

U.S. DOE



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Jesse Brown VA Medical Center

3.4 MW CHP Application

Project Overview

In November 2003, a 3.4 MW Combined Heat and Power system was installed at the Jesse Brown Veterans Affairs Medical Center to provide electricity and steam to the medical facility. The CHP system offered energy independence and security to the hospital and currently maintains an availability of over 98%. The CHP system consists of a Solar Centaur 40 TM combustion turbine fueled by natural gas with a maximum steam generating capacity of 50,000 lbs/hr when duct-fired. At an installed cost of \$12.5 million, the CHP system will save \$41 million in energy costs over the life of the 25 year project lease.

Reasons for CHP

Energy Savings

In 1997, the U.S. Department of Veterans Affairs (VA) was looking to reduce their expenses on the utility bills for their 168 hospitals and medical facilities. VA performed a study to evaluate CHP in all VA medical facilities and identified 48 of the 168 facilities that held high potential for energy cost savings with Combined Heat and Power. CHP was implemented at three of the 48 sites – Jesse Brown VA Medical Center (Chicago, IL), North Chicago Medical Center (North Chicago, IL), and James H. Quillen Medical Center (Johnson City, TN) – applying VA's Enhanced-Use Lease authority.

Energy Independence

Prior to CHP, the Jesse Brown VA Medical Center purchased its steam from the neighboring University of Illinois at Chicago (UIC) campus and electricity from the local electric utility, Commonwealth Edison (ComEd). To gain energy independence, the hospital found its solution in a CHP system that would generate both electricity and steam. The CHP system would be housed in an energy center, a facility that is isolated for the sole purpose of providing energy needs to the medical facility (electricity, steam, hot water and chilled water). The hospital took advantage of a nearby existing warehouse (originally a dairy building) built in 1920. The building was a two story, 200,000 sq. ft., concrete facility that would serve as their energy center that would be home to the new CHP system and other utility equipment.

Quick Facts

LOCATION: Chicago, Illinois

PRIME MOVER:

(1) Solar Centaur 40™ Natural Gas Turbine

GENERATING CAPACITY: 3,419 kW

HEAT RECOVERY EQUIPMENT:

(1) Kentube Heat Recovery Steam Generator

50,000/15,000 lbs/hr (fired/unfired)

(1) 800 ton Absorption Chiller

HEAT RECOVERY APPLICATION: Building Heat, Absorption Cooling

IMPLEMENTATION COST: \$12.5 million (energy center & CHP system)

TOTAL ENERGY AND OPERATION SAVINGS:

\$41 million over the life of the lease

SYSTEM FINANCING OPTION: Enhanced-Use Leasing

LEASING TERM: 25 years



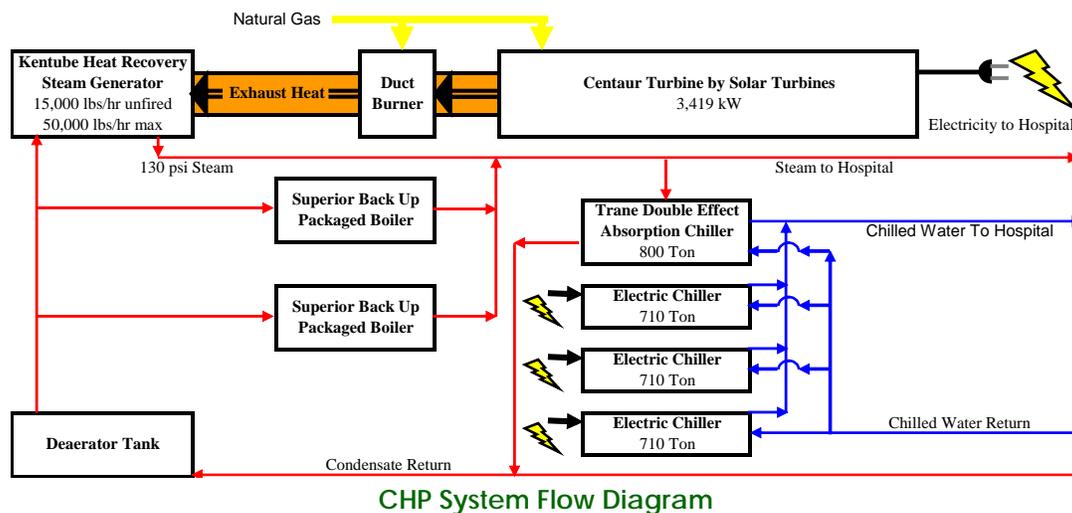
Jesse Brown VA Hospital Energy Center

Energy Reliability

Reliable power is critical in hospitals to maintain patient safety and staff and patient satisfaction. The CHP system maintains an annual availability of over 98% and the remaining <2% of the time the system may be down for maintenance. This allows for the system to provide a reliable source of prime power to the medical center and another layer of electric redundancy in combination with the grid connection and emergency generators to ensure electricity is available when needed.

Creative Financing of a CHP Project

The Jesse Brown VA Medical Center had land, but did not have the capital to fund an energy center and CHP project. Therefore, the VA decided to use a mechanism known as enhanced-use leasing to make the energy center and CHP system a reality. The enhanced-use leasing mechanism was a cooperative arrangement between the VA and the A&E firm, Energy Systems Group (ESG), which would provide the upfront installation costs to the CHP system and energy center. The VA would then contract out the design, construction, operation, and maintenance of the energy center and CHP system to ESG and collect revenue based upon energy use. ESG established an owner trust which sold bonds to finance the project. As a result, the realized energy savings for the Jesse Brown VA Medical Center came at no initial capital cost to the VA. The owner trust contracted ESG for a term of 25 years, a more than an adequate time period to pay back the installed first costs of the energy center and CHP system. In conclusion, the VA Medical Center supplies the land and the building to house the CHP system and at the end of the contract, the hospital is equipped with a fully maintained CHP system.



Heat Recovery

One of the benefits of operating a combustion turbine within a CHP system is the large capacity for heat recovery heat recovery which can be used in multiple applications (steam, chilled water and domestic hot water) to dramatically increase net Btu efficiencies. A combustion turbine is capable of producing a high volume of high pressure steam, in this case 15,000 lbs/hr at 130 psi, unfired and 50,000 lbs/hr duct-fired.

The HVAC system at the Jesse Brown VA Medical Center consists of a variable air volume (VAV) system that requires both chilled water and steam simultaneously in order to maintain space temperature conditions. During the winter months, the recovered heat from the CHP system produces all the required steam to maintain space heating in the hospital. During the summer months, the CHP system produces more than an adequate amount of summer steam requirement allowing the excess steam generated to be sent to an 800 ton double-effect absorption chiller to supplement the chilled water supply to the hospital. Utilizing recovered heat year round is the most efficient and economical way to operate a CHP system.

For More Information

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