



## Cedarville School District Retrofit of Heating and Cooling Systems with Geothermal Heat Pumps and Ground Source Water Loops

May 18, 2010

Principal Investigator  
**Mr. Barry Ferguson, Building  
Design Services, Inc.**

- Timeline
  - Project start date, Jan-2010
  - Project construction begin date, Jun-2010
  - Project construction & commissioning end date, Mid-2011
  - Project monitoring during 2011, 2012, and 2013
- Budget
  - Total project funding, \$3,257,030
  - DOE share, \$1,628,515
  - Awardee share, \$1,628,515
- Barriers
  - None anticipated
- Partners
  - Building Design Services, engineering and monitoring
  - Geo-Energy Solutions, project management and installation contracting

## Objectives:

- Improve the indoor air quality and lower the cost of cooling and heating the buildings that make up the campus of Cedarville High School and Middle School.
- Provide jobs, and reduce requirements of funds for the capital budget of the School District, and thus give relief to taxpayers in this rural region during a period of economic recession.
- Remove unusable antiquated existing equipment and systems from the campus heating and cooling system, but utilize ductwork, piping, etc. where feasible. The campus is served by antiquated air conditioning units combined with natural gas, and with very poor EER estimated at 6+/-.
- Install a ground source water loop for energy exchange in the best adjacent area for geological conditions and minimum environmental impact.

## Objectives:

- Install spray-on roof insulation and modify windows to reduce energy loss and infiltration. Install a heating and cooling system with geothermal heat pumps and centralized energy management and control system. The new Heat Pumps will be targeted to perform at very high efficiency with system capacity planned at over 300 tons.
- Monitor for 3 years the performance of the new systems compared to benchmarks from the existing system, and provide data to the public to promote adoption of Geothermal technology.
- The Geothermal installation contractor is able to provide financing for a significant portion of project funding with payments that fall within the energy savings resulting from the new high efficiency heating and cooling systems.

- Completed audit of the buildings along with existing utility distribution, cooling and heating systems in order to confirm and optimize design concepts for the new Geothermal Heat Pump systems, and determine which portions of the existing systems will not feasibly be usable. The operational costs of the existing systems and existing air quality have been measured and documented in order to set benchmarks for comparing the performance of the new systems.
- Completed preliminary design plans and specifications and have been approved. Bids for equipment and contract services have been solicited, vetted, and orders are currently being placed. Permits, which are expected to be routine, will be obtained.
- When the school activity schedule permits, the removal of existing equipment will begin, followed by the beginning of the installation of new equipment, and the redistribution of electrical services for the new equipment.

- The details of design for the vertical well water loops will be confirmed based on test bores to be made in May 2010. Water loop construction, roof insulation, and installation of heat pumps and other equipment will begin in June 2010. Work will be planned so that it does not unduly interfere with school activities.
- Commissioning the new systems and training will be completed as needed in phases as major portions of the system are completed. Completion of all phases of installation and commissioning is expected by mid-2011.
- The performance of the new systems will be monitored for a period of three years after commissioning, during 2011, 2012 and 2013.
- The centralized energy management and control system will supply operational data, and other data regarding utility usage, maintenance and other costs will be gathered and made available to the National Geothermal Data System.

## Project Management Plans

- The project management team will consist of representatives from the Cedarville School District, the engineering firm (Building Design Services), and the geothermal installer / project manager (Geo-Energy Solutions).
- Cedarville School District personnel will control finances, as well as communications with employees and the public.
- Building Design Services will provide engineering design, quality control, and commissioning supervision during installation; and then monitoring and data reporting services for system performance for the following three years.
- Geo-Energy Solutions will provide project management and general contractor services, and be the contractor for geothermal loop installation.

- The site will be a demonstration for the economic feasibility of geothermal heat pump systems.
- Data from the new system's performance compared to the old system will be made publicly available via DOE databases.
- The project offers educational opportunity, and will stimulate economic growth in a rural area.
- Two other schools in the District have been audited and studied as candidates for installation of geothermal heat pump systems, and the District School Board may approve one of these for a project to install a system beginning in 2011.

- The project is well underway with completion of facilities audit, preliminary engineering design, planned schedule of construction, and selection of contractors and vendors.
- Full scale construction activity will begin in June 2010.
- System installation and commissioning is planned for completion by mid 2011.