



### Award Category

Lighting Design and Retrofit

### Green Features

Extensive retrofit of all interior and exterior lighting fixtures

Installation of 752 new fixtures and ballasts

T5 high-output and compact fluorescent lamps

Occupancy controls

Exterior lighting tied into campus-wide EMS

### Annual Energy and Cost Savings

Lighting:  
99 MWh; \$15,000

Entire energy project:  
539 MWh & 3900 therms; \$85,000

### Cost

Total project  
\$3,390,000

### Completion Date

Expected Summer 2011

# Copper Mountain College Comprehensive Lighting Retrofit

Bond measure funding enabled a wide range of energy improvements, including the retrofitting of all interior and exterior fixtures with low-wattage lamps, installation of new ballasts and occupancy sensors throughout the campus, and tying the exterior lighting into a campus-wide energy management system.

When Measure C was approved by voters in the Copper Mountain Community College District in 2004, it provided the college with close to \$20 million to be used for construction of new facilities, updating obsolete facilities, and for making infrastructure improvements. The measure also included funding for a wide range of energy efficiency upgrades, and investments in renewable energy infrastructure.

To optimize the opportunity offered by this funding, the college drafted a comprehensive energy saving program, identifying multiple goals. First, the college leadership wanted to use the project to showcase the college as a leader in energy efficiency and renewable power generation. They wanted to leverage the educational aspects of the renewable energy features, while improving comfort for campus building users. The college also wanted to create a performance-based design/build program that would utilize savings to supplement the funding from the bond measure, and to maximize all available utility incentives and state loan opportunities. Finally, the college wanted to reduce its impacts on natural resource consumption by reducing the energy it purchases from the grid, and to capture energy cost savings.

The project's energy efficiency measures included lighting and HVAC retrofits, and the installation of a new campus-wide energy management system (EMS). The program also includes a substantial investment in renewable energy infrastructure, with an extensive solar photovoltaic (PV) array with a maximum generating capacity of 240 kW.

The program also included a 2.4 kW wind turbine, planned for installation in 2011. Although its contribution to the campus electricity supply will be small compared to the PV array, the college plans to use the turbine as part of the college's renewable energy curriculum.

### Lighting upgrades and an extensive photovoltaic array will significantly reduce campus peak load demand.

When Dan Cain joined the campus as Chief of Facilities in 2008, moving the energy savings program forward soon became one of his primary objectives. He notes that some of the projects were moving slowly, or were not being designed in ways that would minimize costs while realizing their full energy savings

potential. For example, the PV array was being planned as a ground-mounted installation. However, such a design would have used precious open space on campus; in addition there was parking lot that required upgrading due to poorly installed paving. Cain advised the project team to integrate the PV array into parking shade structures, upgrading the parking surface as part of the same project, "killing two birds with one stone," as he explains.

The bond measure funded a large number of both new construction and retrofit projects, and managing these projects put stress on

an already burdened facilities group. Cain researched methods of project delivery that would help the college move forward with the energy saving program, maximizing potential incentives while limiting the demands on facilities staff. He recommended using a



Copper Mountain College replaced all interior and exterior lighting fixtures. Photo: CMCC.

### Contacts

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### Project Team

CMCC:  
Departments of  
Maintenance &  
Operations, and  
Facilities

Design/build contractor:  
Chevron Energy  
Solutions

Utility partner:  
Southern California  
Edison

Community partner:  
CMCC Measure C  
Citizens' Oversight  
Committee

### More Information

[http://www.  
cmccd.edu/Press\\_  
Releases?display=89](http://www.cmccd.edu/Press_Releases?display=89)

[http://desertvalleystar.  
com/article.php?a=360](http://desertvalleystar.com/article.php?a=360)

[http://www.cmccd.edu/  
Measure\\_C\\_Bond](http://www.cmccd.edu/Measure_C_Bond)

design/build general contractor that could help manage the projects, and proceeded to interview three potential contractors that could provide that service. The college ultimately selected Chevron Energy Solutions to take on that role, managing the design and construction of the many projects included in the program.

### Carefully integrating energy efficiency projects with new campus expansions reduced costs, and will improve future campus operational efficiencies.

Of the energy efficiency measures adopted, an extensive lighting retrofit has been estimated to provide the greatest energy savings (excluding the savings from the PV generation).

The college replaced more than 752 lamps and ballasts, including all exterior and interior fixtures. Inefficient 400-watt high-pressure sodium fixtures were replaced with three-lamp, fluorescent T5 high-output (HO) fixtures; older 50-watt halogen incandescent fixtures were replaced with fixtures housing two 13-watt lamps. Occupancy sensors further reduce lighting electrical demand. The exterior lights were tied into the new energy management system, greatly improving control capabilities, and replacing obsolete mechanical time clocks. The complete lighting retrofit is estimated to reduce annual campus electrical use by 99 MWh.

By the end of 2010, the majority of the energy savings projects had been completed, with good results. But evaluating the projects' energy impacts was complicated by the many new projects completed on campus during the same time frame. For example, a new 37,000 ft<sup>2</sup> gymnasium was opened shortly before the PV array was completed. This building

and other projects have doubled the campus' overall facilities, from approximately forty-thousand square feet to over eighty-thousand. Preliminary reviews of energy data show that the PV array is providing approximately 30-35 percent of the campus' previous energy demand, meeting the original estimates. One of the last pieces of the project to be completed will be the installation of the wind turbine, which the college reports will be the



View of photovoltaic array integrated into parking shade structures under construction in 2010. Photo: CMCC.

first wind turbine approved by the Division of the State Architect for a community college.

### LESSONS LEARNED

Dan Cain explains that carefully integrating the energy retrofits with the campus expansion projects was highly beneficial. For example, the project team was able to utilize the same EMS being installed for the energy program in the new gymnasium, reducing costs and streamlining facility processes. However, he notes that some financial incentives may not have been fully taken advantage of — due to the incentive structure, projects that were implemented later had access to a smaller pool of incentive funding. Although he advocated expanding the parking and PV project to best leverage incentives, this approach was ultimately not taken. However he was able to persuade the team to provide underground services that would allow for expanding the PV system in the future.

*Best Practices* case studies are coordinated by the Green Building Research Center, at the University of California, Berkeley.

The Best Practices Competition showcases successful projects on UC and CSU campuses to assist campuses in achieving energy efficiency and sustainability goals. Funding for *Best Practices* is provided by the UC/CSU/IOU Energy Efficiency Partnership.



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