NEW ENGLAND

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

PROJECT PROFILE

Eastern Maine Medical Center

4.6-MW CHP System

Eastern Maine Medical Center's central heating plant.

PHOTO COURTESY OF SCOTT HUMPHREY

Quick Facts

LOCATION: Bangor, ME
MARKET SECTOR: Healthcare
FACILITY SIZE: 2 million sq. ft.
FACILITY PEAK LOAD: 6 megawatts (MW)
EQUIPMENT: 4.6 MW turbine generator, 24,000 lb/hr HRSG, and a 500-ton Absorption chiller
FUEL: Natural Gas and #2 Heating Oil
USE OF THERMAL ENERGY: Heating & AC
CHP TOTAL EFFICIENCY: 70%
ENVIRONMENTAL BENEFITS: Reduced Greenhouse Gas (GHG) emissions by 10,600 tons CO_2/year; reduced fuel use by 27%
PROJECT BY: Cianbro Corporation
TOTAL PROJECT COST: $8,590,594
CHP IN OPERATION SINCE: 2006
ACTUAL PAYBACK: 4.5 years
CURRENT SAVINGS: $3 million/yr (compared to oil)

Site Description

Founded in 1892, Eastern Maine Medical Center (EMMC) is a comprehensive, 411-bed medical center serving communities throughout central, eastern, and northern parts of Maine. A medical staff of more than 450 physicians provides a large majority of the primary-care, specialty, and intensive services offered in the Bangor area.

EMMC's central heating plant provides 95% of the campus electricity and steam required to operate. A utility tie-in to the local utility provides the balance of electricity, and the original boiler plant provides the balance of steam. EMMC can completely separate from the grid and does so approximately 10-12 times per year. Additionally, EMMC has maintained full electrical operation during numerous power outages since 2006, including the 2017 October wind storm outage.

Reasons for CHP

With an increase in storm intensities and the existing electrical grid infrastructure aging, EMMC realized the need to remain fully functional during extreme weather events, which can cause power outages. CHP was adopted to achieve three main benefits:

- Increase redundancy – chosen unit can fully supply electrical load during the winter months.
- Reduce energy costs by converting recovered exhaust heat into free steam.
- Reduce the facility's carbon footprint due to recovered heat and reduced boiler runtime.

CHP Equipment & Configuration

Partially funded by a $3 million grant from the Department of Energy[1], EMMC's CHP system consists of a 4.6 MW turbine generator and a 24,000 lb/hr Heat Recovery Steam Generator (HRSG), which uses the turbine's exhaust heat to create high pressure steam. This steam is used directly for heating, humidification, sterilization, cooking, and laundry. In the summer months, a 500-ton absorption chiller and a two-cell cooling tower use excess steam to cool the facility.

The CHP system – designed, procured, and constructed by Cianbro Corporation of Pittsfield, ME – gives EMMC a more reliable means of generating heat and electrical power while reducing the carbon footprint of the campus.

A 4.6-MW steam turbine generates 95% of the electricity and thermal energy required to operate the campus annually.

PHOTO COURTESY OF SCOTT HUMPHREY

CHP Operation

Since commissioning in 2006, the CHP system has operated for 13 years with scheduled shutdowns for preventative maintenance. The CHP system reduced oil consumption by more than 800,000 gallons/yr in the early years of operation and reduced carbon dioxide (CO_2) emissions by 10,600 tons/yr. Further, an additional 2.0 million kWh/yr was saved by utilizing steam-driven absorption chillers instead of electrical chillers.

Based upon its success, the EMMC was granted an Energy Star rating of 85 and awarded the 2010 Energy Star CHP Award for reducing fuel use by 27%.

> ***"A Hospital needs to function as a Hospital no matter what is happening to the power. An ice storm can leave you without reliable power from the utility for days. Now with the Cogen plant, patients and the community can depend on the hospital at all times."***
>
> ***-Scott Humphrey***
> ***EMMC Plant Operations Manager***

Lessons To Share

The project would have benefitted by hiring the engineering firm directly by the owner, not the installer as a way to oversee construction.

Planning should include:

1. Understanding how your energy profile fits the operating outputs over an entire year.
2. Understanding the impact of other, planned energy projects.
3. Discussions with public utilities to understand rate class changes after installation.
4. Adequate time for relatively-long public and Department of Environmental Protection (DEP) review processes.
5. Understanding how the CHP system will affect property taxes.
6. Understanding how emissions may affect the facility's licensing and internal and external reporting requirements.

Before startup, staffing and controls must be in place to monitor a large CHP around the clock. Training must include how operating conditions will affect costs for budgeting. Lastly, neither the installer nor the manufacturer should be expected to provide operating expertise, so staff procedures must be documented prior to start-up.

For More Information

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More CHP Project Profiles:
http://www.nechptap.org

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[1] https://www.energy.gov/sites/prod/files/2013/11/f4/data_collection_and_analysis_of_chp_system_emmc.pdf