PROJECT PROFILE

Utah State University

4.5 MW CHP Application

Site Description

Utah State University is a state university located on a 400-acre site in Logan, Utah. The university maintains approximately 4.5 million square feet of classroom, laboratory, administrative and dormitory space for its 21,000 student-body. Since its founding in 1888, Utah State University has evolved from a small, agricultural college to one that is recognized nationally and internationally. This cogeneration system represents the first cogeneration project at a university in Utah.

Quick Facts

LOCATION: Logan, Utah
TOTAL PROJECT COST: $14 Million
PAYBACK PERIOD: 20 Years
MONTHLY ENERGY BILL SAVINGS: Varies depending on price of gas
EQUIPMENT: Solar Taurus 60 Turbine, York Chiller, Victory HRSG
FUEL: Natural Gas and No2 Diesel Oil
USE OF THERMAL ENERGY: Heating
FACILITY SIZE: 4.5 Million Square Feet, 21,000 Students
FACILITY PEAK LOAD: 13 MW
FACILITY AVERAGE LOAD: 9 MW
CHP IN OPERATION SINCE: January 2004

Reasons for CHP

The project was initiated by the need of the university to expand the functionality of the central utility plant. The Utility Plant Expansion Project had the objective of providing chilled water to select campus buildings via an existing tunnel system while concurrently generating onsite power. The financial goal was for the resulting savings in purchased energy (both power and gas) to be more than the cost of the plant expansion, over the life of the financing period. USU's expansion included a 4.5 MW solar turbine for on-site electrical generation, an 850-ton central chiller, and 6,000 feet of supply and return chilled water piping.

In order of priority, the objectives for adding onsite self-generation were to:

- Consistently reduce the cost of electricity to USU,
- Increase overall reliability of electricity supply to critical loads, and
- Improve overall power quality.

Cost savings, reliability, and power quality were the key drivers for the CHP project at Utah State University.

CHP System Equipment & Configuration

The addition of the cogeneration portion to the expansion of the central utility plant enabled the entire project to be self-financed through a tax-exempt lease, based on energy savings over a period of at least 12 years.

The gas-fired Solar Taurus 60 turbine generator interfaces with two city-wide utility companies – the university is connected directly to Questar Gas' main line to feed natural gas to the generator, and the electricity is then fed into the lines owned an operated by Logan City.

The Utah State University campus in Logan, Utah has a 13 megawatt (MW) peak demand. The CHP system cuts 4.5 MW off of the peak.

Between 20,000 and 45,000 pounds per hour of 85 psi saturated steam is produced by the turbines, which is captured and forced into the existing heating pipes. This steam is the main source of heat for the campus to heat both water and buildings, though in the cold winter months the campus does require the use of supplemental boilers for heating.

The turbine is monitored from the control room, located within 50 feet of the turbine and staffed 24/7. USU has a diesel generator onsite to provide some backup. Backup power for the remainder of campus is supplied by the local electric utility. The university maintains regular boilers for backup heating.

CHP Operation

- USU's CHP plant was designed to operate 24 hours a day, seven days a week to cover base electrical and thermal loads. However, because of high natural gas prices, the plant is instead operated as a peak shaver.
- USU has the ability to export to the grid but generally does not do so, because it is more cost effective to reduce its own power costs than to sell to the grid.
- The system has been marginally reliable. Reliability issues are strongly correlated with operator familiarity of the system. Reliability has improved as operator familiarity has improved.
- USU experienced problems with the CHP's ability to operate with the university-owned substation and the local utility's system, and to maintain a proper power factor. These problems were resolved by reprogramming substation capacitor banks and slowing down the turbine response.

Utah State University's 4.5-MW gas-fired turbine was installed as part of an expansion to the central utility plant.

For More Information

INTERMOUNTAIN CHP CENTER
Patti Case, Director (etc Group)
801-278-1927 x 5#; plcase@etcgrp.com
More CHP Project Profiles: www.intermountainCHP.org/casestudies
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