Retrofitting Existing Buildings and Offices for Energy Efficiency

Green California 2012
About Me

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Adura Technologies
San Francisco, CA

Adura Technologies
• Wireless networked lighting control
• UC Berkeley startup company founded in 2005
• Center for the Built Environment (CBE) at UC Berkeley
• California Energy Commission and PIER
  • EISG research project in 2006
  • Lighting California’s Future 2007-2008
• 6.5M ft² of lighting under control
Why Lighting?

U.S. Commercial building electricity use

- Lighting: 35%, $32 billion
- Space conditioning: 21%
- Plug load: 12%
- Ventilation: 8%
- Refrigeration: 9%
- Other: 15%

300 million tons CO₂
Existing Buildings

California Commercial Office Space

- New Construction: 130 million ft²/yr
- Existing: 5 billion ft²

Most of these have little or no advanced lighting controls (sensors and systems) - huge savings potential!

Lighting fixture retrofits get a lot of attention ... but lighting controls usually installed & updated in new construction projects or major renovations only
What’s the Problem?

EXISTING BUILDINGS ARE MESSY!!!
Wiring in New Controls

Wired controls: the more advanced the control, the more wires need to be connected

Lighting Control Tied to Power Wiring
Lighting Control Tied to Power Wiring
How Wireless Technology Helps

• Wireless point-to-point devices
  • Wireless RF communication between occupancy sensor and wall switch receiver or relay pack receiver
  • Very easy to install
  • Control limited to existing switch/circuit wiring configuration


Source: Leviton LevNet RF Technical Manual
How Wireless Technology Helps

• Networked wireless lighting control systems
  • Wireless RF communication to each individual light fixture
  • Easy to install in new or existing fixtures
  • Flexible, granular control not limited by power wiring configuration

2.4 GHz Secure ZigBee® Wireless Mesh Network
any light fixture can be an addressable networked device

Control zones not limited by power wiring or size – control a single fixture or any group of fixtures as a zone
SMUD Advanced Lighting Retrofit at the Cannery

Challenge:
- 100 year old Libby’s fruit cannery, converted to office space complex
- Old 135W 4-lamp T12 fixtures
- No controls, just light switches

Solution:
- Retrofit with Lunera LED panels w/ wireless controls
- Occupancy sensors and dimming switches (wireless)
- Simple installation
  - Replace fixtures 1:1
  - No changes to power wiring

Source: Fulcrum Property
Source: Lunera

www.aduratech.com
Cannery Results

Original Typical Weekly kWh Load

760 kWh avg. use

LED + Wireless Lighting Controls

237 kWh avg. use

Project Savings

69% Energy Savings
SMUD Advanced Lighting Retrofit at AmerisourceBergen

Challenge:
• Modern 100W T8 parabolic fixtures with A/B switching
• 66 fc on the desk
• Large switching zones, lights on all the time

Solution:
• Retrofit with Cree LED panels w/ wireless controls
• Personal control of lighting over each cubicle
• Simple installation
  • Replace fixtures 1:1
  • No changes to power wiring

Source: SMUD
Source: Cree Lighting
AmerisourceBergen Office Results

63% Energy Savings
Case Study: 221 Main Street, San Francisco

- **Building Type:** 403,600 sqft Class A office, multi-tenant
- **Control Strategies:**
  - Fluorescent Dimming
  - Daylight Harvesting
  - Occupancy Detection
  - Task Tuning
  - Demand Response
- **Rebate Used:** None
- **Simple Payback:** 4 years
- **Benefits:**
  - 58% average savings across suites
  - Added value prior to sale of building
  - Ability to participate in utility demand response peak load reduction programs
Hills Plaza Parking Garage

- **Building Type:** 3.2 acre mixed use commercial
- **Project Size:** 186,000 sqft
- **Control Strategies:**
  - Fluorescent Dimming
  - Occupancy Detection
  - Task Tuning
- **Rebate Used:** SF Energy Watch
- **Simple Payback:** 21 months
- **Benefits:**
  - 40% average savings
  - 65,198 kWh annual reduction
  - 16.9 tons of CO² annual reduction
  - $9,200 annual electricity bill savings
  - Decreased maintenance costs and time
  - Ability to participate in utility demand response peak load reduction programs
California Energy Technology Assistance Program (ETAP)

• Energy efficiency technology rebate program for CA state and municipal agencies
  • Wireless lighting control, bi-level lighting, wireless HVAC control installation projects
  • Funded by DOE ARRA and CEC State Energy Program
  • 21 month program – August 2010 to April 2012
  • Administered by Energy Solutions

• **Program Goal:** $3.4M of rebates to achieve 13.2 GWh/yr of energy reduction

• **Result:** $3.4M of rebates issued and **19.2 GWh/yr** of energy reduction implemented

• Adura performed 12 lighting upgrade projects
  • **1.9 GWh** annual energy savings – 10% of total program results
  • **$262,000** annual energy cost savings
  • **$363,000** ETAP Rebates

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TRENDS TO BE AWARE OF
Trends in Codes and Standards

U.S. Department of Energy
Energy Efficiency & Renewable Energy
Building Energy Codes Program

ASHRAE
Shaping Tomorrow's Built Environment Today

International Code Council
People Helping People Build a Safer World™

California Energy Commission

2013 Standards Update Schedule
Trends in Mandatory and Voluntary Codes

- Codes & standards are updating frequently, and getting much stricter.

- Lighting retrofits will trigger an update of the space to the latest energy code.

- Lighting requirements are moving toward...
  - Dimmable lighting everywhere.
  - Control of lighting that was previously considered “okay” to leave completely uncontrolled during and after business hours.
  - Different control strategies for different parts of the building.
  - Demand Responsive lighting systems.

- Meeting these standards with standalone control devices or panel systems is possible, but not practical.
Demand Response with Networked Lighting Controls
LEDs

- Dramatic cost reductions as LED lighting technology matures
- LEDs were made to be dimmed!
- Combining LEDs with wireless dimmable controls provides long-term energy savings, maintenance improvements
THANK YOU

Alex Do
Director of Product Marketing
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