

## **Final Scientific/Technical Report**

**DE-EE0003217**

1. **Name of Recipient:** West Chester University

**Project Title:** Design and Implementation of Geothermal Energy Systems at West Chester University

**Project Director/Principal Investigator:** Mark Pavlovich

2. **Patentable Information:** None. There is no restriction on the release of this information.

3. **Executive Summary:** West Chester University is launching a comprehensive transformation of its campus heating and cooling systems from traditional fossil fuels (coal, oil and natural gas) to geothermal. This change will significantly decrease the institution's carbon footprint and serve as a national model for green campus efforts. The institution is in the process of designing and implementing this project to build well fields, a pumping station and install connecting piping to provide the geothermal heat/cooling source for campus buildings. This project addresses the US Department of Energy Office of Energy Efficiency and Renewable Energy (EERE) goal to invest in clean energy technologies that strengthen the economy, protect the environment, and reduce dependence on foreign oil. In addition, this project advances EERE's efforts to establish geothermal energy as an economically competitive contributor to the US energy supply.

For this grant, WCU will extend piping for its geo-exchange system. The work involves excavation of a trench approximately 8 feet wide and 10-12 feet deep located about 30 feet north of the curb along the north side of West Rosedale for a distance of approximately 1,300 feet. The trench will then turn north for the remaining distance (60 feet) to connect into the mechanical room in the basement of the Francis Harvey Green Library. This project will include crossing South Church Street near its intersection with West Rosedale, which will involve coordination with the Borough of West Chester. After installation of the piping, the trench will be backfilled and the surface restored to grass as it is now. Because the trench will run along a heavily-used portion of the campus, it will be accomplished in sections to minimize disruption to the campus as much as possible.

4. **Actual Accomplishments:** All goals and objectives of the Statement of Project Objectives were met. 1,300 feet of main distribution piping was installed connecting the University's central geothermal well field to our Academic Quad and a 150,000 square foot building in that Quad - Francis Harvey Green Library. The piping was flushed, pressure tested and put into service in May of 2011. The disturbed ground and pavement were restored to their original configuration. The first two months of building HVAC operation using the geo-exchange well field indicate a summertime cost reduction of approximately 20% from a similar period of time during the previous year when the building was utilizing a cooling tower as a heat sink.

5. **Summary of Project Activities:** The project was implemented by developing a good project plan which included developing a scope, timeline, list of milestones, and budget. A thorough bid document was developed from the subsurface investigation and resultant detailed engineering design for the installation of the dual 20 inch geothermal water distribution main and smaller 12 inch branch lines. Permits and approvals were obtained from local authorities for this construction project.

The winning contractor prepared the work site, excavated about 150 feet of trench at a time, several lengths of HDPE pipe would be fused together above ground and then installed in the trench, covered it up and then repeated the process until the entire length of piping was installed. Several critical areas of piping were left exposed until successful completion of piping leak test, flushing of the pipe, and exercising of valves. Then the piping system was placed into operation. The disturbed ground and paving areas were restored to as found condition.

The engineering design was very successful and no major construction change orders occurred due to unforeseen circumstances.

## 6. **Products Developed under Award:**

- a. **Publications:** There have been a number of articles about West Chester University transitioning to a district geo-exchange for its heating and cooling and about the various grants received from the Department of Energy to assist in the transition.
  - 2009 Vol. 6, No. 4 – Publication: GEO OUTLOOK – West Chester, Converting to District Geothermal
  - Summer 2010, WCU Magazine – Geothermal Heating and Cooling Building Conversion: A Major Sustainability Initiative
  - December 6, 2010, Philadelphia Inquirer Blog, - \$4.7 M U. S. Grant For Chesco Energy Field

- December 7, 2010, Philadelphia Business Journal – West Chester U. gets \$5M DOE grant
- December 9, 2010, Web Site: West Chester University News and Events – Public Relations and Marketing - West Chester University Awarded \$5 Million for Geothermal Project
- December 12, 2010 The Daily Local (dailylocal.com) – Historic energy grant for WCU
- University News – Largest WCU Grant Goes to Energy Project
- January 31, 2011, Chronicle of Higher Education – Energy Department Supports Project at 2 Climate – Commitment Signatories
- Winter 2011, WCU Signs of Excellence – WCU Awarded \$5 Million Energy Grant

b. **Web Site:** This Grant supports one element of a much larger transition of West Chester University to a geo-exchange heated and cooled campus. The university website describes our efforts at this large transition:  
[http://www.wcupa.edu/\\_INFORMATION/AFA/Facilities/Energy/default.asp](http://www.wcupa.edu/_INFORMATION/AFA/Facilities/Energy/default.asp)

c. **Networks or collaborations fostered:** The University worked with Engineering firms, locators and construction contractors to develop a well thought out plan and avoided surprises during construction. The design was completed by Century Engineering (New Cumberland, PA). Construction was completed by B&S Sheet Metal Mechanical (Morrisville, PA) as prime.

d. **Technologies/Techniques:** Construction contractor developed expertise in efficient deep trench excavation, trench wall stabilization and large piping installation. Developed methods to install the 900 feet of dual 20" HDPE pipe and 400 feet of 12" pipe with minimal personnel entry into the 13 foot deep trench.

e. **Inventions/Patent Applications:** None

f. **Other products, data or databases:** None

7. **Computer Modeling:** No computer modeling was used.