

Pleasanton Library cuts lighting energy use 46% with wireless lighting controls and fixture retrofits



CASE STUDY SNAPSHOT

Pleasanton cut lighting energy use by 46% through a lamp and ballast retrofit and wireless lighting controls in the City Library, built in 1988.

Building type: Public Library

Size: 30,300 square feet

Annual energy savings: 140,827 kWh

Peak load reduction: 28.9 kW

Project cost: \$166,000

Simple payback: 6.2 years

Benefits:

- Annual electricity bill savings of \$21,100
- Greenhouse gas emission reduction of 61.5 metric tons of CO₂ annually
- Lighting energy use automatically adjusts based on occupancy, natural daylight, and programmed schedules
- Increased comfort and sense of security
- Ability to participate in utility demand response peak load reduction programs
- Flexible lighting controls system, accessible via login from the internet

The Pleasanton Public Library features multiple skylights and large windows that supply an abundance of natural light. Such plentiful daylight could save taxpayer money by reducing electricity costs. Until recently, however, adjusting light levels to meet building users' needs was not possible. Instead, as in many of California's older public buildings, the library's lights were constantly on from the arrival of the first staff in the morning until the last person left at night. In July 2011, a lighting retrofit project coupled with the installation of a wireless lighting controls system put City staff back in the driver's seat, enabling them to significantly reduce energy costs and greenhouse gas emissions, while increasing comfort and occupants' sense of security.

Facility Profile: Pleasanton Public Library

The Pleasanton Public library is a 30,300 square foot single story building that serves just under a million visitors annually. Before the lighting retrofit, the library's 661 light fixtures were on an average of 13 hours per day, seven days per week, costing the city approximately \$46,000 each year in

electricity. The library's lighting controls were limited to three main switches, which controlled the majority of the building's lighting with no timers or automation. This lack of suitable lighting controls resulted in all of the lights being switched on whenever the facility was occupied, regardless of the number of occupants or daylighting opportunities.

Lighting Retrofit & Controls Installation

The Pleasanton Library's retrofit project included both a lamp and ballast retrofit and the installation of a wireless lighting controls system. Project installation was completed in about one month.

Retrofit: The existing 32-watt, 2-lamp linear fluorescent T8 fixtures with magnetic ballasts



Case Study | City of Pleasanton Library



◀ The lighting control system adjusts light levels and corresponding energy usage based on occupancy. In unoccupied areas (shown in the foreground), light levels are dimmed. When someone walks into the space (shown near the 3rd bookcase) occupancy sensors sense their arrival and light levels increase to full output.



were replaced with high efficiency 32-watt, 2-lamp linear fluorescent T8 lamps and dimmable electronic ballasts.

Controls: The Adura Technologies Wireless Lighting Control System was installed, consisting of light controllers for each fixture, wireless gateways, wireless wall switches, occupancy sensors, photocells, and the web-based Adura Enterprise Application.

Wireless light controllers were installed on the retrofitted T8 fixtures, as well as on existing T5HO fixtures and a few CFL can fixtures. Photocells were placed in areas with abundant daylight. The photocells provide information to the control system, which varies the brightness (and energy usage) of nearby fixtures according to available daylight. Occupancy sensors were installed in both the library public areas and private staff areas to automatically dim or turn lights off when these areas are unoccupied. Lastly, wireless on/off and dimming control switches were installed at various locations throughout the library to also provide staff with the means to manually control lighting.

After the equipment was installed, Adura engineers configured the occupancy sensors and photocells, established time schedules, and adjusted the baseline light levels to the proper light output. Adura also trained City facility staff and library staff to use the system and controls software effectively.

Why Wireless Lighting Controls?

Lighting controls are an important tool for effective energy management. They enable a variety of energy saving strategies, such as



Components of the wireless lighting control system

- ① Adura wireless light controller
- ② Adura wireless gateway
- ③ Leviton ultrasonic and passive infrared occupancy sensor
- ④ Wattstopper photosensor

The Adura wireless light controllers are installed inside the ballast cavity of each light fixture and relay signals to/from the Adura wireless sensor interfaces that are attached to each motion/photosensor (not visible in photos). The controllers also relay signals to the gateway, which transmits data between the controller network and the Adura system server.

daylight harvesting, automatic scheduling, task tuning, dimming, and occupancy sensing. Wireless lighting controls offer the same or better functionality as traditional wired controls systems at a lower cost and with less invasive, easier installation. Wireless controls systems do not require modifications to the existing electrical wiring or addition of new control wiring. Wireless controls can also be

easily modified to adapt to changing space needs, schedules, or energy reduction strategies through reprogramming instead of rewiring.

Project Costs and Savings

The Library's fixture retrofit alone is estimated to reduce annual electricity use by 31,071 kWh (10% of total lighting electricity use) and peak demand by approximately 7.4 kW. In addition,



“Making better use of the sunlight in our atrium-rich building is just smart. The space stays bright and comfortable throughout the day and evening with no effort and is reducing library operating costs! We are happy with the project and the patrons enjoy excellent lighting at a lower cost.”

Julie Farnsworth, Director of Pleasanton Library Services

the Adura Controls System is expected to reduce annual electricity use by 109,756 kWh (36% of total lighting electricity use) and 21.5 peak kW.

The full cost of the project was \$166,000 (43% labor, 57% equipment). The Energy Technology Assistance Program and Pacific Gas & Electric's Customized Rebate Program covered 20% of the project cost. Taking into account these program rebates, the project will have a six year simple payback. The City of Pleasanton utilized funding from their Facility Renovation Fund to complete the project.

Adura Wireless Lighting Control System

The Adura Technologies Wireless Lighting Control System can control both newly installed fixtures and pre-existing fixtures. The core of the Adura system is the light

controller, which communicates wirelessly with system components such as occupancy sensors, photosensors, switches, and individual fixtures. The light controller integrates the inputs of all components and controls the lighting environment to achieve desired light levels and maximize energy efficiency. The system is universally compatible with standard, commercially available occupancy sensors, photosensors and switches.

Control and management of the lighting system is provided with the Adura Enterprise Application, a customized, browser-based dashboard that uses a secure login to access graphical and data screens showing each light and occupancy sensor. The software displays real-time energy use of the building lighting as a whole and can also allow for analysis of individual fixtures.

PROJECT DATA

PROJECT SUMMARY

Site: Pleasanton Library
Location: 400 Old Bernal, Downtown Pleasanton
Size: 30,300 sq. feet, single story, 92% open area, 5% private offices, 3% conference/meeting space
Built: 1988

ENERGY INFORMATION

Annual lighting electricity use before retrofit: 306,471 kWh
Annual electricity savings from fixtures: 31,071 kWh
Annual electricity savings from controls: 109,756 kWh
Total annual electricity savings: 140,827 kWh
Peak demand savings: 28.9 kW

PROJECT ECONOMICS

Annual electricity cost savings: \$21,100 or 46% of previous annual electrical lighting costs

Total project cost: \$166,000

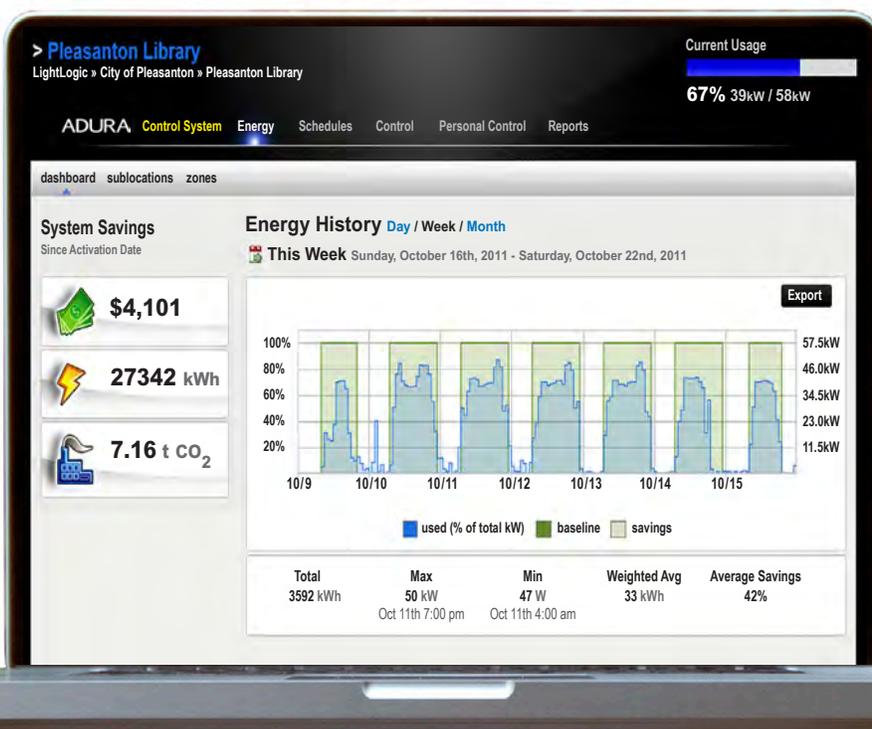
Utility & CEC incentives:

- PG&E Customized Retrofit Program Rebate - \$4,800
- Energy Technology Assistance Program Rebate - \$25,500

Simple payback: 6.2 years

EQUIPMENT INSTALLED

- 580 2-lamp F32T8 GE UltraStart T8 programmed start dimming ballasts and 1,200 T8 GE High Lumen 4100K lamps
- 680 Adura Technologies Light Controllers
- 4 WattStopper® LS-290C Photocells
- 63 Leviton Ultrasonic, Dual-Technology, and Passive Infrared ceiling occupancy sensors
- 67 Adura Technologies Sensor Interfaces
- 35 Adura Technology Wall Control Interfaces
- 35 Leviton Momentary Switches
- 4 Adura Technologies Wireless Gateways



Real-time energy usage and individual fixture light output is displayed on the Adura Enterprise Application. The web-based platform allows access from any internet-connected computer. Facility managers can turn lights off and on, establish automated schedules, and respond to demand response events from any computer.

“The installation of the Adura control system has been a real eye-opener. Watching our lighting energy use fluctuate from between 30-70% throughout the day, compared to our previous usage, shows that it is really working. Plus it’s a great diagnostic tool. The on-screen data allows us to track our daily usage and know exactly where problems occur in real time.”

Chris Rizzoli, Pleasanton Supervisor of Support Services

T A K I N G T H E N E X T S T E P

Selecting a contractor

The California Advanced Lighting Controls Training Program (CALCTP) trains C-10 electrical contractors and state certified general electricians on the installation and operation of advanced lighting controls systems, including wireless controls. A list of CALCTP certified lighting contractors is available at www.calctp.org.

Additional case studies on wireless lighting control projects

- Pier Wireless Lighting Controls – highlights project at UC Berkeley (www.aduratech.com/pdf/CEC-TB-38.pdf)
- Personal Controls Lighting Retrofit of an Open Plan Office Demonstration at Webcor Concrete Facility (www.aduratech.com/case-studies/webcor.php)
- PIER Wireless Integrated Photosensor and Motion Sensor Demonstration at UC Santa Barbara (http://cltc.ucdavis.edu/images/documents/case_studies/Pier_UCSB_WIPAM.pdf)
- PG&E Emerging Technologies Assessment of Advanced Lighting Controls for Energy Efficiency (http://aduratech.com/pdf/ETWirelessControl_EE.pdf)
- PG&E Emerging Technologies Assessment of Advanced Lighting Controls for Demand Response (http://aduratech.com/pdf/ETWirelessControl_DR.pdf)

Applicable utility incentives

Contact your utility representative for specific information for your utility. Incentives for wireless lighting controls projects may include:

- Fixture retrofit programs offering standard per-fixture rebates or incentives based on project energy savings.
- Demand response (DR) programs paying incentives based on the amount of kW load a building can shed when called upon to do so.
- Automated DR programs providing additional incentives for customers that automate their equipment’s response to a requested load shedding event.

Financing assistance

- California Energy Commission low interest loans for energy efficiency projects
- Utility on-bill financing
- Financing from energy service companies (ESCO)



Energy Solutions is an energy efficiency consulting firm working to create large-scale environmental benefits by developing and implementing innovative, market-based approaches to increase sustainability through energy efficiency, water efficiency, and renewable energy initiatives. Energy Solutions developed and implements the Energy Technology Assistance Program (2010-2012). Funding has been provided by the American Recovery and Reinvestment Act of 2009 and is administered by the California Energy Commission.