

COAL-FREE CONVERSION

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Vanderbilt University ends the use of coal on campus, moving to a cost- and energy- efficient natural gas cogeneration system.

By Karla Hignite

Vanderbilt University, Nashville, burned its final truckload of coal in November 2014, ending 126 years of continuous coal use on campus. As of October 2015, the university has been fully operational with its conversion to a 100-percent natural gas cogeneration system. It uses diesel fuel as backup, primarily for the university's medical center, explains Mark Petty, Vanderbilt's associate vice chancellor for plant operations. (Read also "[Resource Reshuffle](#)" in May 2016 *Business Officer* magazine.)

According to Petty, the transition began about eight years ago during informal discussions with the university's chancellor and chief business officer about current and future energy costs and modernization of Vanderbilt's physical plant. By 2012, Petty had worked with the chancellor to develop a formal proposal to fully convert the campus from coal to natural gas. "Based on our engineering studies and research, the availability of natural gas and stabilization of prices—coupled with the escalating maintenance costs of our aging coal-fired system—confirmed moving in this direction," says Petty. While the inefficiencies of its 30-year plant were a huge factor, as for many campuses, an increased focus on sustainability efforts by Vanderbilt's faculty and student body also contributed to the switch.

Positive economics. At its height, the coal-fired system produced about 11 MW of electrical power at the university's plant. In 2000, the university expanded the plant by installing its first natural gas boiler component, which virtually doubled the plant capacity, notes Petty. Much of the necessary gas infrastructure was put in place during that upgrade, which required about a \$5 million investment by the university's utility provider to make improvements to its main lines running to the campus.

The cost to convert Vanderbilt's system from coal to natural gas, roughly \$29 million, has been largely funded by university investment, says Petty. The conversion included installation of two natural gas-fired boilers and one natural gas-combustion turbine to cogenerate steam and electricity on site. According to Petty, the project has addressed about \$7 million in deferred maintenance needs. "All the economics have been very positive. We've already seen a tremendous return on our investment and on efficiencies of the new system and equipment."

While Petty suggests it is too soon to quantify actual savings based on projections from the initial engineering studies in 2012, the original eight-year payback projected when gas was \$4 per dekatherm has likely been reduced to about a five-year payback based on current rates of nearly half that cost, notes Petty. He also expects to see significant greenhouse gas reductions. "When we conduct our next emissions survey, we expect a dramatic decline—perhaps as much as 40 percent—and a substantial decrease in particulate matter as well, likely by more than 50 percent."

Mindset adjustments. An immediate adjustment with which Petty had to contend was the necessary shift in leadership mentality to help employees make the transition. "With an aging coal-fired plant, you have lots of mechanicals and moving parts that require lubing and ongoing maintenance and cleaning. Our operating procedures with our new plant are very different and center on efficiency gains and preventive maintenance, and those take a much different set of skills and disciplines."

An easier adjustment has been a much quieter campus now that the daily traffic—trucks carrying coal onto campus and others hauling off the ash—has ceased, says Petty. Annually, about 2,300 trucks delivered 105 million pounds of coal and hauled away 15 million pounds of ash waste.

One surprise for Petty resulting from the plant's conversion was the sentimental resistance by some on campus with regard to removal of the smokestack, a long-time landmark in the community. "One employee shared stories about her father, a mason, who helped build the chimney in the 1960s," says Petty. "Others wanted to leave it standing but wrap it in solar panels." Maintenance issues related to an abandoned smokestack argued against that option, says Petty. The six-week dismantling of the coal plant infrastructure, including removal of the smokestack, silo, and bag house, made it clear to the campus community that the university would not be returning to coal.

KARLA HIGNITE, New York City, is a contributing editor for *Business Officer*.