Healthier Hospitals
A PRACTICE GREENHEALTH PROGRAM

University of Massachusetts Medical School
UMASS

Case Study: Leaner Energy Challenge - Combined Heat and Power Expansion Project

UMass Medical School

Summary

The CHP project was undertaken to better support a growing campus.

To make this project financially possible, UMass Medical School combined current construction efforts to include a new Combined Heat and Power System and received financial incentives from the local utility company.

The project saved annually 58,000 MWh in electricity and $6.2 million.

Problem

In 2010, UMass Medical School (UMMS), including UMass Medical School and UMass Memorial Medical Center, had an existing and sophisticated central plant that provided steam, chilled water and power to the entire campus. However, they needed to support its growing campus, specifically the energy needs of the planned Albert Sherman Center, a $300 million 512,000 square foot bio-medical research and clinical education facility, scheduled to open in January 2013.

The Strategy Selected

UMMS's long-term campus and utility master plan envisioned the continued expansion of combined heat and power on their campus. With the inception of the Sherman Center, UMMS began programming this CHP expansion project to include looped chilled water and steam distribution systems as well as the equipment diversity such as steam drive and gas turbine drive generators. In order to accomplish this financially, they included the upgrade as part of a larger $450 million campus capital campaign and integrated it into plans for new construction. This allowed UMMS to capitalize on low-cost financing and also ensured a fully integrated implementation approach. UMMS installed a new 7.8 MW gas turbine with 60,000 pph heat recovery steam generator to support the campus's existing and future electrical, steam and chilled water loads. The system was also designed with enough capacity to support future expected construction at the campus.

Implementation Process

Leadership from the school and hospital supported the strategy and project on all accounts—infrastructure resiliency and redundancy, green gas reductions, energy efficiencies and life cycle cost reductions—making the project possible. UMMS's project team completed the construction and installed a Taurus 70 Solar Turbine—a mechanical drive package, which can be combined with one or more centrifugal gas compressors to form a complete compressor set. Designed specifically for industrial service, Taurus 70 packages are compact, lightweight units requiring minimal floor space for installation. The project also included an electric drive 4,000 ton chiller, two new cooling towers and associated electrical switchgear. The CHP system was installed as part of a $48 million overall expansion to the campus's existing central plant, which was offset by $7 million from a National Grid incentive.

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The UMass Medical School campus supports the 400-licensed bed Level 1 Trauma Center, known as UMass Memorial Medical Center. In addition, the campus supports a $250M per year bio medical research center and the medical school. The CHP provides steam, chilled water and electrical production for over 3million square feet.

Benefits

Increased savings, power and energy efficiency were realized through this project including:

- 58,000 MWh in annual electricity savings.
- $6.2 million in annual savings.
- Less than 3 year payback period.
- Increased power production and chiller capacity for the 500,000 square foot Sherman Center.
- Designed to support future construction at hospital.
- Back up for the hospital's existing central plant.

Challenges and Lessons Learned

The central plant at the UMMS campus is a complex and sophisticated system of multiple technologies. Effectively integrating the new gas turbine into this system and optimizing system-wide performance was a complicated engineering task.

Additionally, given the scale of the system, interconnecting the CHP unit into the local electrical grid was a challenge. UMMS staff had significant experience working with National Grid on previous projects and were able to work closely with utility representatives to meet all interconnection requirement.

School staff noted that incorporating the CHP system into the early planning phase of the hospital's long-term master plan was a major reason for the success of the project. This long-term view of CHP project development allowed the hospital to take a careful and considered approach to CHP system planning. Staff also noted that a close working relationship with utility staff was a critical success factor for the project.