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Bathroom Lights Save Energy and Boost Safety

The Problem

Lights in the bathrooms of hotels, senior living centers, and nursing homes are frequently left on for extended periods—either due to forgetfulness or deliberately so that they can serve as night-lights. The night-light function is especially critical in senior housing, where tripping and falling can cause serious problems. Leaving lights on for a long time wastes energy—especially when inefficient incandescent light sources are used. Occupancy-sensor controls would help, but hotel managers in particular have been reluctant to use occupancy sensors in these areas because of concerns about lights turning off when bathrooms are occupied (an occurrence referred to as “false-off”).

The Solution

Two new products developed at the California Lighting Technology Center (CLTC) address these problems. One, aimed primarily at retrofit applications, is the Motion Sensor Nightlight, now available from The Watt Stopper as product WN-100 (**Figure 1**). The other, for new construction, is the Smart Vanity Light (SVL). The SVL is currently available in limited production quantities from Speclight, a subsidiary of Lithonia Lighting. Both products feature occupancy controls and light-emitting diodes (LEDs), and they promise to reduce bathroom lighting energy use by 50 to 75 percent.

Features/Benefits

The WN-100 integrates a motion sensor with a low-power (less than 1 watt) LED night-light into a wall switch unit that controls lighting based on occupancy.

The SVL incorporates an occupancy sensor and an LED night-light into a bathroom fixture and adds a rechargeable battery, which enables the night-light to serve as a safety light during power outages (**Figure 2**).

Figure 1: Integrated motion-sensor/LED night-light

The Watt Stopper's WN-100 combines a motion sensor with a low-power light-emitting diode (LED) night-light.

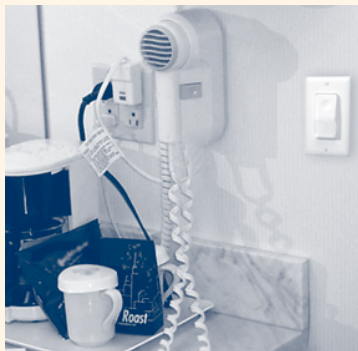


Figure 2: Smart Vanity Light

The Smart Vanity Light (SVL) incorporates an occupancy sensor and an LED night-light with battery back-up.



Both products offer a number of benefits:

Reduced energy use. Field tests in guest rooms at the Sacramento Doubletree Hotel showed that the WN-100 could cut energy use by about 50 percent. The average amount of time that the lights were left on per day was reduced from 4.4 hours to 2.4 hours. Reductions in energy use occurred throughout the day, and the magnitude and duration of peak demand were cut. Payback period based on energy savings alone was estimated to be about 2.5 years (**Table 1**, next page).

Avoiding false-offs. Both products offer the ability to set a time-out period that is significantly longer than what is typically used by occupancy sensors—the period can last up to 1 hour. Research showed that 75 percent of bathroom lighting energy is consumed when lights are left on for more than 1 hour. By using longer time-out setpoints, most of the potential energy savings can be achieved while the chances of generating false-offs are minimized.

Safety at night. The LED night-light uses less than 1 watt of power yet provides enough light to enable individuals to navigate within a room while their night vision is preserved.

Lower maintenance costs. The Doubletree field tests showed that the reduced use of lights extended lamp life and thereby cut maintenance costs by 33 percent.

Improved guest comfort. When asked about the sensors in the Doubletree tests, some guests said that the night-light made them feel safer and more secure. There were also fewer complaints from guests about burned-out lamps.

Table 1: Rapid payback

Installation of the prototype WN-100 at a Doubletree Hotel paid for itself in 2.5 years based on energy savings alone. Maintenance savings from less-frequent lamp burnout added \$6,000 in annual savings.

Number of rooms	448
Retrofit cost (\$/room)	45
Project cost, including labor (\$)	20,000
Annual energy savings (kWh)	66,500
Annual energy-cost savings (\$)	8,000
Simple payback period (years)	2.5

Note: kWh = kilowatt-hour.

The SVL offers several additional features, which are listed below.

Efficient light source. The SVL uses linear fluorescent lighting that is much more energy-efficient than the incandescent bulbs used in many bathroom fixtures.

Easy to install. The SVL is a complete, out-of-the-box solution that replaces the traditional hotel bathroom renovation approach of custom-made fixtures constructed on-site.

Range of configurations. The SVL is offered in three different lengths (2, 3, and 4 feet) and provides a large selection of light diffusers to meet various aesthetic and financial needs and preferences.

In addition, the placement of the LED night-light at the top of the fixture offers more even night-light illumination throughout the bathroom than the stand-alone WN-100. Also, because the light source is hidden, there is less chance that night vision will be lost due to looking directly at the source.

Applications

The intended applications for the two products include bathrooms in hotels and motels as well as bathrooms in nursing homes, senior and assisted-living centers, dormitories, military housing, and healthcare facilities.

California Codes and Standards

California's Title 24 energy code requires that bathroom lighting use efficient sources or use motion controls with "automatic off" capability, which turns lights off after the room becomes unoccupied and the delayed off time expires. The SVL provides the capability to do both cost-effectively and could lead to code changes for the next revision of Title 24 in 2008.

In addition, the code requires that motion sensors be able to turn off lights within 30 minutes after an area has been vacated. Research conducted for this project showed that a 30-minute (min) delay would save only slightly more energy than one lasting 60 min, and a 30-min delay would add the risk of annoying occupants by switching the lights off prematurely. To make the products compliant with Title 24, the option to set a 30-min delay was added. If it can be demonstrated that bathroom occupancy sensors with time delays greater than 30 min and less than 60 min are significantly less likely to be disabled, this result could form the basis of a code change proposal to Title 24.

What's Next

The Sacramento Municipal Utility District (SMUD) is field-testing the SVL at three sites: Regency Place, a senior assisted-living facility; Emerald Gardens Nursing Center, a skilled nursing facility; and the Red Lion Hotel. Other SVL tests are planned for a series of California college dormitories. In addition, a WN-100 demonstration project in assisted-living sites is currently being planned by Pacific Gas and Electric Co. in collaboration with the CLTC.

Collaborators

The organizations involved in this project include the CLTC, The Watt Stopper, SMUD, Sacramento Doubletree Hotel; and Speclight for the SVL.

For More Information

Detailed reports on this project can be downloaded from the web at www.archenergy.com/lrp/advlight_luminaires/project_4_1_reports.htm. The final project report number is CEC-500-2005-141-A10.

To view Technical Briefs on other topics, visit www.esource.com/public/products/cec_form.asp.

Contacts

California Lighting Technology Center, Erik Page, 530-757-3492

Watt Stopper, Jerry Mix, 408-988-5331, www.wattstopper.com

Speclight, Mike Pitts, 512-651-1573, www.speclightsolutions.com

California Energy Commission, Michael Seaman, mseaman@energy.state.ca.us, or visit www.energy.ca.gov/pier/buildings

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.

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