PIER Lighting Research Program
Project Summaries

ELEMENT 2: ADVANCE LIGHTING TECHNOLOGIES

PROJECT 2.1 LIGHT EMITTING DIODE (LED) LUMINAIRES FOR EXTERIOR, PORCH AND PERIMETER LIGHTING

Project Goals and Objectives

The overall goal of this project is to reduce energy consumption by researching and developing a series of a high performance energy efficient LED based alternatives to incandescent exterior, porch and perimeter lighting in residential, commercial and institutional applications.

The technical goal will include developing a series of 4 to 8 integrated designs with a manufacturing partner that use LED's, advanced controls and optical systems that improve the overall delivery efficacy.

Prototype evaluation will include laboratory testing and field research and application evaluation. Field monitoring protocols will be developed for use by other California groups as needed.

Project Lead: Eric Page and Michael Siminovitch, Lawrence Berkeley National Laboratory

PROJECT 2.2 LED TASK LIGHT UTILIZING NEW MATERIALS TO REDUCE THERMAL STRESS ON HIGH BRIGHTNESS LEDS

Project Goals and Objectives

The goal of this project is to accelerate the use of energy efficient light emitting diodes (LED) technology for general lighting applications by developing a task lamp utilizing high brightness LEDs in a consumer acceptable light fixture, and utilizing new materials that have high thermal conductivity that will enhance lifetime and performance of the LEDs.

Project Lead: Steve Johnson, Lawrence Berkeley National Laboratory

PROJECT 2.3 LED LOW PROFILE FIXTURES

Project Goals and Objectives

The goal of this project is to develop, test, and evaluate prototype, energy-efficient, "low-profile" LED luminaires. These fixtures will be optimized to take advantage of the optical characteristics of LEDs for such applications as task lighting, under-cabinet lighting, shelf, and display lighting.

Project Lead: Nadarajah Narendran, Lighting Research Center

ELEMENT 3: DEMAND RESPONSIVE LIGHTING SYSTEMS

PROJECT 3.1 RETROFIT FLUORESCENT DIMMING WITH INTEGRATED LIGHTING CONTROLS

Project Goals and Objectives

The goal of the project is to develop and test a dimmable, fluorescent lighting system that is suited for easy retrofit into existing commercial buildings and demonstrate the benefits to the lighting community. The system will dim in-line controlled (e.g., "phase-cut") fluorescent dimming ballasts down to 25 percent output and will be controllable by the following manual and automatic means:

1. manual dimming from a wallbox or handheld remote control.
2. automatic lighting control using PC-connected "multi-sensor".
3. manual dimming from PC control panel.
4. utility-triggered load shedding via Intranet-connected PC.
5. IJB "auto-pilot" mode, automatically enabled when PC, multi-sensor or IP connection are not in service.

Combining a dimmable fluorescent lighting system with the above control options will result in an integrated, yet highly flexible lighting control system. This unique lighting solution is particularly suited to retrofit applications since the installation requires no added wiring.

Project Lead: Francis Rubinstein, Lawrence Berkeley National Laboratory

PROJECT 3.2 ENERGY EFFICIENT LOAD SHEDDING TECHNOLOGY

Project Goals and Objectives

The goals of this project are to work with ballast manufacturer partners to develop an instant start load shedding ballast and a simple retrofit load-shed device for fluorescent lighting systems, speed their development, and market introductions. These products will have low cost and dimming range of 30 to 60 percent.

Project Lead: Andy Bierman, Lighting Research Center

PROJECT 3.3 CLASSROOM PHOTOCELL AND CONTROL SYSTEM

Project Goals and Objectives

The goal of this project is to develop a photosensor and lighting control system that is optimized for common classroom electric lighting solutions (recessed and pendant lighting) and daylighting configurations (side-lighting only, top-lighting only, side- and top-lighting), that can be simply and easily commissioned, and that effectively operates with manual controls and occupancy sensors. The knowledge gained from this process will be public. The Watt Stopper intends to incorporate this public knowledge into a new family of daylighting controls. Other control manufacturers will be in the position to use this information for developing their own devices.

Project Lead: Doug Paton and Dorene Maniccia, The Watt Stopper

ELEMENT 4: ADVANCED LIGHTING LUMINAIRES & SYSTEMS

PROJECT 4.1 HOTEL AND INSTITUTIONAL BATHROOM LIGHTING PROJECT

Project Goals and Objectives

The goal of this project is to develop two energy efficient bathroom lighting technologies that will save energy and improve safety in hotel bathrooms and related institutional applications. The economic goal for the first technology is to achieve 50 to 75 percent energy savings over the estimated base case use and have a three-year payback period. In the second system, the goal is also to achieve 50-75 percent energy savings. The payback as a function of energy in this second system will be longer, but this increased payback will be mitigated by a first cost reduction in installation costs.

Project Lead: Michael Siminovitch, Lawrence Berkeley National Laboratory

PROJECT 4.2 ENERGY STAR RESIDENTIAL FIXTURE PROJECT

Project Goals and Objectives

To organize the higher-end residential fixture manufacturers and co-fund the technical development of 4 to 8 residential ENERGY STAR® table and floor lamp fixtures. An additional goal is to work with the Showroom Lamp companies, ALA, EPA, CEE and other groups to help guide the specifications needed for market acceptance of these new high-efficiency fixtures for the California market. Each fixture would reduce energy use by approximately 75 percent. Using the figure of 20,000 new ENERGY STAR fixtures being sold in the California market in year 1, consumers will save in excess of 2 million kWh per year and approximately one megawatt of electric demand.

Project Lead: Janet Leishman, Applied Proactive Technologies

PROJECT 4.3. DEVELOPMENT OF ENERGY EFFICIENT RETROFIT/REMODEL ALTERNATIVES TO INCANDESCENT DOWNLIGHTS

Project Goals and Objectives

The goal of this project is to develop an energy-efficient retrofit/remodeling downlight system for both residential and commercial applications. The overall costs will approach the costs of the material and labor costs of existing incandescent downlighting systems. By utilizing an integrated systems approach, this system will reduce energy and operating costs by 60-75 percent.

Project Lead: Michael Siminovitch, Lawrence Berkeley National Laboratory

PROJECT 4.4 PORTABLE OFFICE LIGHTING SYSTEMS

Project Goals and Objectives

The goal of this project is to design, develop and prototype portable energy-efficient office luminaires that integrate occupancy-based controls to provide users a higher level of control and visual quality than they currently receive from traditional overhead lighting systems. This system is intended to be flexible enough to be suitable for the varied demands of a broad cross-section of office lighting applications.

On a technical level, this includes developing light distribution systems that integrate user controls with high-efficiency luminaires that provide for both task and ambient lighting needs. The economic goal of

this project is to develop a portable luminaire which, when used as a system, will reduce lighting energy costs by 30-50 percent in conventional office applications.

Project Lead: Michael Siminovitch, Lawrence Berkeley National Laboratory

PROJECT 4.5 INTEGRATED CLASSROOM LIGHTING SYSTEM

Project Goals and Objectives

The goal of this project is to develop a classroom lighting system using a new 97 percent reflective material and integrated controls. This system combines installation flexibility, high-efficiency luminaire with occupancy sensing, daylight sensing, and other classroom and general building controls so that the buyer will have one source for system layout, pricing, training, commissioning, and warranty service.

Project Lead: Terry Clark, Finelite, Inc.

ELEMENT 5 LIGHTING PERFORMANCE, METRICS, CODES AND STANDARDS

PROJECT 5.1 BI-LEVEL STAIRWELL FIXTURE PERFORMANCE

Project Goals and Objectives

The goals of this project are to co-fund the development of bi-level stairwell fixtures with NYSERDA and to determine the energy savings, demand reduction and safety code acceptability of occupancy-based standby lighting in California. The stairwell lights will use built-in ultrasonic occupant sensors to control the lights so that stairwells are lit to full brightness only when the stairwell is occupied. The occupant sensor automatically reduces the lights to a low-power consuming “stand-by” level when the space is unoccupied. Savings are estimated to be up to 75 percent in a typical high-rise commercial buildings depending upon occupancy patterns.

Project Lead: Francis Rubinstein, Lawrence Berkeley National Laboratory and Cylette Willis, International Facility Management Association

PROJECT 5.2 EVALUATIONS OF ELECTRONIC BALLASTS AND RELATED CONTROLS FOR HID LIGHTING SYSTEMS

Project Goals and Objectives

The goals of this project are to:

- Test, analyze and determine the potential of electronic ballasts for high intensity discharge (HID) lighting systems in cooperation with manufacturers as an emerging energy efficient technology to reduce lighting loads in commercial, industrial and municipal applications.
- Identify control strategies to further improve the energy efficiency of these systems with municipal partner.
- Provide appropriate recommendations for incorporating these technologies into current state codes and regulations.

Project Lead: Steve Johnson, Lawrence Berkeley National Laboratory

PROJECT 5.3 LOW GLARE OUTDOOR RETROFIT LUMINAIRE

Project Goals and Objectives

The goals of this project are to:

- Analyze new performance standards developed in Europe for a low glare retrofit system for outdoor luminaires and determine the applicability of this work to U.S. manufacturers of similar luminaires now in use in California.
- Develop design concepts in coordination with a manufacturer for an energy efficient low glare retrofit system for outdoor luminaires founded on results of recent visual performance studies and research data from Europe and North America.
- Develop and demonstrate a prototype retrofit system for outdoor luminaires with manufacturer's participation with improved performance characteristics.

Project Lead: Steve Johnson, Lawrence Berkeley National Laboratory

PROJECT 5.4 DALI LIGHTING CONTROL DEVICE STANDARD DEVELOPMENT

The DALI is a non-proprietary digital communication protocol that allows communications between a DALI ballast and the lighting system. Tridonics, Advance Transformer, and OSRAM SYLVANIA currently offer DALI ballasts. The key features of the DALI ballast enable:

- Two-way communications for obtaining operating status and performance of luminaires.
- Individual fixture control which allows users to re-configure space lighting groups without changing the wiring, easily implement load-shedding functions, and integrate a fixture into multiple control zones.
- The user to mix and match ballasts from multiple suppliers and obtain consistent control operation.
- The elimination of costly installation errors due to reversing control wiring at ballast or control terminals.
- The easy addition of DALI-based wall controls and other devices because a two-wire communications bus is used. This feature greatly reduces labor and installation costs.

Project Goals and Objectives

The goal of this project is to develop an enhanced DALI lighting ballast control standard to allow for the operation and control of a complete lighting system. The enhanced DALI open standard would enable different manufacturers control devices to operate on the same control system. The lighting system includes the ballast, peripheral lighting control devices (such as occupancy sensors, scene switches, centralized network monitoring and photosensors. To realize this goal, industry consensus must be reached among the different control manufacturers. The standard would create predefined messages and commands that would be embedded in the controller intelligence and allow for seamless communication between control devices and between the control device and the ballast.

Project Lead: Dave Peterson, The Watt Stopper

ELEMENT 6: MARKET CONNECTION

PROJECT 6.1 PROGRAM-WIDE MARKET CONNECTION SYSTEM

Project Goals and Objectives

The goal of this project is to improve the market focus of all the LRP's R&D projects and thereby to increase the ultimate commercial viability of the program's technology products. This is both an economic and a social goal, leading to increased public benefits of PIER's investment in the program's products. The project meets this goal by systematically creating a "commercialization infrastructure" of alliances with key efficiency advocates and regulatory agencies, market-based reviews and refinements of each product's market approach, both professional and consumer audiences, and communications via web and print for more specific aid to products that become ready for commercialization during the program term.

Project Lead: Bob Knight, Bevilaqua-Knight Inc.

PROJECT 6.2 LRP TECHNOLOGY AND PRODUCT DESIGN TOOLS

Project Goals and Objectives

The goal of this project is to develop new design tools that effectively link the lighting technology and products developed through the PIER LRP to lighting design practice and existing design tools. These design tools will enable quicker application in the marketplace.

Project Lead: Caroline Clevenger, Architectural Energy Corporation

PROJECT 6.3 LIGHTING R&D/CODES SCOPING STUDY

Project Goals and Objectives

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/or demand reduction potential.

Project Lead: Doug Mahone, Heschong-Mahone Group