MIDWEST CHP APPLICATION CENTER

In Partnership with the US DOE

combined heat & power in colleges

Elgin Community College

4.1 MW CHP Application

Project Profile

CHP Quick Facts

Location:
Elgin, Illinois
Campus Size:
798,598 sq ft (main campus)
25,000+ students
Maximum Facility Demand:
3.0 MW
CHP Prime Movers:
4 - 800 kW Waukesha Gensets (1997)
1 - 900 kW Waukesha Genset (2004)
Primary Fuel:
Natural Gas
CHP Maximum Thermal Output:
11,200 MMBtu/hr steam total
CHP Heat Recovery Equipment:
5 - Beaird Heat Recovery Silencers
5 - Beaird Exhaust Silencers
Absorption Cooling Equipment:
1 – York 550 RT Absorption Chiller
1 - Trane 800 RT Absorption Chiller
Installation Costs:
Phase I - $2,500,000
Phase II - $1,200,000
Simple Payback:
Phase I – 3.5 years
Phase II – 4.0 years (projected)
Installation Dates:
Phase I - May 1997
Phase II - June 2004

Project Overview

In 1997, Elgin Community College (ECC) of Elgin, Illinois installed a 3.2 MW Combined Heat and Power (CHP) system to provide electricity, low pressure steam and absorption cooling to the main campus buildings of ECC. By 2005, the college had expanded the CHP system with an additional engine genset and absorption chiller due to campus expansion. The current CHP system generates a maximum of 4.3 MW of electric power, 11,200 MMBtu/hr of low pressure steam, and 1,350 RT of absorption cooling. The main components of the CHP application include four 800 kW and one 900 kW Waukesha Reciprocating Engine Generators, two absorption chillers (Trane 800 RT and York 550 RT), and Beaird heat recovery equipment. The CHP system can now meet the campus demands of the entire electric and cooling demands, and nearly the entire heating demand.

Elgin Community College Main Campus

Reasons for CHP

Energy Savings - ECC is a growing institution. Today, the college has more than 25,000 students and projections show an enrollment of 50,000 by the year 2020. With the growing student population and facility expansion, lower energy costs and a reliable source of electricity became increasingly important.

Energy Reliability - With the CHP system generating on-site electricity, ECC has almost eliminated any threat to the campus from brownouts or total blackouts due to energy shortages. This allows ECC greater reliability and ensures that the campus will still be functioning during energy shortages. Reliability is needed to keep the central computer mainframe in operation along with over 2,000 campus desktop computers. Reliability is also needed because the college has been designated as a Federal Emergency Management Act (FEMA) shelter. In the event of an emergency the college must be self sufficient and act as a shelter for the local community.

On-Site Energy Control - The CHP system allows the college to take control of its energy needs. The second installation came with a monitoring system which allows the plant managers to monitor the entire system online providing real-time data to evaluate the system status and operate at the optimum system conditions – primary power, peak shaving, or emergency power. ECC expects the CHP system to provide an advantage to providing their energy requirements when electric deregulation arrives in 2007.

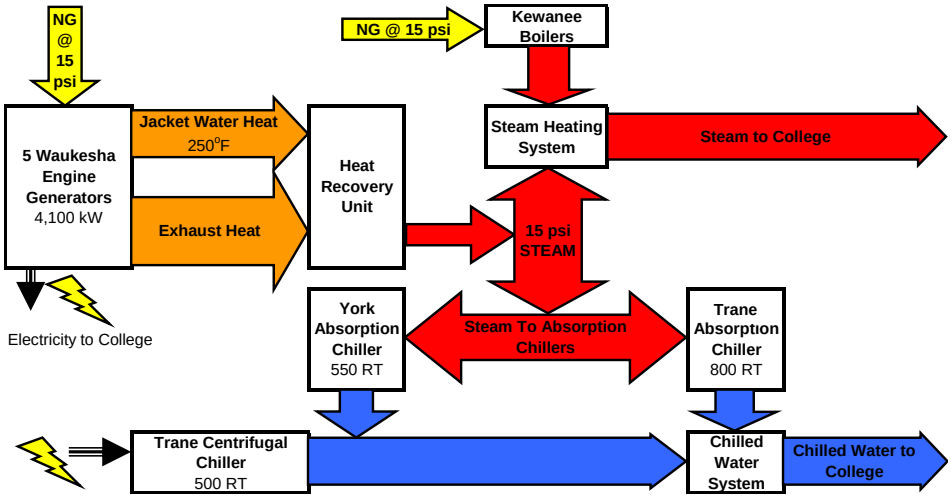
Favorable CHP Experience Prompts CHP Expansion

The performance of the original CHP application installed in 1997 met the expectations of the ECC staff and therefore with the desire to meet the entire electric and cooling demands of the expanding main campus, ECC installed an 800 RT Trane Absorption Chiller in April 2003 and a 900 kW Waukesha Engine Generator in June 2004 as additions to their existing CHP system. Since 1997, even with the additional CHP equipment added on, the college has not suffered a full demand charge while operating their CHP system. The 5th prime mover unit provides redundancy so that the campus has adequate generating capacity if an engine needs to be repaired.

Trane Absorption Chiller Project Details
Date Operating: April 2003
Installed Costs: $868,000
Projected Savings: $175,000
Simple Payback: 5 years
Installer: Edwards Engineering

Waukesha Engine Genset Project Details
Date Operating: June 2004
Installed Costs: $1,200,000
Projected Savings: $300,000
Simple Payback: 4 years
Installer: National Heat and Power

CHP Configuration



Producing Low Pressure Steam from Engine Jacket Water

In order to maximize steam production during the heat recovery process from the prime movers, ECC utilizes an ebullient cooling system. In an ebullient cooling system, feedwater is mixed with steam to input into the engine jacket at a temperature of 247°F. The heat rejection from the engine jacket raises the temperature of the jacket water to 250°F, corresponding to 15 psig. The heated jacket water is then sent to the heat recovery steam generator (HRSG) and utilizes exhaust heat to produce steam at 15 psig. Sending hot water to the HRSG at the required steam pressure allows for maximum safety of steam production. In addition, using mixed steam and hot water in the engine jacket, allows for the system to operate without a pump.

Additional Information

- Lessons Learned - ECC recommends having "black start" capability either through relays or an automatic transfer switch to operate a CHP system during a utility outage.
- Lessons Learned - ECC recommends to carry the programming rights to all installed equipment.
- The original CHP system installed in 1997 was incorporated as a smaller project in a $15.8 million building expansion to ECC.
- Local referendums provided the funding for each phase of the CHP system.
- Regularly performed maintenance activities are performed by ECC staff. Additional maintenance is contracted out to Charles Equipment Company
- The original CHP feasibility study was completed by KJWW Engineering Co., the general contractor of the original project was Morse Electric Company., and the equipment supplier was Charles Equipment Company.

For further information contact:

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ECC uses an ebullient cooling system to maximize steam production using hot water from the engine jacket.

"We have not suffered a full demand charge since the CHP system has been operational in 1997."

"The CHP system will hopefully give us an edge when electricity is deregulated in 2007."

Paul Dawson
Managing Director of Facilities, Elgin Community College

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