Energy Infrastructure

University of Massachusetts Medical Center
Worcester, Massachusetts

Project Cost: *$30 million*

Annual Cost Savings: *$3.6 million*

Facility Description: *Medical Center, Hospital and Research Lab, 2 million square feet*

Contract Term: *10-Year Energy Savings Performance Contract*

Cogeneration and energy conservation measures make the difference

The University of Massachusetts Medical Center in Worcester, MA, is among the most respected health care facilities in the New England region. Co-located on site with the medical center, the University of Massachusetts Medical School (UMass Medical) is also recognized for its world-class research facilities and the high caliber of its educational curriculum. Founded in the early 1970s, this almost three-decade-old institution faced problems due to its aging and inefficient energy systems.

Through the Commonwealth of Massachusetts' Performance Contracting program, NORESCO was selected to conduct a comprehensive energy audit and identify major energy conservation measures and infrastructure improvements to help UMass Medical meet its goals. The $30 million project is expected to save UMass Medical $36 million in utility and operating costs over the next 10 years while improving power and system infrastructure reliability.

> *"Our power plant supports critical services throughout the campus for electric generation, heating, cooling and water heating. This project provides UMass Medical with systems we can safely depend on for efficiency, reliability and environmental performance, and certainly sets a standard for others to follow."*
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> Mark Armington
> UMass Medical
> Project Director
> Facilities Management

The most significant energy conservation measure NORESCO implemented was re-powering UMass Medical's existing steam cogeneration topping-cycle power plant to a full cogenerating facility. The 25-year-old plant was designed to generate 5 megawatts (MW) of electricity in parallel with the local electric utility, significantly reducing UMass Medical's costs during periods of high electric demand.

The plant has black-start capability and can also operate isolated from the grid, if necessary, to provide emergency power for the hospital in case of a utility power failure.

The infrastructure upgrade project gives UMass the ability to generate up to 10,000 kW-more than enough power to operate both the hospital and the Medical School. The new cogeneration system will be 43% more fuel efficient than the original steam turbine system, and the university estimates it will be able to generate electricity for about half the cost of purchased electricity.

More Power, Greater Efficiency

As part of the infrastructure upgrade project, a 3900 square foot addition was built onto the existing power plant to make room for the added equipment. To improve the efficiency and capacity of the steam plant, NORESCO optimized the cycle using three steam pressures, installing two new dual-fuel boilers designed to generate high-pressure (1100 psig and 850ºF) steam to power a new 5000-kW back-pressure steam turbine. To minimize emissions, the new boiler system was equipped with a state-of-the-art low nitrogen oxide (NOx) burner system with combustion controls and flue-gas recirculation technology designed to meet emissions guidelines, an important objective for UMass Medical.

NORESCO also installed a boiler plant master control (BPMC) system to oversee operation of all turbine generator sets and bypass valves, including maintaining high- and low-pressure steam headers at proper pressures. The system was designed to reduce operating and repair costs related to pressure problems as well as reducing the amount of employee time required to monitor the systems. The BPMC system will work in conjunction with the individual control system on the boilers, turbines, and chillers.

The chart below details the energy and infrastructure improvements undertaken at UMass Medical.

Energy Conservation Measure	Measure Detail	Approximate Project Investment	Approximate Project Annual Savings
Chilled water and cooling improvements	Air handling, steam humidifier and air balancing improvements; eliminate chilled water bypass	$271,000	$55,000
Energy management system upgrade	Installation of integrated EMS: 65% increase in control points; better technology	$750,000	$160,000
Ventilation upgrades	VAV Conversion/VFD Installation	$1,800,000	$164,000
Domestic and process water improvements	New toilets; new reverse osmosis demineralized water system; redesign of cooling water flow for refrigeration equipment	$500,000	$156,000
Premium efficiency motors	134 high efficiency motors totally 5,000 HP	$240,000	$150,000
Lighting improvements	Lamp reduction with improved lighting levels (replaced over 27,000 fixtures); ballast reduction	$3,000,000	$650,000
Combined Heat and Power Plant	Repower existing steam cogeneration topping cycle power plant to upgrade generation capability to 10,000 kilowatts	$23,000,000	$2,293,000
TOTAL		$29,561,000	$3,628,000