



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Bowdoin College

630-kW CHP System



Bowdoin College's Central Heating Plant.

Quick Facts

LOCATION: Brunswick, ME
MARKET SECTOR: College / University
FACILITY SIZE: 49 buildings, 1.4 MSF
FACILITY PEAK LOAD: 630 kilowatts (kW)
EQUIPMENT: Two 60,000 lb / hr boilers & Dresser-Rand backpressure turbine
FUEL: Natural Gas or #2 oil
USE OF THERMAL ENERGY: Heating
CHP TOTAL EFFICIENCY: 87%
ENVIRONMENTAL BENEFITS: Greenhouse Gas (GHG) emissions reduced by 228 metric tons CO₂e / year, an 18% reduction in CO₂e; Helped Bowdoin College achieve carbon neutral goal in 2018.
TOTAL PROJECT COST: \$3.5M Plant Update
EXPECTED YEARLY ENERGY SAVINGS: \$137,500
PAYBACK: <6 years for turbine-generator
IN OPERATION SINCE: 2012

Site Description

Founded in 1794, Bowdoin College is a liberal arts college in Brunswick, ME with an enrollment of approximately 1,800 students. The Bowdoin College campus was home to multiple notable alumni, including Henry Wadsworth Longfellow, William Cohen, and Cynthia McFadden, and now includes 49 buildings encompassing approximately 1.4 million SF of heated residential, laboratory, administrative, and classroom buildings on 207 acres. Bowdoin's central heating plant supplies 100% of the heating needs for the campus and is located within a 123-year-old building having limited space.

Reasons for CHP

Bowdoin College's long tradition of environmental stewardship was re-affirmed in 2007 when Bowdoin ratified the American College and University President's Climate Change Commitment (ACUPCCC) and committed to being carbon neutral by 2020. Accordingly, Bowdoin adopted CHP to realize three key benefits:

- Environmental stewardship
- Cost savings
- Proven technology to supply resilient heat and power

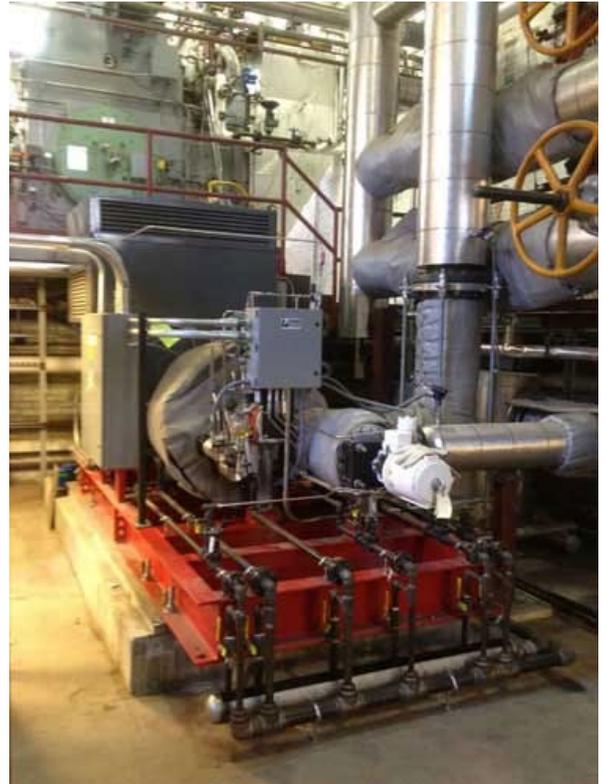
"The Turbine Generator will soon surpass the 1 million dollar saved mark. With regular maintenance, it will continue to make power for many years."

**- John Simoneau,
Senior Project Manager**

CHP Equipment & Configuration

Commissioned in March 2012, the CHP system consists of two 60,000 lb / hr high-efficiency boilers generating steam at 250 psig. The 250-psig steam passes through a Dresser-Rand backpressure turbine to generate 630 kW of electricity and reduce steam pressure to 30 psig. The 30-psig-pressure steam is then routed through a network of pipes to heat 56 buildings.

The CHP system – engineered by RMF Engineering of Baltimore, MD and installed by H. P. Cummings of Winthrop, Maine – satisfies Bowdoin’s campus heating requirements while saving money and reducing greenhouse gas emissions.



CHP Operation

Since commissioning in March 2012, the CHP system has operated more than 30,000 hours with the bulk of operation occurring in the 8 months between October and May each heating season. The CHP systems provides all the heating for the entire campus while generating 1.1 million kWh of electricity / year, thus offsetting approximately 8% of the energy Bowdoin would have otherwise purchased from the electric grid. At 12.5 cents / kWh, the 1.1 million kWh in “free” electricity saves Bowdoin College approximately \$137,500 / year and 230 metric tons of carbon dioxide equivalent (CO₂e) / year, or \$960,000 and 1,610 metric tons of CO₂e since installation. Additionally, the high-efficiency boilers installed as part of the CHP system save approximately \$15,000 / year in fuel costs and 340 tons of CO₂e / year.

Bowdoin College's 630 kW backpressure steam turbine generates 8% of Bowdoin College's electricity.

In total, the CHP system reduced costs by \$152,500 / year and GHGs by 570 metric tons of CO₂e / year, thus helping Bowdoin achieve carbon neutrality in 2018, or 2 years prior to Bowdoin’s original 2020 goal.

Lessons To Share

LESSONS LEARNED:

- Work with your system designer/engineer to specify components to meet your operation & maintenance expectations.
- Selecting components that the supplier is familiar with avoids compatibility, integration, and support issues.
- It is very important to have staff capable of interacting with all of the technology. Investment in staff training will reduce downtime and save you money if/when problems occur.
- During the process of design, engineering, installation, and operation, the entire team at Bowdoin was very diligent in discussing the possible issues (like noise due to the proximity to student housing). Spending the time up front to explore these issues has resulted in a very efficiently operating turbine.
- The Turbine Generator will soon surpass the 1 million dollar saved mark. With regular maintenance, it will continue to make power for many years.

For More Information

U.S. DOE New England CHP TECHNICAL ASSISTANCE PARTNERSHIP (CHP TAP)

David Dvorak, Ph.D., P.E.
(207) 581-2338
dvorak@maine.edu

Bowdoin College

John Simoneau
Senior Project Manager
(207) 725-3979
jsimonea@bowdoin.edu
www.bowdoin.edu

More CHP Project Profiles:
<http://www.nechtpap.org/>

Date produced: May 2019