN OPERATION SINCE: 2006
ENVIRONMENTAL BENEFITS: CO_2 emissions cut by 64,000 tons/year, equivalent to the energy used by 3,585 homes/year

Site Description

Arizona State University's historic main campus in Tempe, Arizona is a thriving urban undergrad, graduate, and research campus. ASU ranked second in U.S News and World Report's list of "Up and Coming" universities and fifth in the Wall Street Journal's "Best Qualified Graduates," and was named to the Green Honor Roll by Princeton Review. The research university is highly regarded for its programs in journalism, criminal justice, supply-chain management, environmental management, and design and the arts.

Reasons for CHP

"CHP is one of the key pieces to our overall goals of carbon neutrality, sustainability, and lowering our energy costs overall for the campus," says Associate Facilities Manager Rick Pretzman. Another driver for installing CHP, adds Mike Buter, Operations and Maintenance Manager for NRG Energy, was to have a reliable source of energy for key research buildings. "That not only serves the current buildings by keeping them always running, but it is a selling point for attracting future research as well."



CHP Equipment & Configuration

ASU's CHP system is driven by a 7-megawatt (MW) Solar Turbines Taurus 70 turbine fueled by natural gas. The system was sized to meet the electrical loads of four key research buildings that had high reliability needs, the bulk of steam for the whole campus, and some chilled water peaking capacity.

The 1100-degree exhaust heat from the gas turbine is recovered through a Rentech Heat Recovery Steam Generator (HRSG) and duct fired for 84,000 pounds per hour of steam. Some of the steam runs a 2-MW Dresser-Rand steam turbine for additional electric capacity and the remaining steam is distributed throughout the campus via underground piping and used for heating, humidification, cleaning, cooking, and more. "You name it: it's a long list," says Pretzman. "Traditionally you think in Arizona there would not be much use for the steam, but even in a location like this we were able to make it work, so I think CHP can be a good alternative in a lot of locations."

A separate central plant provides most of the campus' chilled water. Electricity from the CHP system also powers five York 2000-ton electric chillers, shaving 2 MW off the central plant's cooling load. "It's a very interdependent relationship we have between the existing central plant and the CHP because we share the same pipes," noted Buter.

CHP Operation

The system is owned by ASU and operated by NRG Energy, in an innovative arrangement that lets them each focus on their core business. The system runs 24/7, although it is not always fully loaded. "The system output fluctuates based on the campus cooling needs, so the hotter it gets the more it loads," says Buter. The facility is manned at all times and also has remote monitoring to alert the operators to any problems. "Since 2007, we've maintained a minimum reliability factor of 99% and an average of 99.99%, important for our critical loads in the research buildings," he noted. A grid connection and two backup diesel gensets provide further redundancy.

Lessons To Share

- "A good way to improve reliability even further is to install two turbines, so you can shut one down for maintenance and still run the other," said Buter.
- "Make sure that all the key stakeholders are involved up front in the planning stages so they have ownership and understand the system capabilities. There is no such thing as 100% reliability, but overall the CHP system has done very well," added Buter.

"CHP is integral to how we operate the campus, and we enjoy the benefits of it: reliable and efficient operation."

— Rick Pretzman, Assistant Facilities Manager, Arizona State University

For More Information

U.S. DOE SOUTHWEST CHP TECHNICAL ASSISTANCE PARTNERSHIP (CHP TAP)
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