



Public Interest Energy Research

The goal of the California Energy Commission's PIER Lighting Research Program (LRP) is to create new lighting technology and products that can save energy, reduce peak demand, and reduce pollution for the citizens of California. The LRP includes fifteen research projects spanning both the residential and commercial sectors as well as outdoor lighting associated with buildings, and three market connection projects.

Lighting Research Program Projects

LED Occupancy Sensor and Bathroom Smart Fixture



Concept: An LED occupancy sensor that can be installed in a half hour or less and serves the dual purpose of lighting control and night lighting for hotel bathrooms. Concept development for a smart bathroom fixture is also planned.

Solution: The Watt Stopper's Motion Sensor Nightlight is the first implementation of this concept. PIER helped fund a demonstration at the Sacramento DoubleTree Hotel with support from the Sacramento Municipal Utility District (SMUD). The resulting data indicated that the nightlight provided 46 percent energy savings. The California Lighting Technology Center (CLTC) is also working with Lithonia and SMUD on development of a bathroom smart fixture. Demonstrations of the fixture in hotel and assisted living applications are underway.

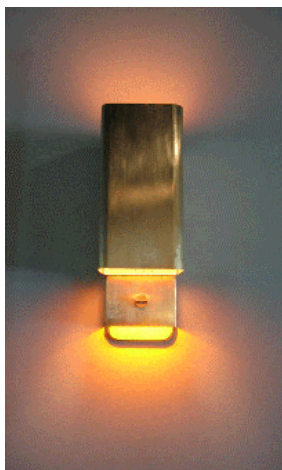
Bi-Level Stairwell Fixture



Concept: A bi-level fixture for stairwells that maintains a low light level, switching to full light output only when occupancy is detected. This product is designed for stairwells, restrooms, laundry rooms, and other areas that demand minimal but constant lighting over long periods of time.

Solution: LaMar Lighting's bi-level stairwell fixture has an integrated occupancy sensor and saves energy by operating most of the time at a low standby light level. Results from four PIER-funded demonstrations, which included three office buildings and a university building in California, indicate energy savings of 40 to 60 percent for stairwell lighting.

LED Exterior Luminaire



Concept: The objective is to work with one or more manufacturing partners to design, prototype, and evaluate a series of exterior porch lighting systems that integrate high efficiency optics with solid state technology and lighting controls into one system.

Solution: The CLTC has developed a series of designs for various exterior applications. The main concept is a hybrid approach to LED illumination. It combines an 'always on' ambient LED illuminator with a standard incandescent lamp on a motion control sensor.

Energy use is reduced from 60 watts for a typical incandescent lamp to 5 watts for the LED package. CFL options may be developed. A demonstration is underway. Three manufacturing partners (Shaper Lighting, The Watt Stopper, and Lithonia Lighting) are working with the CLTC on various fixture concepts.

Retrofit Fluorescent Downlights



Concept: The objective is to develop an easy-to-install compact fluorescent downlight system for use in existing commercial and residential applications.

Solution: Working in close partnership with Lithonia Lighting, the CLTC is developing a simple retrofit strategy for fluorescent downlights with flexible optical head mounting, 2-lamp ballast, low glare reflector optics, and plug-n-play wiring. A new construction version of the product is in production with units currently being installed by a number of Sacramento homebuilders. Energy use of the new construction system is approximately one-third of incandescent. The retrofit product, which will be applicable for residential and commercial installations, is expected to be ready by 2006.

Integrated Classroom Lighting System



Concept: A complete lighting system that simplifies the requisition process for schools trying to meet high energy performance standards by providing direct-indirect fixtures, occupancy and daylight sensors, and plug-and-play interconnection cables.

Solution: PIER's manufacturing partner, Finelite, Inc., coats their direct/indirect fixtures with 96% reflective white paint, allowing for either two or three rows of fixtures. With the Integrated Classroom Lighting System, schools receive premium lighting and controls for less than the cost of standard 2x4 lay-in fixtures. Nineteen demonstration classrooms have shown energy savings of 30 to 50 percent over current Title 24 levels. A secondary project is underway with Southern California Edison (SCE) and The Watt Stopper to develop and recommend a system for the Los Angeles United School District.

ENERGY STAR® Residential Light Fixtures



Concept: Based on data gathered at a series of EPA workshops, PIER is encouraging lighting manufacturers to develop high-end, portable indoor residential fixtures. These fixtures will utilize pin-based CFLs rather than screw-in bulbs, and will qualify for the ENERGY STAR label.

Solution: Four lighting manufacturers — American Fluorescent, Fire & Water, MaxLite, and PowerLux — have developed pin-based CFL portable residential fixtures with electronic ballast that meet ENERGY STAR specifications and provide high-quality lighting. These fixtures will be available in the California marketplace by the end of 2004. Energy savings vary ranging from 50 to 75 percent over a typical 120-watt incandescent fixture.

LED Low Profile Fixtures



Concept: A low-profile LED luminaire that will take advantage of the benefits of solid state lighting. This fixture would be suitable for applications where operating hours are long, space is limited, and reduced maintenance is desired.

Solution: The Lighting Research Center (LRC) has developed prototype fixtures for elevators. A demonstration of the fixture prototype is underway at the Rensselaer Polytechnic Institute campus. Currently, LRC is courting manufacturers to bring the product into production. Preliminary information on jewelry case applications is also under development.

LED Task Light



Concept: A high performance task light that uses state-of-the-art LED and thermal management technology.

Solution: Lawrence Berkeley National Laboratory (LBNL) has assembled four manufacturers to develop the product. Permlight is prototyping the thermal management assembly board. Advanced Transformer is making the necessary ballast with variable intensity. Cree Lighting is providing the LEDs. Luxo is the luminaire manufacturer, developing designs to meet both the US and European markets. Comparing an 18-watt CFL, the LED task light uses a 10-watt LED package and provides quality optics.

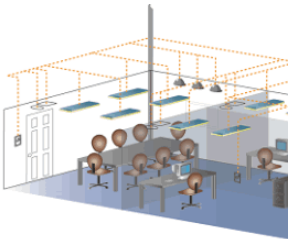
Improved Classroom Photosensor



Concept: An improved daylight responsive lighting control for classrooms with an expanded cone of view. The photosensor will be easy to calibrate with a simple hand held tool reusable for multiple installations.

Solution: The Watt Stopper is working to improve their current photosensor design using the PIER-funded performance specification developed through a lengthy process of reviewing existing products, consulting with industry experts, and evaluating computer simulations. The hand held calibration tool simplifies commissioning. A small-scale classroom demonstration at SCE has been completed. Product release is planned for 2005/2006.

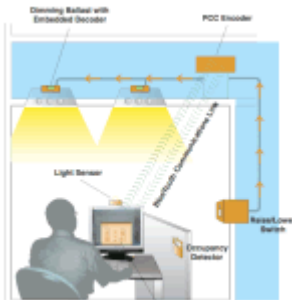
DALI Control Standards



Concept: The objective is to develop an open controls standard to allow for a complete DALI-managed lighting system. The enhanced DALI standard will enable the control devices of different manufacturers to operate on the same control system.

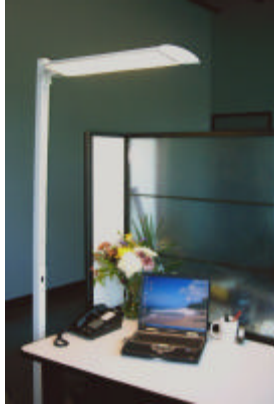
Solution: PIER has brought together a NEMA-facilitated working group of major manufacturers to develop an open standard for controls. This process included gaining input from designer and end-user groups. Some of the participants in the standard development include Advance, Genlyte, Leviton, Lutron, Starfield, Universal Ltd., and The Watt Stopper. A demonstration of the new control standard is underway at two of The Watt Stopper's facilities. NEMA anticipates adopting the standard by 2005.

Integrated Lighting Control System



Concept: An advanced lighting controller designed to bring low-cost control to existing lighting systems in commercial buildings. The specific hardware is designed to work with commercially available fluorescent lighting ballasts to form the core of a highly progressive, functional and efficient lighting control system.

Solution: LBNL researchers collaborated with Vistron to create a proof-of-concept dimmable lighting control system that does not require additional control wiring in the ceiling. The system uses a new power line control communication technology, called Phase Cut Carrier, to send digital commands over existing lighting power circuits. LBNL is communicating with various manufacturing partners about producing the different components of the system.



The Portable Office Lighting System

Concept: A floor-standing fixture with user and space management controls that separately adjusts ambient and task lighting. Optional office-level controls will provide easily choreographed motion/occupancy sensors and monitor usage in a modular way.

Solution: The CLTC and LBNL are currently developing control strategies and prototypes of this system. Finelite, Inc. serves as the manufacturing and commercialization partner. Pacific Gas & Electric (PG&E), SCE, and SMUD have expressed interest in providing demonstration opportunities for the technology. The use of portable office lighting in lieu of overhead systems may reduce energy use up to 60 percent.

Load-shedding Ballast Technology



Concept: The load-shed ballast is designed to replace existing instant start ballasts in fluorescent lighting fixtures used in commercial buildings. When a signal is received via power line carrier communications, the load-shed ballast dims the fluorescent light fixture, reducing the lighting power by a fixed amount during periods of high electric demand.

Solution: The LRC is working with a major ballast manufacturer on integrating the load-shed design into an existing ballast case. In addition, they are surveying power line carrier communication systems to determine the most effective means to deliver the load-shed signal to the ballast. The LRC is also working with NYSERDA to demonstrate the technology in a commercial building in 2005.

Low Glare Outdoor Fixtures



Concept: Wall packs are common on commercial buildings for security and nighttime lighting. The objective is to replace wall packs with a cost competitive product having the following features: high efficiency, quality optical performance, and better light quality. The anticipated results are to reduce energy consumption and night light pollution.

Solution: LBNL is working with Gardco Lighting to model, develop, and evaluate a new concept luminaire, which features a ceramic metal halide lamp and a near full cut-off tilted lens. The Gardco luminaire will throw the light 45 feet when mounted at a height of 15 feet and potentially provide energy savings while illuminating more area than conventional wall packs.

HID Electronic Ballast Testing



Concept: The objectives are to test, analyze, and determine the potential of electronic ballasts for HID lighting systems in cooperation with manufacturers. Control strategies will be studied for commercial, industrial, and municipal applications. Also, appropriate recommendations may be developed for integrating this technology into current state codes.

Solution: The measurements to characterize the performance of HID lamp-ballast systems have been performed at LBNL. Both electrical and spectral performance measurements have been completed for low and high wattage systems. Control strategies are under evaluation. In related work, LBNL is also testing HPS electronic ballasts for the City of Oakland.

Market Connection Activities



Concept: The goals are to provide crosscutting market connection activities for the PIER LRP projects, while improving the market focus of the individual projects to make the products more commercially viable

Solution: Led by Bevilacqua Knight, the PIER team has worked together to create and implement a consistent and coordinated effort of market activities. Expert guidance has been solicited and provided to Project Leaders, and alliances have been developed with key professional, governmental, and trade organizations.

Sensor Placement Optimization Tool



Concept: The goal is to develop software tools that take advantage of the PIER LRP products and technologies or fill a need in the lighting community for a specialized tool.

Solution: The Sensor Placement Optimization Tool (SPOT) is a software package intended to assist a designer in establishing the correct photosensor placement relative to the daylighting and electric lighting. SPOT consists of an Excel interface on top of a Radiance calculation engine that provides information regarding photosensor selection, placement, and performance. SPOT was developed by Architectural Energy Corporation with classroom daylighting in mind, but may be applied to other spaces.

Codes and Standards



Concept: The goal of this project is to determine how the PIER Lighting Research Program can best translate its successes into workable code and standards proposals. The emphasis will be to identify efforts that are likely to have the largest energy savings and demand reduction potential.

Solution: Heschong Mahone Group has been evaluating all the LRP efforts, and mapping the path from each research and product outcome into the codes and standards arena. They have identified the most code-ready technologies and recommended steps to adoption, and identified those projects that may require additional R&D before they can enter the code process.

Detailed information on each of the PIER Lighting Research Program projects is publicly available on the following web sites: <http://www.energy.ca.gov/pier/buildings/projects/500-01-041-0.html> or <http://www.archenergy.com/lrp>.

Arnold Schwarzenegger, Governor
California Energy Commission

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