

# ALAMOGORDO PUBLIC SCHOOL DISTRICT

www.energyctrl.com

RENEWABLE ENERGY & PERFORMANCE CONTRACTING

Alamogordo Public Schools made a major financial commitment to install the largest renewable energy HVAC system in the Southwestern United States. Although ground-coupled heat pumps (GHP) have been used for over two decades, this project is unusual due to the comprehensive design that integrates a direct digital control (DDC) system from Delta Controls with the ground-coupled heat pumps and a district-wide lighting retrofit.

To date, ECI has deployed 5 earth heat exchangers driving 316 heat pumps, enabled by a total of 715 bore holes. The system generates 1,039 tons of cooling, managed centrally, remotely, and via BACnet standard controls in each classroom. The District now has over 50% of their educational space heated and cooled by ground source energy.

- Geothermal heat pump systems, also known as “geoexchange,” are the most energy efficient, environmentally clean, and cost-effective space conditioning systems available, according to the Environmental Protection Agency.
- They generate no on site emissions and have the lowest emissions among all heating and cooling technologies.
- GHP systems have a long life expectancy with minimal operational and maintenance requirements.

These projects focused on the district’s desire to optimize the learning environment through effective temperature control. However, they wanted more. Alamogordo’s director of operations and superintendent focused the original project on the high school due to critical issues at the facility. The high school was constructed in phases and there were six different mechanical systems with corresponding control technology. The district also wanted to look at improving the lighting systems.

ECI evaluated the high school and was given the liberty to evaluate other schools in the district. The goal was to upgrade the high school to one standardized system for both mechanical equipment and controls. Alamogordo Public Schools researched a great deal, but the budget would not support their project vision. ECI, an Energy Service Company, was asked to conduct an energy engineering study to evaluate controls and the earth heat exchanger required for the heat pump system.

During the district engineering analysis, it became clear that DDC was needed in three schools to address high energy costs and comfort issues. These schools had been retrofitted from evaporative to mechanical cooling that was running continuously year round. As a result, a Master Plan was developed outlining an \$8 million retrofit including:

- DDC in three schools,
- Ground-coupled heat pumps with DDC at the high school and
- Lighting retrofits in the thirteen schools

The GHP system incorporates traditional water-source heat pumps. Key changes to the units are larger condensers to accommodate wider temperature swings on the ground loop and higher efficiency compressors.

This project provided a heat pump with DDC control in each classroom. The first project phase encompassing 400 tons (1407 kW) of cooling was completed in Summer 2004, and the next phase began in Spring 2005. In 2007, the School District voted for a 6,000,000 bond to expand the GHP system to encompass the entire High School facility.

A Delta Controls DDC system using BACnet® was designed to optimize daily and annual schedules, and to ensure comfortable learning environments during normal school hours. The system also provides knowledge tools necessary to perform savings measurement and verification. Controls were implemented in all four schools, along with sub-meters on major electrical loads, to measure energy consumption after the project and to verify savings. ECI is currently under a 10-year Performance Contract with the District providing a savings guarantee with third party financing.

BACnet® will afford Alamogordo Public Schools maximum flexibility and cost-effectiveness because control products from other manufacturers can be integrated into a single, uniform system. The data communication architecture for this system uses extensive integration of Information Technology (IT). BACnet® is the standard used for DDC communication and the system interfaces directly to the district Ethernet local area network and BACnet/IP.

ECI completed a district wide lighting survey and identified cost-effective retrofits for 13 schools. Lighting upgrades are an effective way to reduce operating costs. Operation dollars are also saved because a group re-lamp addresses lighting in all schools at one time. This retrofit upgraded T12 lamps and magnetic ballasts to T8 lamps with electronic ballast technology.

The Alamogordo project is a good example of how funding creativity is being used, as the funds to complete the initial project included:

- \$1 million in state funding,
- \$1.98 million in performance contracting &
- \$5 million in general obligation bonds and property tax from the mil levy.

ECI as the design firm developed and facilitated the performance contract, including the financing. In the future, combining multiple funding sources will become a requirement rather than a novelty.

- Additional GHP systems have been funded through general obligation bonds