BEST PRACTICES 2014

CSU Dominguez Hills Welch Hall Lighting Controls Retrofit

A pilot installation of a wireless lighting control system produced convincing energy savings with ease of implementation. A student-led evaluation of the technology provided the case for deploying it in several additional buildings throughout campus, leading to thousands of dollars in annual energy savings.

Award Category
Lighting Design/Retrofit

Green Features
Wireless light control technology, based on daylight, task tuning and occupancy

275 control units installed in Welch Hall

100 control units installed in SAC-2

78% lighting energy savings in hallways

50% savings in offices and classrooms

Demand-response control

Student and faculty engagement

Size
Multiple campus buildings

Annual Energy and Cost Savings
200,000 kWh

$26,000

Cost
$50,000

Completion Date
December 2013
(With additional installations in 2014)

The lighting control retrofit at CSU Dominguez Hills demonstrates a successful collaboration between an emerging clean technology company and the facility managers of a CSU campus. Lighting controls from Silicon Valley-based Enlighted were painless to install, produced extensive energy savings, and offered an intuitive energy dashboard that is useful for energy managers and other campus groups.

Project team members from Enlighted explain that their company approached CSU Dominguez Hills because they viewed academic buildings, with their highly intermittent occupancy patterns, as likely candidates for their products. A core product in the Enlighted system is a wireless sensor/controller unit that is powered directly at the light fixture, and that adjusts light output based on daylight and occupancy. Each unit can control up to four fixtures, and can also be grouped together to provide additional flexibility. The devices are wirelessly linked to a gateway device, which can handle up to 200 units within a 100-meter radius. A central network panel provides managers access to the system via a web browser interface, showing the locations of the devices on a floor plan, and the status of all light fixtures being controlled.

The technology promised significant potential savings and was first installed at Welch Hall, a multi-use building on campus where hallway lights were on continuously prior to the retrofit. Of the many departments housed in this multi-purpose building, the campus energy team first approached the campus Information Technology group. Meetings between the IT group, the facilities team and Enlighted representatives proved to be immensely valuable, and gained support from the IT staff. This pre-installation coordination provided confidence that the Enlighted system would not interfere with existing wireless networks, and the facilities team moved forward with confidence to test the technology in the building, with helpful support from the IT group.

The occupancy and daylight-sensitive controls have achieved 78 percent lighting energy savings in corridors, and close to 50 percent savings in offices and classrooms.

The system was found to be easy to install, and the sensor units could be installed and commissioned without an outside contractor, making the product affordable to maintain. In the initial pilot, four sensors were installed outside of the IT suite, and the energy monitoring results were shared with an earth sciences class. A group of students studied the performance data from the sensors, which supported the case to expand the pilot to include all corridors in Welch Hall, as well the IT offices and server room.

Carolina Lopez and Ri Ek (front left) present their research project on the controls energy savings during 2013 Student Research Day. Image: CSUDH.

The project team was not timid in testing the limits of energy savings with the system. Corridor lights in Welch Hall were lowered to 10 to 30 percent of full brightness. In the IT

2014

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More Information

http://www.csudhnews.com/2013/06/living-lab/

http://www.csudhnews.com/2013/04/enlighted-retrofit/

office spaces, the lights were set at 30 to 50 percent when occupied, depending on the daylight levels in the space. Kenny Seeton, the Central Plant Manager and Energy Manager, said that "by scaling back both the duration and amount of light of each fixture, you get the most savings, especially in corridors and outdoor spaces."

System interface screen from Enlighted displaying real-time, monthly and annual energy savings at Welch Hall. Image: CSUDH.

The successful outcome at Welch Hall led to installations in other buildings, including in South Academic Complex Building Two (known as SAC-2), a classroom building where 100 additional Enlighted sensors were installed. By the summer of 2014, over 500 sensors had been deployed throughout campus, and the team expects the total to reach 1,000 by the end of the year.

Feedback on the lighting control system has been highly favorable, with many occupants appreciating the new lower light levels and the compelling high-tech system.

With each sensor controlling up to four lighting fixtures, the facilities team has a greater understanding of how the building is being used and occupied. Studying patterns that emerge from the sensor data can also help the facilities team identify other opportunities for energy savings, outside the realm of lighting energy. For example, if the occupancy sensors show an unoccupied HVAC zone, an energy manager could perform a temporary temperature setback. For spaces in buildings that lack thermostats, temperature readings from Enlighted sensors could possibly be used to highlight abnormalities that would otherwise be unnoticed. (The readings are skewed by heat emitted from the light fixtures, but can still alert building managers of abnormally overheated or overcooled areas.)

LESSONS LEARNED

Seeton notes that the Enlighted lighting control system is especially effective in intermittently occupied areas such as corridors and outdoor spaces. As the controls are linked directly to individual fixtures, the positioning of the sensors is crucial and effectively subdivides zones that were originally controlled by one switch. The team tested the system with many types of lamps and luminaires, and found it to be most compatible with LED fixtures.

In offices and other regularly occupied spaces, the team learned that many spaces on campus are over-illuminated. Seeton empowered an individual in each department to get familiar with the interface and make adjustments if needed. The project team observed that people chose lighting levels well below what was expected. In the future, Enlighted plans to provide controls that can be accessed via mobile phones or desktop computers.

Finally, the element that was likely most critical in ensuring a smooth implementation process was the integrated team process at the outset, particularly gaining the IT group's feedback and support. For this technology-driven energy efficiency system, having the campus technology group confirm its compatibility with existing wireless networks accelerated the installation and promoted its adoption throughout campus.

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.