

Iowa Photovoltaic Educational Electronic Kiosk

As Part of the Central College Vermeer Science Center Renovation and Expansion Project



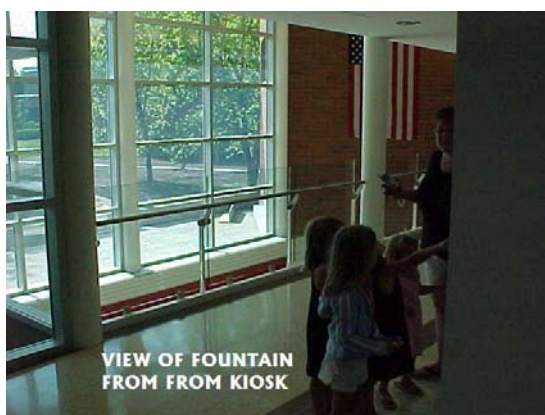
In September 2003, Central College's Vermeer Science Center (VSC), which recently underwent a \$20 million renovation and expansion, was awarded a Leadership in Energy and Environmental Design (LEED) Version 2.0 Silver Medal Rating. The VSC is the first building in the state of Iowa to achieve this certification. According to the U.S. Green Building Council (USGBC) website, 63 facilities in the United States have received LEED certification at various levels. Central is one of 14 silver medal winners. There have also been 2 platinum, 19 gold, 6 bronze, and 22 certifications awarded (bronze medals are no longer given). In order to become a LEED certified building, Central registered the VSC with the USGBC and met the requirements set forth by the Council to obtain the points necessary to achieve the rating.

Central College's strategic plan includes a strategy that addresses the college's commitment to environmental practices. Strategy 15 – Actively Pursue the Central College Community Goal

“To Promote and Model Appreciation of our Natural Environment and Stewardship of Its Limited Resources”. While there are other claims of environmentally friendly buildings in Iowa, this facility is the first LEED rated building in the state. What makes this even more impressive is the fact that this is a laboratory facility, typically a high energy user due to the extensive use of fume hoods and high ventilation rate requirements.

Through a partnership between the Iowa DNR, the Iowa Energy Center, and Central College, an electronic touch screen informational kiosk has been placed in the lobby of the building, providing users with valuable educational information, including solar energy statistics, details on the building’s solar powered fountain and other campus PV systems, current weather information, and information on the Iowa DNR’s solar programs. The kiosk also serves as a building directory. The information displayed on the kiosk monitor is programmed and implemented using state-of-the-art web technology and the resulting information can also be accessed via the Internet through Central College’s website at http://www.central.edu/VSC_Kiosk/vscpage2.html.

This kiosk features a touchscreen monitor mounted flush with the wall facing the building entrance, overlooking the solar-powered fountain.



The monitor displays an eye-catching message, inviting the observer to touch the screen, after which a menu containing several tabs appears. Beginning at a home page, a visitor learns about the sponsors of the project, including the Iowa DNR, as well as fun facts about the building,

current weather information, and several building images. A guest has the option of choosing other tabs, including one to learn more about the Vermeer Science Center, its unique LEED rating, and information regarding its solar-powered fountain. Another tab takes you to a building directory, which assists the visitor in locating classrooms, labs, and building personnel. Still another tab takes you to a renewable energy page, which includes graphics that interpret data collected “in real time” from sensors mounted on the photovoltaic panels, such as AC solar power (watts), sunlight (lumens), wind speed (mph) and temperature. The display will also show the accumulated energy saved and the carbon dioxide, sulfur dioxide, and nitrous oxide being kept from the atmosphere due to the use of this renewable energy source vs. the burning of fossil fuels. The user will also be able to view a brief explanation of why each of these items is significant, along with a general overview of photovoltaics and other PV projects on campus as well as throughout the state.

The kiosk provides details about the building’s LEED features. Through publicity provided by the Pella Chamber of Commerce and other Pella organizations, tour groups and other visitors to Pella will be encouraged to tour the facility, learn about the LEED rating process, observe renewable energy being used in a practical application, and discover what the Iowa DNR can do to offer assistance in renewable energy efforts.

Central College believes in promoting and modeling appreciation of our natural environment and stewardship of its limited resources to our students, the greater Pella community, and to the state of Iowa.

The campus and local community have participated in a number of presentations that detail the VSC and its environmentally friendly design and raised awareness about the potential of our renewable energy resources.

In order to increase awareness and educate the public about renewable energy, the college chose to incorporate a solar powered fountain into the building design. In addition to enhancing the quality of life of those who enjoy its beauty and cooling water, the fountain provides a hands-on learning opportunity about the power of the sun. This unique renewable energy feature is the indirect result of a gift the college received from Alliant Energy. In 1999, Alliant donated two 4-kW photovoltaic arrays, associated grid-tied inverters, and scientific-grade monitoring equipment to Central. One of the arrays is currently being incorporated at Central's Carlson-Kuyper field station, also featured on the kiosk, and the remaining array was installed on the roof of the VSC, providing power for the fountain located at the building's main entrance. This array provides power to a speed controller that ramps a 3-HP pump based on the output from the solar panels. The pump is fully loaded when the solar income is greatest, allowing the fountain to gradually change in water flow characteristics from minimum streams, to a striking display of arching columns. These sprays vary in height and distance, based on the amount of sunlight available at the solar panels. A sheeting action of water crossing a granite paver surface originates from beneath a shelf located under the solar powered fountain jets. This flow is maintained when the fountain is operated, (determined by the building's occupancy schedule and outdoor air temperature), by incorporating a 10 HP, 208 volt / 3 phase pump, which sheets 650 GPM. This pump is powered from the building's utility power supply. This entire process is described in detail by incorporating an animated graphic, accessed through one of the kiosk's screens.

Central College has applied for grants in an attempt to enhance this demonstration project to include hydrogen technology. On winter days when outdoor temperatures prohibit the use of the fountain, solar power could be utilized by an electrolyzer to separate hydrogen from water. This hydrogen could be piped to a demonstration fuel cell located in Undergraduate Research

Lab 161, which contains a large window adjacent to a public corridor. This window is close to the building's display cases, which would invite the public to view this state-of-the-art technology. The hydrogen could also be piped to the building's South parking area to fuel a donated "proto-type" hydrogen powered vehicle. This vehicle could be used as a shuttle to the College's Carlson - Kuyper Biology Fieldstation, close to Lake Red Rock, about 8 miles away.





An informational placard is located near the fountain, providing information about how solar energy is being incorporated to power the fountain, and inviting visitors to learn more by accessing the electronic kiosk just a few steps away.



Accomplished Objectives

1. Providing a hands-on, interactive public demonstration of renewable energy for Central College students and general public by capturing their interest as they visit the building, as well as providing this information to anyone in the world via the internet.
2. Exposing participants in the Center for Math, Science, and Teaching Excellence, which is housed within the Vermeer Science Center, to the concepts and technology used to produce renewable energy.
3. Educating people on the potential of photovoltaics and the viability of this type of energy as a future energy source.
4. Providing students within programs such as chemistry, physics, environmental science, and pre-engineering with opportunities to work with and study renewable energy.

5. Aligning with the College's strategic plan of actively pursuing the goal: "To promote and model appreciation of our natural environment and stewardship of its limited resources."

Project personnel

Project director: Mike Lubberden, Director of Construction and Energy Management, Central College

Information technology director: Deb Bruxvoort, Associate Director of Academic Computing, Central College

Project construction engineer: Steve Heyne, The Weitz Company

Project architect: Jan Behounek, Holabird & Root LLP

Collaborating organizations and/or consultants

Alliant Energy provided Central College with the photovoltaic array.

The Iowa Energy Center, along with the Iowa DNR and Central College collaborated to provide funding.

Holabird & Root LLP of Chicago was retained as the architect for the Vermeer Science Center renovation with James Baird acting as principle and lead designer. Within this organization Brian Stich, P.E. is serving as the project's electrical engineer and Lee Tapper, P.E. as mechanical.

The Weitz Company of Des Moines is the Vermeer Science Center's general contractor and construction manager, with Chris Harrison acting as project manager.

Schott Applied Power was retained as the photovoltaic consultant, designing the array and peripheral equipment. They partnered with Holabird & Root and Fountain Technologies, a Chicago-based fountain design firm.

Johnson Controls was the building automation control contractor, and involved in the installation of the PV current sensing / weather station hardware, and importing the accumulated data into the kiosk.

Quality Attributes Inc. of Ames was retained for the kiosk programming.