

CASE STUDY / **TECO CENTRAL UTILITY PLANT**

A DISTRICT ENERGY SYSTEM IS BIGGER IN TEXAS

When Thermal Energy Corp. (TECO) needed to expand its district energy system, it had more than one goal in mind. Besides more than doubling its ability to deliver chilled water and steam, TECO also wanted to increase efficiency, reduce its reliance on the Houston area power grid, and improve its ability to continue operating during extreme weather.



TECO'S DISTRICT ENERGY SYSTEM KEEPS THE WORLD'S LARGEST MEDICAL CENTER GOING

Upgrading an already efficient district energy system serving millions of square feet of space at the Texas Medical Center presented some challenges. The upgrades — part of a long-range master plan — needed to be made without any interruption in service while installing equipment that would double capacity.

PROJECT STATS

CLIENT

Thermal Energy Corp. (TECO)

LOCATION

Houston, Texas

CONSTRUCTION COST

\$377 million

48

MW OF CHP CAPACITY

18

MEDICAL INSTITUTIONS
RECEIVE SERVICE FROM TECO

6M

PATIENTS SERVED BY
TMC ANNUALLY

CHALLENGE

It takes the biggest district energy system in North America to deliver reliable chilled water and steam to the world's largest medical center. But what happens when growth in demand for these critical services threatened to outstrip available capacity within a few short years?

The answer came in the form of a 50-year master plan laying out in detail how TECO should respond to a range of priorities.

TECO was formed in 1969 as a central utility plant owned by Houston Natural Gas and dedicated to serve the Texas Medical Center (TMC). In 1978, TECO became a nonprofit service cooperative owned by the medical institutions that comprise TMC and has been a critical part of the medical center's infrastructure ever since.

For many years, TECO operated two plants that supplied steam and chilled water for air conditioning, heating and hot water used for sterilization, laundry and many other support services to 18 TMC hospitals and other medical institutions. That list includes MD Anderson Cancer Center, Texas

Children's Hospital and several other world-renowned medical institutions on the TMC campus.

By 2005, however, TECO was facing the reality that current and future growth of the TMC would outstrip its capacity to continue providing combined heat and power (CHP) services. The system was aging and peak load demands were expected to approximately double by 2020.

The 50-year master plan clearly outlined a number of challenges. Near the top of the list was the fact that TECO could not double the size of its operations footprint even though service capacity needed to double. With space at a premium, the energy center's 4.5-acre footprint could only grow to 6.5 acres.

In addition, as a critical energy provider, the medical center could not tolerate any interruption in service. All construction would need to be carefully planned and staged to not interfere with existing plant operations. It was vitally important that patient care, research and education not be compromised at any TMC institution.



SOLUTION

Burns & McDonnell was engaged to validate the master plan and develop engineering plans to take the next steps forward.

Goals were to increase capacity, improve energy efficiency, reduce emissions, and strengthen overall system reliability and emergency operating capacity. In addition to validating the master plan, we provided engineering, procurement and construction services for the \$377 million expansion, all without hindering the medical center's ongoing operation.

We took on the first phase of the expansion program, which included the design of a 48-megawatt (MW) CHP plant with capacity to produce up to 330,000 pounds per hour of steam. Other elements included:

- An 8.8 million-gallon chilled water thermal storage tank with 76,000 ton-hours capacity.
- A new East Chiller Plant featuring four 8,000-ton electric-drive chillers and space within the plant to add six chillers in the future.
- New cooling towers with the equivalent of 32,000 tons of storage capacity.

- An expansion and upgrade to the 138-kV substation serving TECO.
- A new 29,000-square-foot operations support facility.
- A 6-MW back-pressure steam turbine.
- Additional chilled water loops to serve new loads located on the western and southern perimeter of the TMC campus.

Another priority was storm hardening the entire facility with equipment and systems that would prepare TECO to provide continuous service during hurricanes and the tropical storms that often threaten the Houston area.

RESULTS

The expansion was completed in 2011 and has since met and exceeded objectives outlined in the original master plan.

Improving energy efficiency: TECO's CHP plant operates at approximately 80% efficiency by recovering waste heat from its energy production.

Reducing grid load: TECO's new system reduces the demand created by TMC by 50% through the use of an on-site 48-MW combustion turbine.

Saving money: By 2015, customer rates had been reduced by 4.1% over

rates in previous years. More than \$3 million has been refunded to TMC customers.

Improving security and reliability:

TMC has proven to be a vital medical resource during recent natural disasters, thanks in large part to reliable, on-site energy that has continued in island mode while the surrounding power grid was down. This priority paid off in 2017 when TECO continued to provide full service to all TMC facilities while South Texas was reeling from Hurricane Harvey.

TECO now provides service to approximately 24 million square feet of space dispersed among 50 buildings on the TMC campus. More importantly, and thanks to the foresight in the original master plan, TECO is poised to expand power, chilled water and steam capacity when future needs dictate.

TECO has been consistently recognized over the past two decades by the U.S. Department of Energy for leadership in modeling the benefits of district energy.



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