NETWORKED ADAPTIVE EXTERIOR LIGHTING

for the Health Care Sector

NorthBay VacaValley Hospital
Vacaville, CA

LED luminaires with state-of-the-art lighting controls light the walkways, parking lots, and emergency vehicle routes at NorthBay VacaValley Hospital

ENERGY SAVINGS
66%

OCCUPANCY RATE
35–55%

LIFETIME ENERGY COST SAVINGS
$23,220
at $0.08/kWh, over 10 years

2014 LIGHTING ENERGY EFFICIENCY IN PARKING (LEEP) AWARD WINNER
Best Use of Lighting Controls in a Single Facility

In 2014, NorthBay VacaValley Hospital became one of the first U.S. health care facilities to install an energy-efficient, ultra-smart outdoor LED lighting system. The award-winning project was so successful that the NorthBay Healthcare group is now considering expanding the VacaValley system and retrofitting the outdoor lighting at other sites.

Prior to installing the networked LED system, NorthBay VacaValley Hospital's exterior lighting consisted of 40 induction luminaires, 13 high-pressure sodium (HPS) luminaires, and 7 metal halide luminaires, all operating at full lighting power throughout the night.

A total of 57 luminaires were installed with dimmable LED technology for the lighting demonstration. Motion sensors were installed to provide maximum coverage of the site, ensuring lights operate at sufficient levels when occupants are detected and use less energy when areas are vacant. An "ultra-smart" lighting control network was also put in place, giving facility managers the ability to adjust lighting schedules, light levels and time-out settings, monitor the system's energy use, and receive automated alerts when luminaires require maintenance.

UC Davis's California Lighting Technology Center (CLTC) customized the lighting components to integrate them into a single, fully functional system and worked with hospital personnel to ensure system settings meet the site's lighting needs. The retrofit reduced the site's exterior lighting energy use by 66.4%, dramatically reduced lighting maintenance needs, and received positive reviews from about 88% of end-users surveyed for feedback.

PROBLEM

At many commercial facilities, traditional HID luminaires still operate at full power throughout the night, even when parking lots and other outdoor areas are vacant. This energy waste can easily be averted by implementing energy-efficient light sources and lighting controls. Incorporating luminaires into a networked lighting control system further maximizes energy savings and allows light levels to be customized and scheduled according to the facility's specific needs. This is especially important for applications with critical functions such as health care.

SOLUTION

System components meet or exceed the Illuminating Engineering Society's best-practice photometric performance recommendations and the DesignLights Consortium's criteria for its Qualified Products List. CLTC customized the system components selected for this demonstration, integrating luminaires, sensors, networked control modules, and mounting hardware. Each dimmable LED luminaire installed at VacaValley Hospital was equipped with a fail-safe photocell to prevent energy waste during daylight hours. Passive infrared (PIR) motion sensors were installed where suitable, and a new long-range microwave motion sensor was installed to provide coverage in larger zones.

Each luminaire was also equipped with a radio frequency (RF) communication module that incorporates each light point into a mesh network lighting control system. The network control system includes occupancy logging features, maintenance alerts, and emergency override to full ON to ensure that hospital staff, patients and visitors are always provided with the light they need. The system allows an authorized administrator to adjust lighting schedules and tuning levels, adjust luminaire groupings, and gather revenue-grade energy metering data using an Internet device.

DEMONSTRATION RESULTS

Metering systems calibrated to industry standards showed that the switch to LED luminaires reduced energy use 33.9%. Implementing the network control system then reduced the LED lighting's energy use 49.2%, saving a total of about 29,020 kWh annually. At its rate of $0.08/kWh, NorthBay VacaValley Hospital will save approximately $2,320 annually in energy costs as a result. The project's simple payback period is 21 years. The same installation at sites paying $0.10–$0.20/kWh would result in simple payback periods of about 17–8.5 years, respectively. Large-scale and new-construction installations, involving high-quantity purchases of LED luminaires and controls, will have lower per-unit costs and result in higher energy savings, drastically shortening payback periods.

COLLABORATORS

CLTC led the retrofit in collaboration with Berkeley Lab, the Better Buildings Alliance Lighting & Electrical Project Team, Pacific Northwest National Laboratory, and Siemens Building Technologies Division. Funding was provided by the Commercial Buildings Integration Program, within the DOE's Building Technologies Office. Pacific Gas and Electric Company provided rebates.

PROJECT TECHNOLOGIES

LED LUMINAIRES

Arieta AR18-10M and AR18-15M LED luminaires by Leotek, available at **leotek.com**

WTM/WTL wall packs by Philips Day-Brite, available at **daybrite.com**

ELG-5 LED parking luminaires by Philips Gardco, available at **sitelighting.com**

OUTDOOR MOTION SENSORS

FS-305-LU and EW-205-12-LU PIR motion sensors by WattStopper, available at **wattstopper.com**

MWX-LVE-90U-B outdoor microwave lighting controller by Lumewave, Inc., available at **lumewave.com**

NETWORK CONTROL SYSTEM

TOP900 RF network control modules and LumeStar Software by Lumewave, Inc., available at **lumewave.com**

ABOUT THE CALIFORNIA LIGHTING TECHNOLOGY CENTER, UC DAVIS:
CLTC is a not-for-profit facility dedicated to advancing energy-efficient lighting and daylighting technologies. Part of the Department of Design at the University of California, Davis, CLTC conducts research, development and demonstrations, as well as prototype and product testing, education, and outreach.

Questions about this project or the lighting technologies used for the installation can be directed to:

BERNHARD GOESMANN
Associate Development Engineer, Dipl. Des., CSWA
bgoesmann@ucdavis.edu

NICOLE GRAEBER
Senior Development Engineer, LC, EIT
negraeber@ucdavis.edu