SOUTHCENTRAL

CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

PROJECT PROFILE

University of Texas Medical Branch

15 MW CHP System

CHP-Based Microgrid Built for Resilience

Quick Facts

LOCATION: Galveston, TX
MARKET SECTOR: University/Hospital
FACILITY SIZE: 45+ buildings, 2+ million gross square feet
FACILITY PEAK LOAD: 45 MW
FACILITY AVERAGE LOAD: 30 MW
EQUIPMENT: East Plant: Solar Taurus 60 5.5 MW gas combustion turbine, a 2 MW condensing extraction steam turbine, heat recovery steam boiler, one 1 MW diesel engine
West Plant: **Solar Taurus 60 5.5 MW gas combustion turbine, two** 1 MW diesel generators, and a heat recovery steam generator
FUEL: Natural gas (fuel oil backup)
OPERATION: 15 megawatt CHP power and steam generation capacity
USE OF THERMAL ENERGY: up to 90% of campus heating for hot water and steam distribution; 13,000 tons of cooling capacity.
CHP IN OPERATION SINCE: 2016

Site Description

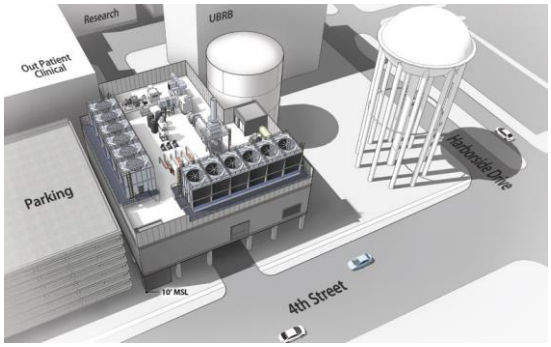
Established in 1891, the University of Texas Medical Branch (UTMB) at Galveston is the oldest medical school west of the Mississippi. Covering 85 acres and supported by 13,000 employees, UTMB includes seven hospitals, a network of specialty clinics, numerous centers and institutes devoted to advanced research (Galveston National Laboratory among them), a medical library, and schools of nursing, health professions, and biomedical science, in addition to a medical school of 2500 students and 1000 faculty members.

Reasons for CHP

In September 2008, Hurricane Ike flooded over one million square feet of University of Texas Medical Branch Galveston campus buildings to depths of six feet, interrupting and damaging electrical power, emergency generators, natural gas, chilled water, and municipal water and sewer. Submerged in seawater, the underground steam distribution system was a complete loss. Rather than replacing in-kind, AEI and UTMB established an approach to significantly improve site resilience and allow for immediate return of the hospital and clinic operations. The approach taken replaces critical infrastructure to 49 buildings. It protects utility sources by elevating boilers and chillers or protecting them with floodwalls; supplementing outside electrical utilities with 15MW of on-site microgrid combined heat and power (CHP); and, replacing much of the existing steam system with a more resilient and efficient district hot water system.

CHP Equipment & Operation

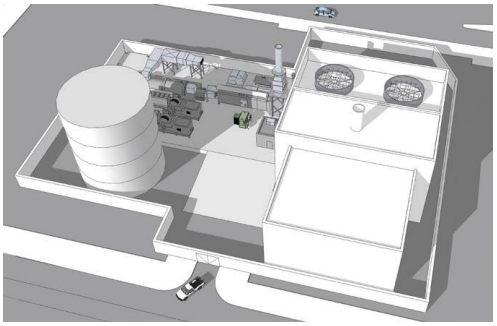
The CHP system consists of an East Plant and a West Plant.



EAST PLANT

Elevated 18 feet above ground level (30-foot MSL), the new 7.5 MW East Plant includes two 3,550-ton electric centrifugal chillers, a Solar Taurus 60 5.5 MW gas combustion turbine, a 2 MW condensing extraction steam turbine, a 75,000 pph heat recovery steam boiler, one 1 MW diesel engine-driven, black-start generator, and 2M gallons of chilled water thermal storage.

The CHP system provides up to 90 percent of the campus heating for heating hot water, campus steam distribution, and domestic hot water, and can provide 13,000 tons of cooling capacity.



WEST PLANT

Adjacent to an existing 10,000-ton chiller plant, the new 7.5 MW West Plant Hardening includes a Solar Taurus 60 5.5 MW gas combustion turbine, two 1 MW diesel generators, a 75,000 pph heat recovery steam generator, and a 2M gallon thermal storage tank. The entire existing plant, CHP, and thermal storage is protected by a 14-foot (20-foot MSL) floodwall.

CHP Benefits

- Reduces CO2 emissions by 16,476 tons per year which is equal to removing the carbon emissions of 2,721 cars.
- 50% more efficient than conventional systems, UTMB's two new CHP plants will save approximately $3 million annually, with a 5-year simple payback.
- Extensive conversion from steam to hot water distribution is expected to save over 10% of the heating load through lower line losses, while reducing susceptibility to storm damage.

"The CHP system's primary value to the University is the ability to provide sufficient chilled water, heating water and steam to maintain operations of critical buildings during the loss of electrical power from the local utility. An added benefit of CHP is the reduction in utility cost of approximately $2 million per year." - Lynn Crawford

Lessons to Share

The CHP system at the UTMB campus was tested during Hurricane Harvey in 2017. Due to the hurricane, the campus lost both of its electrical feeders. The loss of the feeders would have resulted in a complete blackout of the campus. Fortunately, the new CHP system continued to operate during and after the storm and the hospital maintained regular operations.

According to UTMB President Dr. David Callender, "The new systems were completed in 2017 and experienced real-life commissioning via Hurricane Harvey. The systems performed as planned and allowed UTMB to continue its critical inpatient care role, even allowing our university to accept patients from surrounding hospitals that were being impacted by the storm."

For More Information

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