PROJECT PROFILE

SOUTHCENTRAL

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

Louisiana State University

20-MWe CHP System

Picture courtesy of Louisiana State University

Quick Facts

LOCATION: Baton Rouge, LA
MARKET SECTOR: University/Higher Education
FACILITY SIZE: 350 buildings
CHP TOTAL CAPACITY: 40% of peak summer load
EQUIPMENT: GE (LM-2000) gas turbine; heat recovery steam generator
FUEL: Natural gas
USE OF THERMAL ENERGY: 21,500 tons of cooling, and 250,000 pounds per hour of 150 pound steam
TOTAL PROJECT COST: $29 million
CHP IN OPERATION SINCE: 1993, updated in 2005

Site Description

Louisiana State University (LSU) is the flagship university for Louisiana. Founded in 1853, this premier research university now spans almost 5,000 acres and is home to over 31,000 students. Consistently ranked as one of the best universities in the country by U.S. News & World Report, Forbes, Princeton Review, and Kiplinger, LSU offers close to 250 academic fields of study to a diverse student body. Research focuses include energy, materials science, biotechnology, and biomedical research. Additionally, LSU has strategic partnerships with companies including BASF, Shell, and ExxonMobil that support the connection of industries and education, research, and potential solutions.

The combined heat and power plant on the LSU campus has a 20 MW capacity, supplying approximately 40% of the peak summer load. Most days, it generates approximately 18 MW, which is enough to cover 65% of the annual energy requirements.[1] In addition to providing a significant portion of the campus' energy needs, the CHP system also provides energy efficiency and resilience related research concepts for LSU's engineering students.[2]

The University funded the CHP system through anticipated utility bill cost savings that would normally go to the local utility, Entergy-Gulf States. Entergy will continue to provide any additional electricity to the campus that is not covered by the CHP system. The state-of-the-art CHP plant was designed to provide electricity, heat, and air conditioning to the campus as well as to save the university money.

[1] https://www.lsureveille.com/multimedia/cogeneration-plant-provides-power-steam-to-campus/article_3dcc0562-13a9-5169-a7ec-330cbf3762a8.html
[2] https://www.lsureveille.com/natural-gas-plant-provides-campus-energy/article_db3391f7-2118-527e-abd3-38320dbf6719.html

Reasons for CHP

Located in the Gulf Coast, this region is no stranger to extreme weather events such as hurricanes and tropical storms. In the event of severe weather and grid power failure, LSU's CHP plant provides a high level of flexibility. The CHP system along with the emergency generators are able to cover critical campus needs. The CHP plant can be purposefully powered down in anticipation of a grid failure, disconnect from the grid and power back-up, giving the university the ability to bring supplemental power on-line rapidly following anticipated power outages and grid shutdown.

The CHP plant provides assurance that the critical needs of the LSU campus are met should there be an extended blackout. For example, in 2008 during Hurricane Gustav, the system provided electricity to critical sections of the campus for four days until power was restored to the majority of the Baton Rouge region. The university also provided vital community services, allowing businesses to continue to operate by co-locating to the campus during the outage.

CHP Equipment & Operation

LSU's campus has two CHP systems. The first system, installed in 1993, consists of a 3.7 MWe Allison aeroderivative gas turbine and an accompanying heat recovery steam generation (HRSG) referred to as Boiler 7. The turbine drives a refrigeration cycle in order to produce chilled water. This water, along with steam, are used to serve various campus needs.[3] In 2005, LSU brought a new 20 MW CHP facility online. This system is composed of an aeroderivative gas turbine by GE (LM-2000) which is connected to a generator, as well as an HRSG (Boiler 8) composed of an evaporator and an economizer. The 2005 system cost over $20 million at the time of development.

LSU's GE Turbine-based CHP system features the following processes:

- Ambient air is cooled with chilled water in the air cooler and then sent to the compressor to increase its pressure.
- Natural gas and compressed air are burned in the combustion chamber, then sent through the compressor turbine (connected to the compressor).
- The combustion product exits the compressor turbine and expands to near atmospheric pressure in the power turbine, producing electricity.
- These combusted products then go through 2 heat exchangers before being vented:
    - The first exchanger is the evaporator
    - The second exchanger is the economizer
- The combusted air transfers heat to vaporize heated water into steam.
- The steam leaving the evaporator will heat feed water before being sent back to the evaporator.
- Combustion gas finally exits the economizer as stack gas.

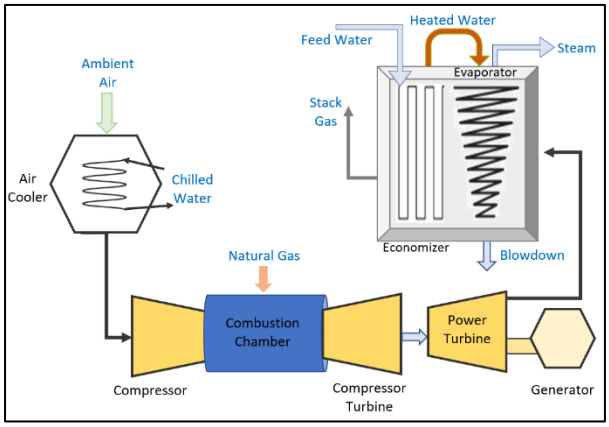

Image developed by U.S. DOE Southcentral CHP TAP

Electricity that is generated from the CHP system is sent to the campus' central power hub while the steam generated is delivered across campus via underground steam tunnels.

For More Information

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More CHP Project Profiles:
http://www.scchptap.org/

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[3] https://pdfs.semanticscholar.org/0c4e/418a688922d31c9bd0bacee183f78fb32c59.pdf