Furman University
Greenville, South Carolina
Energy

SCHOOL
Furman University is a four-year, private liberal arts college with 3,000 students in Greenville, South Carolina.

ABSTRACT
Furman University’s installation of ground source heat pumps in its on-campus apartment complex, North Village, demonstrates the feasibility of retrofitting a traditional system with an innovative renewable energy resource. This project pursues replacing traditional heating and air conditioning units with systems that will significantly reduce dependence on fossil fuels and cut costs of energy consumption. This project is currently in its development phase and as of August 2012, six of the eleven North Village apartment buildings have been retrofitted. The development began in 2010 and the construction is projected to be complete by the summer of 2014 with potential to be finished earlier.

GOALS AND OUTCOMES
Goals
At the beginning of the project, the goal was to replace traditional HVAC systems with ground source heat pumps in all eleven of the on-campus apartment buildings, which house 1,020 residents in 255 apartment units. The prior HVAC systems were reaching the end of their expected life span. With a grant from the U.S. Department of Energy, an opportunity to install a system that would last much longer than the anticipated 15 to 20 years for a traditional HVAC became a reality. Ground source heat pumps provide durable and reliable systems that are expected to last 50-200 years. In addition to developing units that would benefit Furman in the long-term, another fundamental goal of this project was to pursue sustainability. Installing geothermal systems into this housing complex will enable Furman to make great strides towards reaching its climate commitment of campus-wide carbon neutrality by 2026. This project was not only pursued to meet university goals but also to serve as a catalyst for the greater community and, in particular, the Southeast. Although this is a complex undertaking, a goal has been to create a model and teaching tool for other communities and institutions and to display the viability of geothermal systems.

Accomplishments and Outcomes
The geothermal installation project is currently in its development phase and is expected to be complete by the summer of 2014 with potential to be completed earlier. As of August 2012, six buildings have been retrofitted successfully with 20 wells installed per building. Each building is made up of 24 apartment units, which together house 96 student residents. These six buildings are also being metered to make data available for several variables of energy usage for future analysis and monitoring. The installations combined are projected to reduce energy consumption by over 1,000,000 kilowatt-hours each year, cutting energy costs by $55,000 annually. It is likely that due to rise in material costs, there...
will not be enough financial aid to support the final apartment building’s retrofit. Although the project is not yet complete, it has already begun to positively impact the environment on and beyond campus. The geothermal systems have eliminated hazardous emissions that would otherwise harm the ozone and have created a cleaner and safer environment for both human and natural occupants.

**Challenges and Responses**
The major challenge encountered during this project was obtaining the necessary financial resources. Geothermal systems cut costs when evaluating the long-term impacts; however, the initial investment can create a huge barrier. Furman has been able to overcome this obstacle because of resources saved for a new HVAC system accompanied by a grant received from the U.S. Department of Energy. As the project has progressed, installments have required more finances than could have been predicted and materials have increased in price. These have attributed to the funding falling short for the installation of all eleven apartment buildings. Furman’s Facilities Services decided to continue with the project to best retrofit all but one building.

**Campus Climate Action: Your School’s Carbon Footprint**
This project has directly addressed global climate change as a means to substantially reduce the campus carbon footprint. Installing geothermal systems in the apartment buildings on campus is expected to reduce energy consumption by over 1,000,000 kilowatt-hours each year with a reduction of over 600 metric tons of carbon dioxide annually. This retrofit project plays a large role in approaching carbon neutrality as part of Furman’s Climate Commitment.

**Commentary and Reflection**
Furman’s installment of geothermal systems in North Village apartment complex provides a successful model for retrofitting traditional systems into innovative renewable resource systems. Although this process is seemingly complex, difficulties may be avoided if resources are allocated to manage the project from the beginning to end. One of the most important lessons to learn from this project is of the importance in designating a manager to oversee the project in its entirety. Without a primary project manager, it can become difficult to efficiently integrate all components of such a large-scale project.

**ENGAGEMENT AND SUPPORT**
**Leaders and Supporters**
Furman University’s Facilities Services has been instrumental in the success of this project. In particular, Jeff Redderson (Assistant Vice President of Facilities Services), Elcainey Baker (Construction Supervisor), and Jimmy Looper (Building Automation Systems Technician) have played active roles in this project. In addition to the construction of the ground source heat pumps, the David E. Shi Center for Sustainability has been a resource for Furman’s campus and the greater community, and has sponsored a student fellow to do research on the geothermal project, thereby connecting campus operations to sustainability research.
Funding and Resources
Furman received a grant from the U.S. Department of Energy as part of the American Recovery and Reinvestment Act funding. Furman matched the cost awarded for the project from funds allocated to update the existing HVAC system. With these two sources of funding, the total project cost is projected to be roughly $4.9 million.

Education and Community Outreach
No major outreach efforts have been made.

CONTACT INFORMATION
Contacts
Katherine Kransteuber
Program Coordinator
David E. Shi Center for Sustainability
Phone: 864-294-2517
Email: katherine.kransteuber@furman.edu

Case study submitted by: Laura Eubanks ’12, laura.eubanks@furman.edu

MORE ABOUT YOUR SCHOOL
Campus Sustainability History
In 2009, Furman’s Board of Trustees endorsed Sustainable Furman, the university’s sustainability master plan and climate action plan, which set a goal of carbon neutrality by the university’s bicentennial of 2026. The comprehensive plan sets eight goals and over 90 strategies ranging from innovative “green” (energy efficient and environmentally-conscious) buildings to recycling and waste management on campus to transportation policy to curriculum development and research for sustainability. The mission of the David E. Shi Center for Sustainability is to promote the study and practice of sustainability on campus and in the greater community; the Center focuses primarily on student and faculty research and curriculum development. Current sustainability efforts are varied and wide-ranging; the geothermal project is the largest construction project related to sustainability and is managed by Facilities Services. The Shi Center has a myriad of student, faculty, and community programs related to sustainability. See www.furman.edu/sustain for campus sustainability efforts. See www.furman.edu/shicenter to learn more about the Shi Center.

Image Credit: Laura Eubanks, Student Researcher