INTEGRATED CLASSROOM LIGHTING SYSTEM

Laney College, Oakland, CA

Post-retrofit luminaires at Laney College in Oakland,CA.

ENERGY SAVINGS & CO_2E REDUCTION

54%

ANNUAL ENERGY COST SAVINGS

$17,500

based on Laney College's rate of $0.09/kWh

LIFETIME ENERGY COST SAVINGS

$262,500

In the winter of 2011, Peralta Community College District installed wireless lighting controls in 39 of the classrooms on its Laney College campus. The Integrated Classroom Lighting System (ICLS) selected for the project reduced energy use for lighting in those classrooms by over 50 percent and gave instructors the ability to easily adjust lighting to suit a wide range of classroom activities. The system uses daylight harvesting controls, to automatically dim electric lights when the sun is bright, and occupancy sensors that turn lights off when classrooms are empty.

"The faculty is very happy with the system," says Charles Neal, Energy and Environmental Sustainability Manager for the Peralta Community College School District. "It gives them the kind of control that they never had before." Prior to the installation, instructors had just one switch that turned all the classroom lights either on or off.

The lighting system also meets new code requirements under California's 2013 Title 24, Part 6. Under the latest standards, all classrooms must have occupant-sensing lighting controls that automatically shut lights off when the space is unoccupied. The standards also require most classrooms to have at least one lighting control step between 30 and 70 percent of full power.

PROBLEM

Modern classrooms require lighting for a variety of educational activities, from lectures and group work to audiovisual presentations; unfortunately, many classroom lighting systems are still controlled by a simple on/off switch. Allowing instructors greater control over classroom lighting supports their ability to maintain a comfortable, engaging learning environment. Dimmable lighting also saves energy and reduces operation costs.

Efficient classroom lighting solutions exist, but creating a system from separate components, each with a different warranty, can greatly increase design time and cost. It can also cause confusion and delays in repair time if performance problems occur or when routine maintenance is required.

SOLUTION

An Integrated Classroom Lighting System (ICLS) delivers flexible, high-quality, energy-efficient lighting control that is easy to use and maintain. ICLS system retrofits can either utilize existing fixture housings—only replacing lamps and ballasts—or the existing fixtures can be entirely replaced with a one-to-one retrofit. ICLS controls typically feature daylight harvesting, occupancy sensors, dimming, and scene control to automatically maximize energy savings while giving teachers optimal control of their classroom lighting.

The Energi TriPak lighting control system by Lutron uses EcoSystem programmable dimming ballasts, wireless wall control stations, wireless occupancy and daylighting sensors, and wireless PowPak dimming modules. For the Laney College installation, Lutron personnel specified these technologies on a classroom-by-classroom basis in order to maximize energy savings and minimize costs. In each room, the entire lighting system is controlled by one or more wireless PowPak modules, which receive input from wireless, battery-operated occupancy sensors and photosensors.

At Laney College the existing instant-start ballasts were replaced with Lutron's programmable dimming EcoSystem ballasts. Wireless wall controls with scene selection presets were installed at the classroom entrance and the teacher control station, allowing instructors to easily optimize the visual environment for various learning activities. Integrated lighting solutions like the Energi TriPak can also be used in private offices and conference rooms.

PROJECT TECHNOLOGIES

DIMMING BALLASTS

EcoSystem programmable dimming ballasts by Lutron, available at **lutron.com**

WALL CONTROL STATIONS

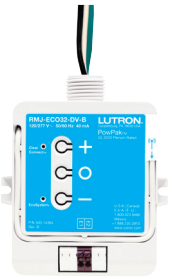
EcoSystem wireless wall control stations by Lutron, available at **lutron.com**

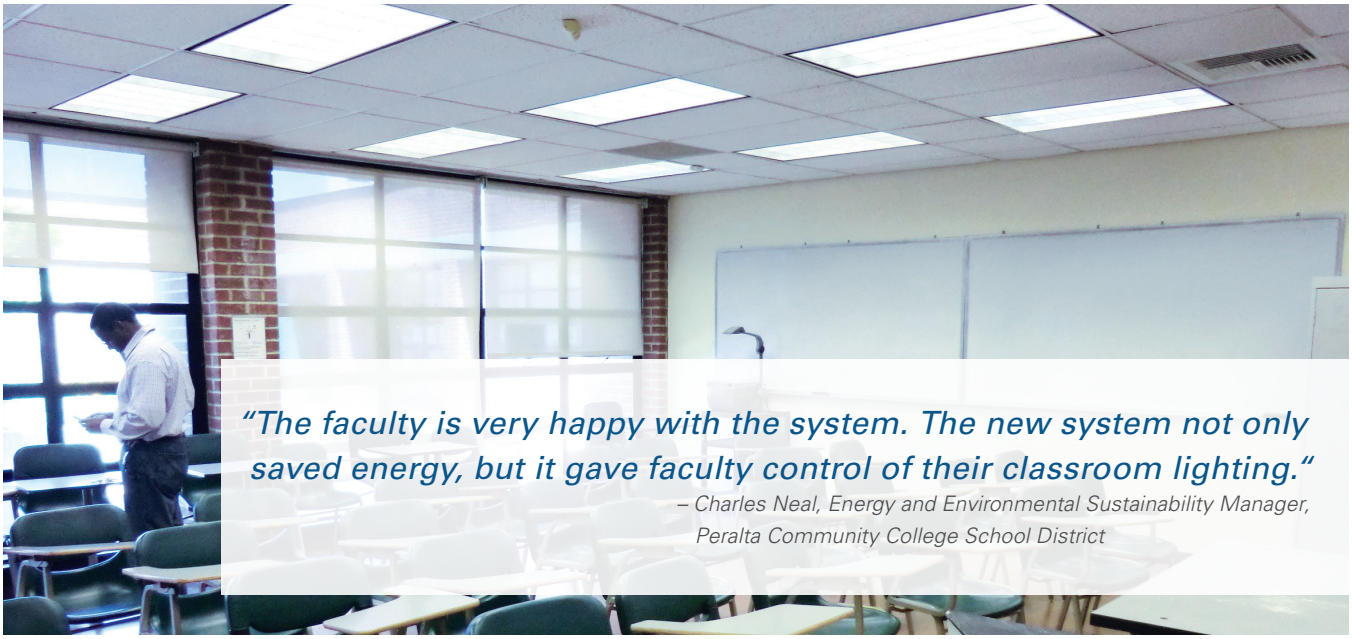
OCCUPANCY AND DAYLIGHTING SENSORS

EcoSystem wireless occupancy and daylighting sensors by Lutron, available at **lutron.com**

DIMMING MODULES

PowPak wireless dimming modules by Lutron, available at **lutron.com**





"The faculty is very happy with the system. The new system not only saved energy, but it gave faculty control of their classroom lighting."

– Charles Neal, Energy and Environmental Sustainability Manager, Peralta Community College School District

DEMONSTRATION RESULTS

"The installation itself was a relatively smooth process," says Neal. He notes that some follow up was needed for commissioning purposes and to train staff, but the result is easier maintenance. "The automatic controls mean 39 fewer classrooms you have to worry about in terms of people leaving the lights on."

CLTC installed data logging equipment in order to monitor classroom use and record how often each system was dimmed. Data was collected over the course of one month, while classes were in session. The results indicated that the ICLS reduced lighting energy use by 54%, saving Laney College 194,091 kWh annually and nearly $17,500 every year. Savings may be higher over a full academic year, which includes holidays and breaks that leave classrooms unoccupied.

Project materials cost approximately $64,000 and installation cost $38,000, for a total of $102,000 (under $2,600 per classroom). Oakland Shines incentives covered both materials and labor costs, making the project's payback instantaneous.

ECONOMIC EVALUATION

A typical ICLS for retrofit installations can cost between $3,000 and $5,000. The cost to then install these advanced lighting system components can range from $2,000 to $4,000, with wiring costs often making up a substantial portion of expenses. (A standard classroom lighting retrofit typically costs more than $4,000.) Some systems avoid these higher installation costs by utilizing low-voltage cables or wireless solutions.

Utility rebates and third-party incentive programs can also offset the costs associated with lighting upgrades. Most utilities offer incentives based on energy savings (typically, $0.05/kWh and $100/kW reduced). Incentives may also be based on the type of technology installed: occupancy sensors, photosensors, energy-efficient sources, etc.

Third-party incentive programs, like Oakland Shines, provide additional incentives, rebates and support to help take projects from the initial planning and development stages all the way through the installation process.

COLLABORATORS

This project was a collaborative effort involving CLTC, Lutron Electronics, Inc., Associated Lighting Representatives, Inc., Energy Retrofit Co., Peralta Community College District, and Laney College.

Monitoring and verification was sponsored by the SPEED program, which is coordinated by the California Institute for Energy & Environment (CIEE) in partnership with CLTC.

LANEY COLLEGE PROJECT COSTS & SAVINGS SUMMARY

	BEFORE	AFTER	
Technology	Standard on/off switching	Lutron Energi TriPak ICLS	
System size	89 W	62 W	**SAVINGS**
Annual Energy Consumption	681 kWh	310 kWh	**371 kWh**
Annual Energy Cost	$61	$28	**$33**
Annual Maintenance Cost	$2	$2	**$0**
Total Annual Cost	$63	$30	**$33**
Lifetime Energy Cost	$915	$420	**$495**
Lifetime Maintenance Cost	$30	$30	**$0**
Total Lifetime Operating Cost	$945	$450	**$495**

* Figures listed are per-fixture. Laney College's retrofitted classrooms each have 12–18 fixtures.

High-end Trimming	*0.7*	**Total Maintenance Cost**	*$30*
Dimming Occurrences	*70%*	**Fluorescent Lamp Cost**	*$2*
Dimming Level	*50%*	**Lifetime**	*36,000 hours*
Cost of Labor	*$25/hr **	**Annual Hours of Use**	*7,650 hours*
Energy Cost	*$0.09/kWh*	**System Lifespan**	*15 years*

ABOUT THE STATE PARTNERSHIP FOR ENERGY EFFICIENT DEMONSTRATIONS (SPEED) PROGRAM: The SPEED program is supported by the California Energy Commission and managed through the California Institute for Energy and Environment (CIEE). SPEED demonstrations are coordinated by the CIEE in partnership with the California Lighting Technology Center and the Western Cooling Efficiency Center, both at the University of California, Davis.

Any questions about lighting technologies, including costs, can be directed to:

PEDRAM ARANI
California Lighting Technology Center, UC Davis
pmarani@ucdavis.edu
cltc.ucdavis.edu

KARL JOHNSON
California Institute for Energy and Environment
karl.johnson@uc-ciee.org
uc-ciee.org

For more resources and information, including technology catalogs, business case studies and demonstration maps, visit **PARTNERSHIPDEMONSTRATIONS.ORG.**

08/2013