U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

RECOVERY ACT CASE STUDY

CHP and district energy serve Texas A&M's 5,200-acre campus, which includes 750 buildings.
Photo courtesy of Texas A&M University

Combined Heat and Power System Achieves Millions in Cost Savings at Large University

Recovery Act Funding Supports CHP

Texas A&M University is operating a high-efficiency combined heat and power (CHP) system at its district energy campus in College Station, Texas. Texas A&M received $10 million in U.S. Department of Energy funding from the American Recovery and Reinvestment Act (ARRA) of 2009 for this project. Private-sector cost share totaled $40 million.

In order to meet the energy load growth associated with ongoing campus growth, Texas A&M installed:

- A new high-efficiency natural gas-fired CHP system now capable of producing 50 megawatts (MW) of on-site generation and 210,000 pounds of steam per hour, and
- Campus-wide electrical distribution system upgrades.

The CHP system can operate as a baseload system to serve 75% of Texas A&M's peak power needs, 65% of total electrical energy needs, and 80% of the heating loads (steam for cooling included).

Texas A&M University installed a natural-gas fired CHP system at its College Station campus in 2011.
Photo courtesy of Texas A&M University

Benefits Fit the Bill

Jobs: This project created immediate engineering, manufacturing, and construction jobs, as well as long-term maintenance and servicing positions, strengthening the local economy of College Station, Texas, and the surrounding area. In addition, energy cost savings from the installed CHP system can be invested in the creation and preservation of long-term education and research jobs at Texas A&M.

Efficiency, Emissions, Cost Savings: The CHP system has increased efficiency, reduced carbon dioxide emissions, and saved millions of dollars.

Reliability: The CHP system enables Texas A&M to isolate critical campus electrical loads to maintain service during grid disruptions.

"This CHP project is a major investment by the university that will provide operational, financial and environmental benefits for many years to come."[1]

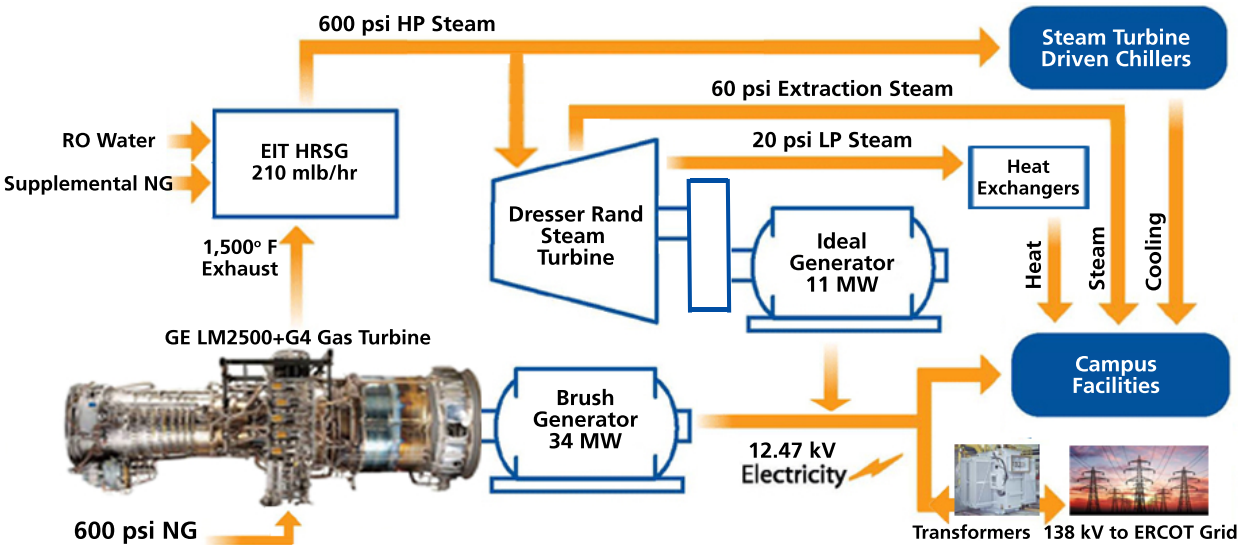
– James G. Riley, Texas A&M's Executive Director of Utilities & Energy Services

"This grant will support the world-class research at Texas A&M by helping the university to upgrade and expand power capacity, increase energy efficiency, and reduce costs. The new CHP system is an example of Texas A&M's continued national leadership toward a new energy future."[2]

– Former U.S. Congressman Chet Edwards

First Look at Success

Texas A&M has self-generated electricity and steam since 1893. The university's CHP equipment was 38 years old before it installed the new CHP system,[3] which became operational on August 1, 2011. The new CHP system achieved more than $250,000 in cost savings in the first week of operation—leading to a total of $1 million in avoided costs in the first month. These costs represent what the university would have had to pay for power provided by off-campus sources if purchased during peak load periods. The CHP system also reduced greenhouse gas emissions by 30% in its first month of operation.[4]



Texas A&M's CHP system includes a gas turbine generator, heat recovery steam generator, and steam turbine generator.

Photo courtesy of Texas A&M University

[1] "Texas A&M's New Power Generation System," Energy Action Plan 2015, Utility & Energy Services, Texas A&M University, Aug. 1, 2011.

[2] "Texas A&M Receives $10 Million DOE Grant For New Combined Heat and Power Generation System," Marketing & Communications Archive, Texas A&M University, Sept. 1, 2010.

[3] Riley, Jim, "Combined Heat and Power (CHP) at Texas A&M University," Presentation at CHP 2011 Conference, Oct. 18, 2011.

[4] "Texas A&M's New Power Generation System," Energy Action Plan 2015, Utility & Energy Services, Texas A&M University, Aug. 1, 2011.

ENERGY STAR® CHP Award 2013

The U.S. Environmental Protection Agency (EPA) presented Texas A&M with a 2013 ENERGY STAR® CHP Award, which "recognizes highly efficient CHP systems that reduce emissions and use at least 10% less fuel than comparable, state-of-the-art, separate heat and power generation." Texas A&M's CHP system won the award because it operates at 70–75% efficiency, reduces carbon dioxide emissions by an estimated 99,600 tons per year, and uses approximately 33% less fuel than separate generation of steam and electricity. An additional benefit is that the CHP system can operate independently from the grid, enabling Texas A&M's facilities to serve as emergency housing for people endangered or displaced by power outages.[5]

Estimated Benefits

Efficiency	70–75% operating efficiency (increase from 55%)
Emissions Reductions	30% reduction in greenhouse gas emissions[6]
Cost Savings	$6–10 million in annual avoided costs (depending upon energy cost)[7]
Reliability	Provides two-thirds of campus electrical power plus thermal energy for cooling and heating the campus[8]

CHP Project of the Year 2011

The Texas Combined Heat and Power Initiative (TXCHPI) presented Texas A&M with the 2011 CHP Project of the Year award, which "recognizes projects implemented in the United States that can serve as an exemplary example for how to design and implement combined heat and power"[9] systems.

James G. Riley, Texas A&M's Executive Director of Utilities & Energy Services, accepts the CHP2011 Project of the Year Award from Ray Deyoe, Chairman of TXCHPI.

Photo courtesy of "Project of the Year," CHP 2011 Conference Awards

Paul Cauduro, Executive Director of TXCHPI, commented, "Earlier this year a DOE report[10] highlighted that CHP is the path to adding energy reliability while improving air quality and dramatically reducing water used for power production…the A&M CHP project clearly helps lead the way."[11]

> "The cost avoidance allows the university to maximize institutional funding in support of teaching, research, improvement of facilities, and other programs."[12]
>
> *– James G. Riley, Texas A&M's Executive Director of Utilities & Energy Services*

[5] "ENERGY STAR® CHP Awards," Combined Heat and Power Partnership Program, U.S. Environmental Protection Agency website.

[6] "Texas A&M's New Power Generation System," Energy Action Plan 2015, Utility & Energy Services, Texas A&M University, Aug. 1, 2011.

[7] Ford, Camryn, "Power towers," The Battalion, Texas A&M University, Jul. 25, 2012.

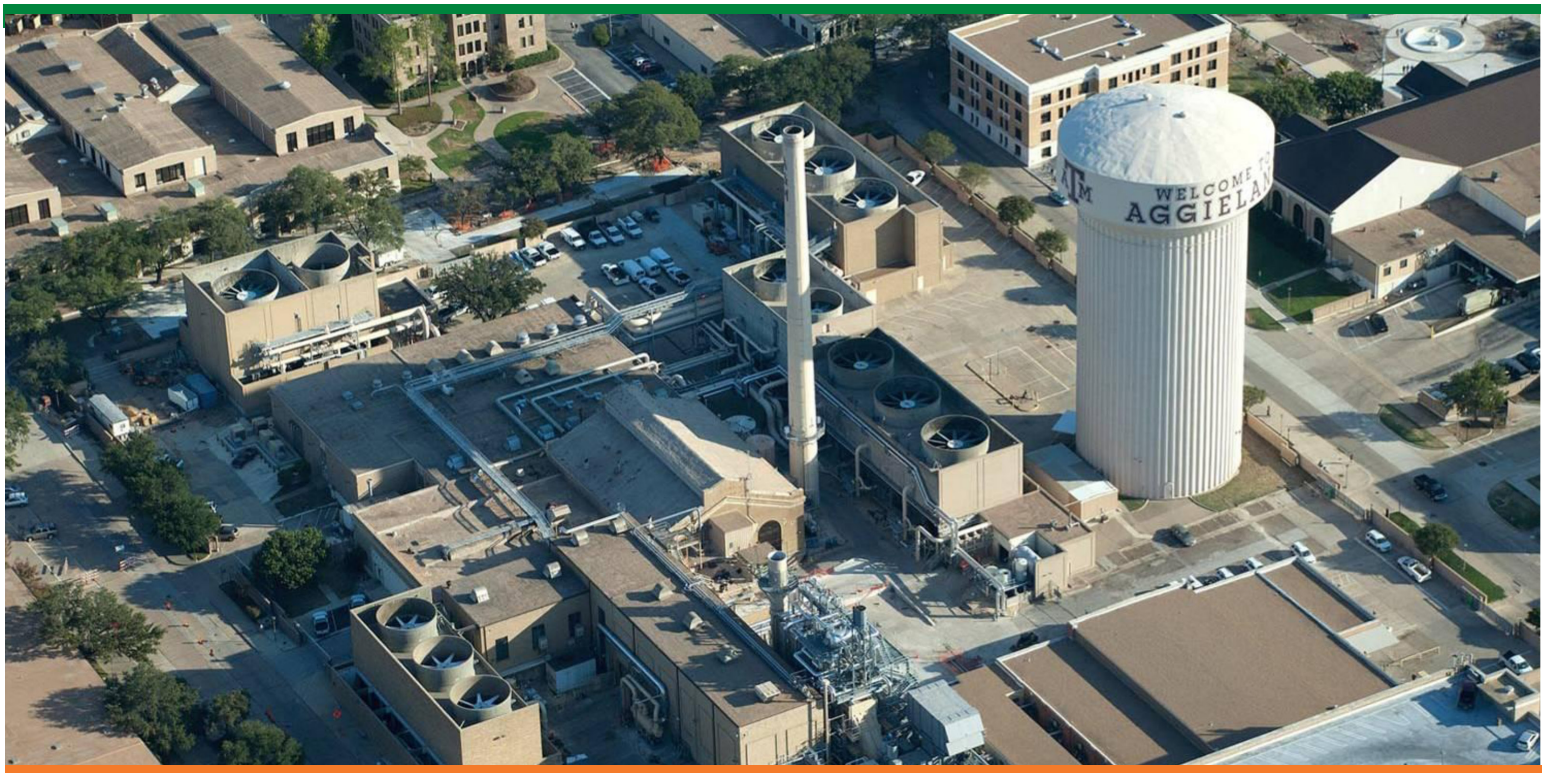
[8] Ibid.

[9] "Top Project Named by Combined Heat and Power Industry," Texas CHP Initiative, Oct. 31, 2011.

[10] "Impacts of Increasing Natural Gas Fueled Combined Heat and Power from 20 to 35 Percent of Total Electricity Production in Texas," U.S. Department of Energy Gulf Coast Clean Energy Application Center, Apr. 4, 2011.

[11] "Top Project Named by Combined Heat and Power Industry," Texas CHP Initiative, Oct. 31, 2011.

[12] "Texas A&M's New Power Generation System," Energy Action Plan 2015, Utility & Energy Services, Texas A&M University, Aug. 1, 2011.



The CHP system at Texas A&M is now capable of producing 50 MW of on-site generation.
Photo courtesy of Jacobs Engineering Group Inc.

Value of CHP at Universities

Texas A&M sits on a 5,200-acre campus and serves 24 million gross square feet (GSF) of facilities. Universities, particularly those with large campuses, are ideal candidates for the installation of CHP/district energy systems because schools are used year-round, requiring a steady supply of electricity and thermal energy. Universities can also be used as places of refuge during emergency situations. For instance, during power outages, people may be displaced from their homes. A university can provide heating/cooling and other essential services to a large number of displaced people if a CHP system is installed, even with a failure of the regional power grid.[13]

Quick Stats—Texas A&M

The Texas A&M district energy campus—located in College Station, Texas—has:

- Over 50,000 students (including 9,500 graduate students)
- 120 undergraduate and 240 graduate degree programs in 10 colleges
- 800 student organizations
- 750 buildings on 5,200 acres
- 24 million total gross square feet (GSF) (increased from 18.5 million GSF in 2002)
- 19 million GSF conditioned space (cooled and heated)[14]

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[13] "Places of Refuge," The Contribution of CHP to Infrastructure Resiliency in New York State, New York State Energy Research and Development Authority, April 2009.

[14] Texas A&M University website.