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CALIFORNIA LIGHTING TECHNOLOGY CENTER

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Adaptive Lighting for Interior and Exterior Applications

June 23, 2011

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RESEARCH INNOVATION PARTNERSHIP

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Founding Organizations

California Energy Commission

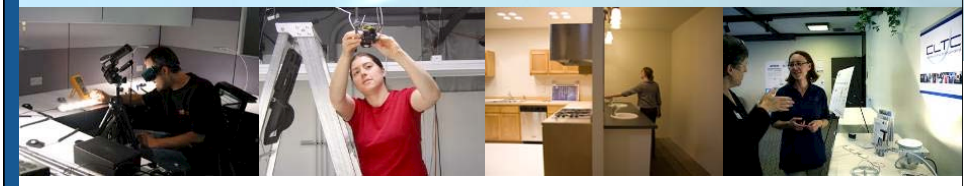
University of California, Davis

National Electrical Manufacturers Association

US Department of Energy

CLTC Mission

- To stimulate, facilitate & **accelerate** the development, application & **commercialization** of **energy-efficient** lighting and daylighting technologies **in partnership** with utilities, manufacturers, end users, builders, designers, researchers, academicians, and governmental agencies.
- Mission-driven Activities
  - Research & Development
  - Demonstration & Outreach
  - Education & Training



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Interior Lighting Controls

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Lighting Control Strategies

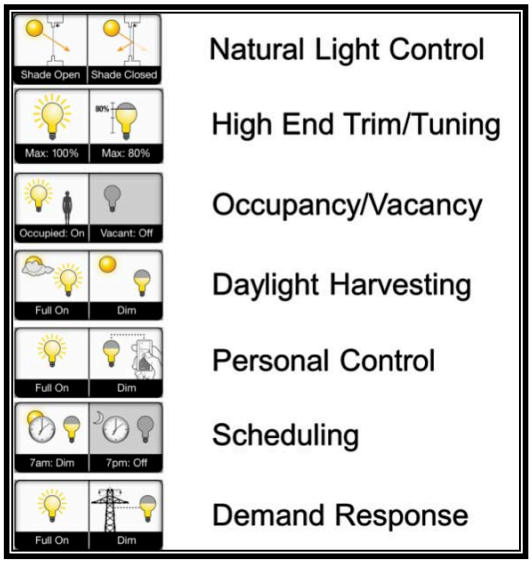


Image courtesy of Lutron

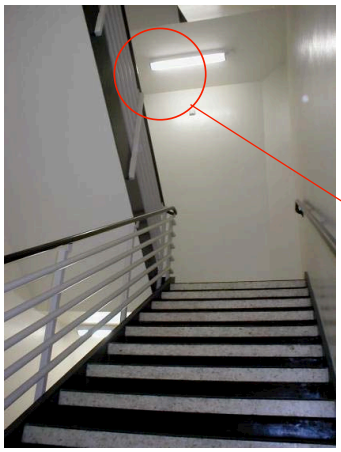
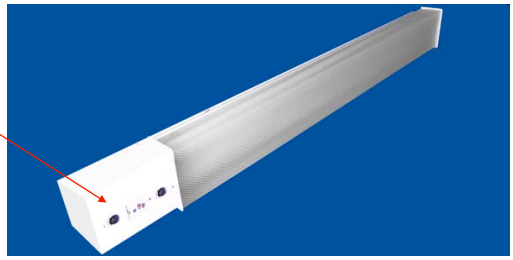
Dynamic, demand-sensitive lighting for interior applications

A combination of strategies

- Occupancy/vacancy
- Scheduling
- Demand Response

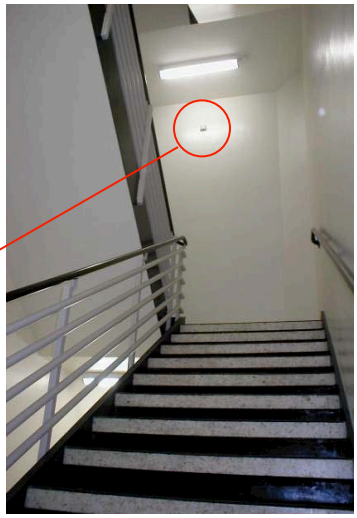


Bi-level Stairwells in Commercial Buildings

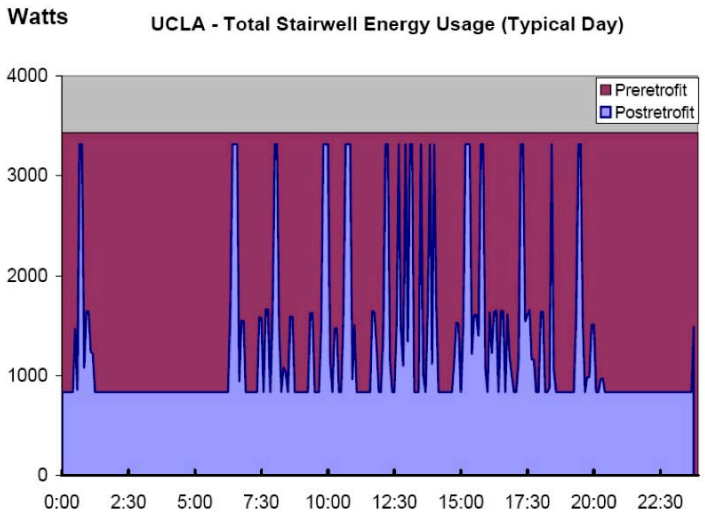



Bi-level Stairwells in Commercial Buildings

- Lights to 50% (or less) on vacancy, automatically to 100% on occupancy
- Integrated or stand-alone sensors
- 40–50% savings
- Longer life
- Reduced maintenance
- LED or Fluorescent

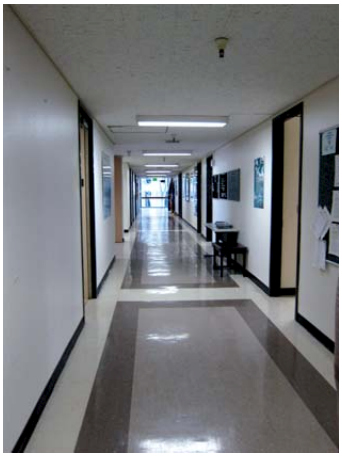


50% Savings in Stairwells: Large Purchase Programs Initiated



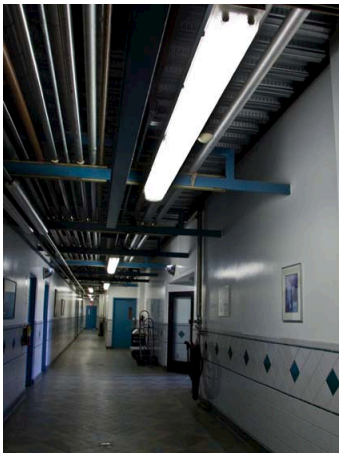
Commercial Corridors and Hallways

- Typical corridors found in commercial, hospitality, and educational buildings are usually illuminated continuously, but are often characterized by highly intermittent occupancy.
- This constant illumination makes these and other secondary spaces a large contributor to California's commercial building energy use attributed to electric lighting.



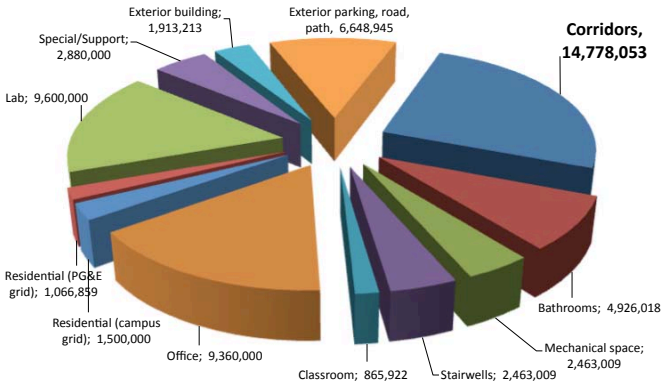
Corridor Lighting

- The busiest corridors in commercial applications are vacant about 50% of the time.
- Most corridors are constantly lit at a high level
- Proposed best practice: bi-level control, lights to 50% (or less) on vacancy, automatically to 100% on occupancy
- Integrated or networked sensors
- 40–50% savings
- Retrofit and new design



Current Usage at UC Davis

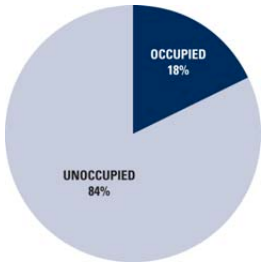
- UCD uses about **73 million kWh** per year for electric lighting.
- About **29%** of total campus electrical use is for lighting.

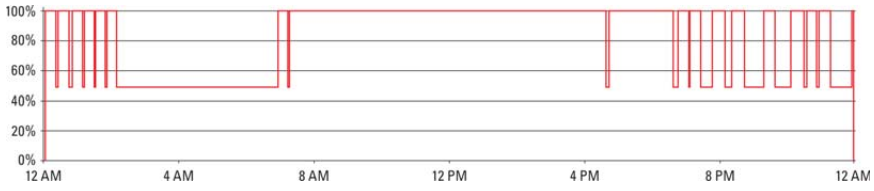


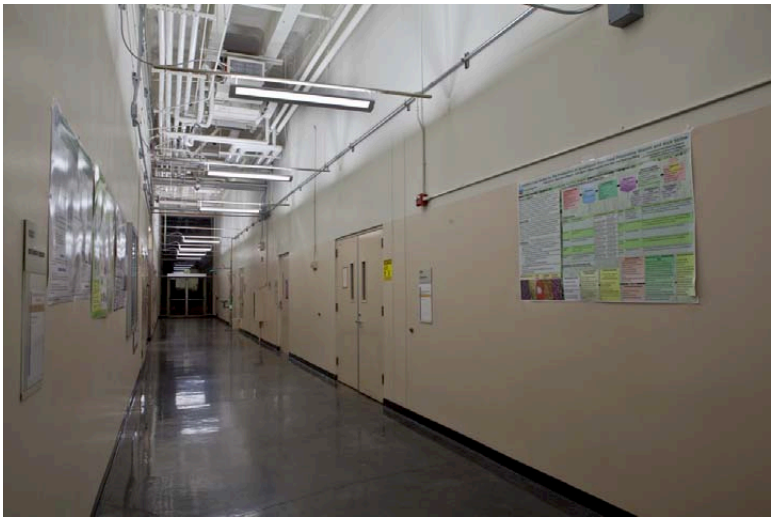
Case Study: University of California, Davis

Average Daily Energy Use

- Total: 11.91 kWh
- Maximum: 616 W (8:00 am)
- Minimum: 313 W (3:00 am)
- Average: 513 W
- Average: 496 kWh



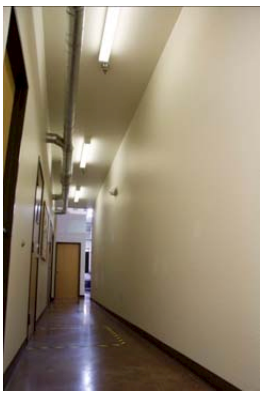




Case Study: Wireless Controls

- The Adura Wireless Integrated Photosensor and Motion Sensor demonstration showcases bi-level corridor lighting controls for both new construction and retrofit

Hallway 1: "New Construction"

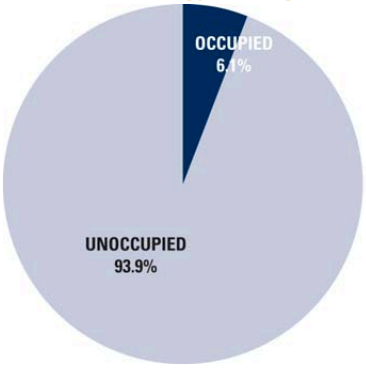


Hallway 2: "Retrofit"

Demonstrated Savings

- High mode: 70% Light output
- Low mode: 30% Light output

Hallway 1:
65.4% Energy Savings

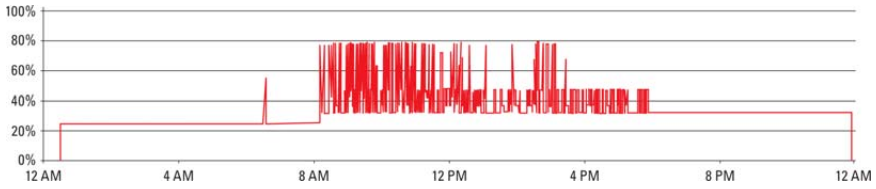


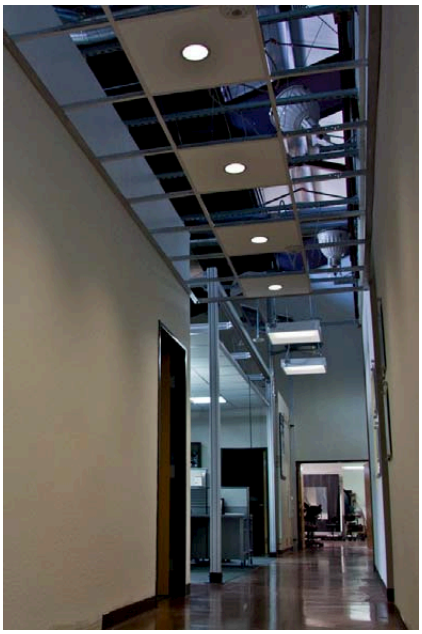
Hallway 2 (bathroom):
59.3% Energy Savings

Demonstrated Results

Average Daily Energy Use

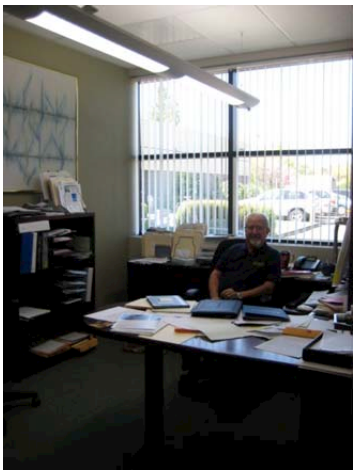
- Total: 2.3 kWh
- Maximum: 149 W (9:00 am)
- Minimum: 71 W (7:00 am)
- Average: 100 W
- Average: 95.69 kWh





Daylighting & vacancy control in small offices

- Bi-level switching with vacancy and daylighting
- Vacancy Sensors (PIR wall switch)
- Fixture Integrated daylight sensors
- Automatic on 50%
- Manual on 100%
- Manual off
- Automatic off



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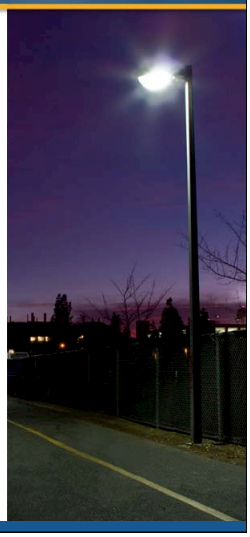
Exterior Lighting Controls



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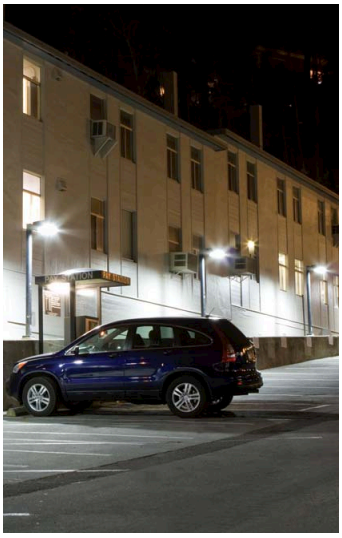
Adaptive Exterior Lighting

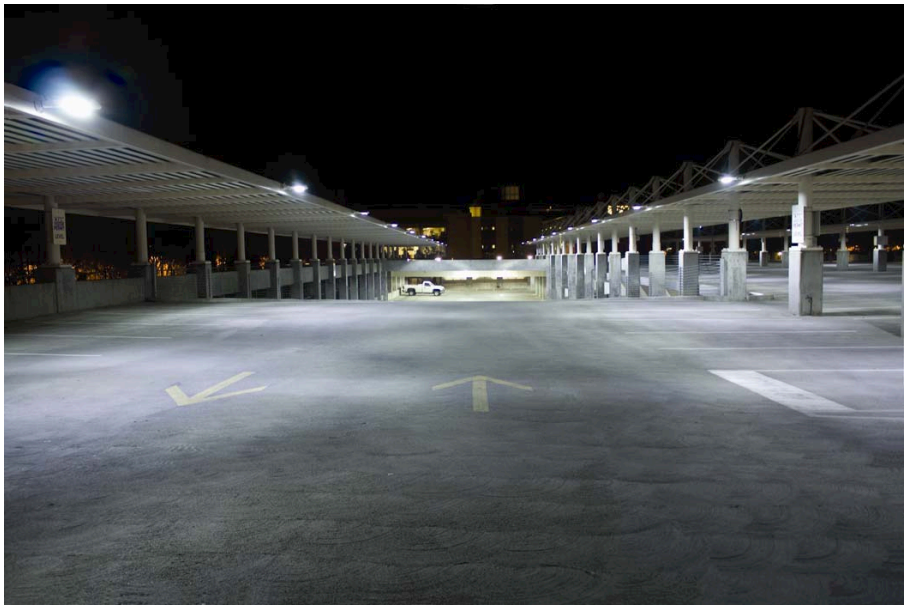
- Many adaptive exterior lighting products offer **30 – 80% energy savings** over traditional systems.
  - Achieved by coupling advanced lighting controls with an efficacious, dimmable source.
  - Reduces energy use in spaces with low occupancy rates, but maintains a minimum light level safety and wayfinding



Bi-level Exterior Parking & Area

- Lighting system will reduce to 50% or less during low-traffic or vacant evening hours
- Sensor and/or time schedule control
- 30–40% savings from controls
- Maintenance savings
- Security enhancement
- Networked or non-networked

Smart bi-level LED lighting



Demonstrated Savings – UC Davis

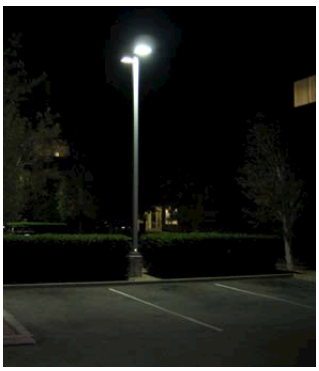
- Smart bi-level LED parking garage luminaires
- Controls makes LED more cost effective
- Extends LED life
- Enhances facility security

- Before: 175 W metal halide
- After: 115 W in high mode and
- 35 W in low mode
- Savings: 80%

Smart bi-level induction lighting

Demonstrated Savings – CDPH

- Smart bi-level Induction parking area and garage luminaires
- Fixture-integrated occupancy sensors
- 100,000 hour lamp life
- Enhances facility security



- Before: 175 W metal halide
- After: 110 W in high mode, 60 W in low mode
- Savings: 67%
- Occupancy rate: 75%

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Thank you!

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