The Problem

Most parking and area lights provide a constant level of illumination throughout the night, regardless of occupancy and actual usage patterns. This wastes considerable amounts of energy and contributes to light pollution. Additionally, parking and area lighting generally utilizes high-intensity discharge (HID) light sources such as high-pressure sodium (HPS) and metal halide (MH) lamps. These light sources consume more electricity and have a shorter average lamp life than emerging light sources available today. HPS lamps also offer relatively poor color rendering.

The Solution

Many of the emerging light sources used for exterior lighting, namely light-emitting diode (LED) and advanced ceramic metal halide (CMH) lamps, provide full-range dimming. Occupancy sensors have provided adaptive lighting controls in exterior parking and area lighting applications, but some applications are not compatible with sensor coverage patterns. In these scenarios, combining dimmable sources with a controller that dims based on time of day can achieve comparable energy savings to utilizing occupancy sensors. Light level reductions can be as modest as 10% or as extensive as 90%, depending on the various needs of the lighting applications.

Features and Benefits

- Pre-programmed light output
- Adjusts to seasonal changes
- Energy savings based on end-user requirements
- Reduces operation and maintenance costs
- Reduces light pollution
- High-quality light source

Technology Costs and Incentives

The expenses associated with curfew dimming luminaires are derived from two factors. The first is the upgrade from standard HID light sources to advanced light sources that are dimmable. Luminaires with dimmable LED and CMH sources cost approximately twice as much as standard HID light sources. The second factor is the inclusion of the curfew dimming module, an option which is approximately $100 more (prices may vary depending on project quantity and distributor). First costs for this technology demonstration at California State University, Long Beach, totaled $3,180. Costs can often be offset by maintenance savings (see Table 1) and utility incentives.

Currently, utilities offer one-time rebates for energy-efficient exterior lighting retrofits, depending on energy savings. Retrofit projects receive 5 cents per kWh saved and $100 per kW demand reduced. Some utilities avoid the need to do energy savings calculations by offering categorized rebates based on application, light source and controls type. Facility managers should consult their local utilities for more information on rebates and incentives.

Demonstration Results

California State University, Long Beach

In the summer of 2011 the California Lighting Technology Center (CLTC) partnered with California State University, Long Beach (CSULB) to replace three 150 W (189 W system wattage) MH luminaires. These incumbent light sources were replaced with 60 W (67 W system wattage) Philips Gardco Pyramid luminaires utilizing CMH lamps. These luminaires came pre-programmed with a curfew dimming system that dimmed the light output of the system to 75% for 10 hours of the night. During that period, each fixture consumed 51 W.
The resulting average consumption for each fixture was 54 W. When compared with the previous lighting system, this project resulted in an energy savings of 71%.

### Product Availability

Luminaires with curfew dimming are available from Philips and can be found at www.sitelighting.com.

Curfew dimming can be achieved through the addition of controllers from other brands as well, including wireless controls systems. More information is available at www.aduratech.com and at www.lumewave.com.

### What’s Next

CLTC continues to develop demonstrations of adaptive lighting technologies through the State Partnership for Energy Efficient Demonstrations (SPEED) program. The SPEED program is aimed at achieving widespread implementation of energy-efficient technologies.

### TABLE 1: ENERGY AND MAINTENANCE COSTS AND SAVINGS

*Figures listed below are per fixture quantities unless otherwise noted

<table>
<thead>
<tr>
<th>TECHNOLOGY</th>
<th>SYSTEM SIZE (W)</th>
<th>ANNUAL ENERGY CONSUMPTION (kWh)</th>
<th>ANNUAL ENERGY COST</th>
<th>ANNUAL MAINTENANCE COST</th>
<th>TOTAL ANNUAL COST</th>
<th>LIFE-CYCLE ENERGY COST</th>
<th>LIFE-CYCLE MAINTENANCE COST</th>
<th>TOTAL LIFE-CYCLE COST</th>
<th>TOTAL LIFE-CYCLE COST FOR ALL FIXTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH</td>
<td>189</td>
<td>828</td>
<td>$124</td>
<td>$20</td>
<td>$144</td>
<td>$850</td>
<td>$140</td>
<td>$990</td>
<td>$2,971</td>
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<tr>
<td>CMH CURFEW DIMMING</td>
<td>51 (Low) 67 (High)</td>
<td>263</td>
<td>$39</td>
<td>$0</td>
<td>$39</td>
<td>$270</td>
<td>$0</td>
<td>$270</td>
<td>$810</td>
</tr>
</tbody>
</table>

### Collaborators

This demonstration was the result of collaboration among CLTC, CSU Long Beach and Philips Gardco. It was sponsored by the PIER-SPEED program, which is coordinated by the California Institute for Energy & Environment (CIEE) in partnership with CLTC.

### For More Information

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**About PIER**

This project was conducted by the California Energy Commission’s Public Interest Energy Research (PIER) Program. PIER supports public interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

Jerry Brown, Governor
California Energy Commission

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