COMBINED HEAT AND POWER ALLIANCE

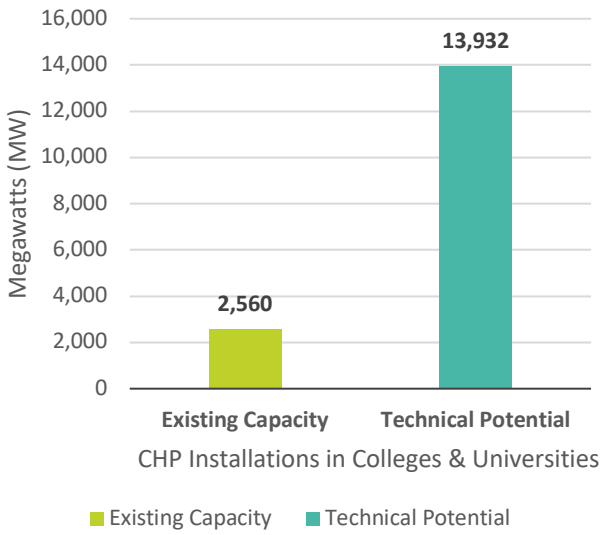
Combined Heat and Power (CHP) Potential in Colleges & Universities

About 20 million students will attend US colleges and universities in the fall of 2019.[1] That large body of students requires reliable energy to ensure they can access the resources they need to learn. As campuses increasingly depend on technology for teaching, research, and student activities, reliable and affordable energy has become increasingly important. Combined heat and power (CHP) generation systems are reliable and low cost. They can provide colleges and universities with the continuous electricity supply and heat they need to support students.

Direct CHP Benefits for Colleges & Universities:

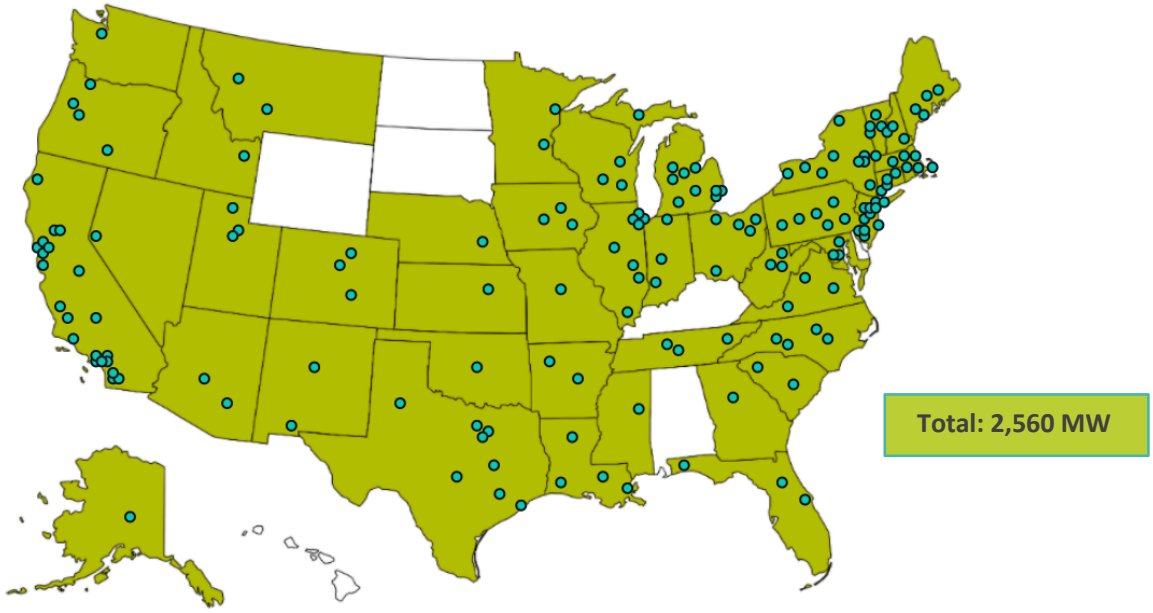
- Microgrid capability
- Reduced energy costs
- Increased energy reliability
- Storm resilience & emergency preparedness
- Increased student safety
- Increased energy efficiency
- Reduced emissions of air pollutants
- Protection from volatile electricity prices
- Decreased dependence on backup power generation systems

Figure 1: CHP Capacity at US Colleges and Universities Compared to Technical Potential [2,3]



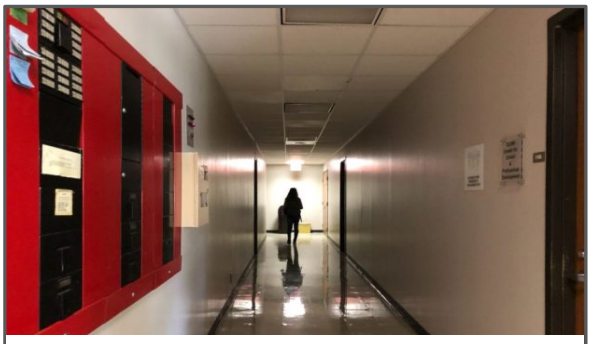
A grid failure due to weather, malfunction, or an emergency can significantly strain universities. Students, especially those living in university housing, need electricity to continue with their regular activities. Advanced research laboratories rely on sensitive machines machines that can be impaired by power outages. CHP systems allow colleges and univerisites to "island" from the electrical grid and operate as microgirds that continue to run even during a grid-wide power outage. CHP can also provide cost-savings to universities by efficiently providing electricity and heat. In the US, 278 colleges and universities have installed CHP systems, providing 2,560 MW of capacity.[2] However, the US Department of Energy estimates that 13,932 MW of potential remains in higher education alone.[3]

Fig. 2: CHP Colleges & Universities Installations in the US[2]



Case Study: Why colleges and universities need dependable power

When the power unexpectedly went out at the University of Houston, student life wasn't the only thing interrupted. Closed parking lots and cancelled or relocated classes were a small problem compared to the threats the outage posed to research machines and experiments. Sensitive research equipment is especially vulnerable during power outages; systems often require longer start-up times after unexpected outages and can even fail in the event of an outage. The blackout also interrupted ongoing experiments, which could delay research progress. Although researchers will be compensated for any losses, it's still a blow to the research-focused University which has previously lost research during power outages. This example demonstrates the necessity of reliable power for college campuses; something CHP systems can provide under almost all circumstance.[4]



An emergency light inside a building at the University of Houston during a recent power outage.

CHP Success Stories

New York University

New York University (New York, NY): New York University built a 14.4 MW CHP system in 2010, which supplies 22 campus buildings with electricity, produces hot water for 37 campus buildings, and meets all of their heating and cooling needs. The system provided power and heat to the core campus during Superstorm Sandy and allowed the university and city officials to house local residents impacted by the storm. Besides resilience benefits, the CHP plant saves NYU over $5 million per year by reducing energy costs.[5]

Vanderbilt University (Nashville, TN): Vanderbilt University uses a 17 MW CHP system to provide heating, cooling, and power for the research university's campus. The system meets 90% of campus heating needs, 40% of cooling needs, and 23% of electricity needs while saving the university $3 million dollars a year. The switch to a CHP system from coal powered boilers has also lowered campus emissions; greenhouse gas emissions fell by 30%, nitrogen oxide emissions by 75%, and particulate emissions by 50%. following the adoption of CHP.[6]

Vanderbilt University

[1]NCES. "Back to school statistics." 2019. https://nces.ed.gov/fastfacts/display.asp?id=372#College_enrollment
[2]U.S. DOE. "Combined Heat and Power Installation Database." Installations as of December 31, 2018. https://energy.gov/chp-installs
[3] U.S. DOE. "Combined Heat and Power (CHP) Technical Potential in the United States." March 2016. https://www.energy.gov/sites/prod/files/2016/04/f30/CHP Technical Potential Study 3-31-2016 Final.pdf
[4]The Daily Cougar. "When the lights go out, research suffers". June 21, 2019. http://thedailycougar.com/2019/06/21/lights-power-outage-research/
[5]ICF. "Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities." Prepared for Oak Ridge National Laboratory. March 2013. https://www.energy.gov/sites/prod/files/2013/11/f4/chp_critical_facilities.pdf
[6]US DOE. "Vanderbilt University." November 2015. http://www.chptap.org/Data/projects/vanderbilt-Project_Profile.pdf

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