EW-201012 | MARCH 2013

Advanced Lighting Controls

Three Lighting Control Systems Delivered 43-79% Energy Savings*

In partnership with Philips Electronics, Lawrence Berkeley National Laboratory (LBNL) studied the performance of three advanced lighting control technologies at Fort Irwin, CA.

▸ REGULATE THE TIMING AND INTENSITY OF LIGHT

Advanced lighting controls (ALC) regulate the timing and intensity of lighting systems with occupancy sensing, daylight harvesting, and light tuning to reduce energy use and improve occupant satisfaction.

▸ REDUCED ENERGY USE, IMPROVED OCCUPANT SATISFACTION

Results showed lighting energy savings between 43% and 79%, and as much as 15% savings in HVAC loads. Modeling predicts payback from two to nine years, depending on building size and control system used. User surveys indicated improved occupant satisfaction with installed lighting control technologies.

* Using ANSI/ASHRAE/IESNA Standard 90.1-1989. baseline for Energy Use Intensity (EUI).

Technologies Tested

PHILIPS DYNALITE

- Wired control system best for new construction or major renovation with drop ceilings. Distributed control, building-wide connectivity (RS 485), with scene settings and scheduling.
- Personalized dimming, illuminance and glare trigger setpoints, light levels, blind heights, and slat tilt angles.
- Integrates with Building Management Systems (BMS) and HVAC, intuitive user interface; uses existing IP connectivity.

PHILIPS HYBRID INTEGRATED LIGHTING AND DAYLIGHT CONTROL (ILDC)

- Combination wireless and wired control best for multi-floor office buildings. Provides building-wide connectivity.
- Combines user preferences with sensor readings for glare avoidance, personalized dimming, light control, and blind motors.
- Facility managers control multiple zones; individuals control task lights and blinds and can override controller.
- Can be integrated with HVAC to reduce load, optimize solar gain and electric light thermal effects. Sensors can be moved without an electrician.

PHILIPS OccuSwitch WIRELESS

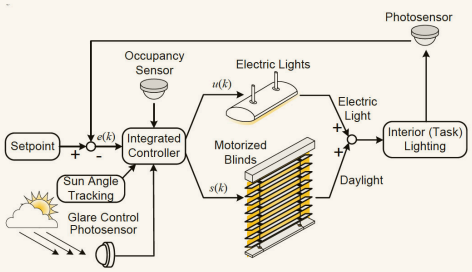
- Wireless room-based control, best for single offices/barracks or small budget retrofits.
- Simple, economical installation without an electrician.
- Passive infrared and advanced logic detect motion to eliminate false triggers.
- Secure 128-bit Advanced Encryption Standard with unique keys.

Best suited to:

- Most cost-effective for installations in buildings over 200,000 ft^2.

ABOUT ESTCP

The Environmental Security Technology Certification Program (ESTCP) is the U.S. Department of Defense's environmental technology demonstration and validation program. The program's goal is to identify and assess innovative technologies that address DoD's high-priority environmental requirements efficiently and cost-effectively.



Schematics of the Hybrid ILDC system

Demonstration Sites: 3 Buildings in Fort Irwin, CA

Philips Research and Philips Lighting Electronics N.A. designed and deployed advanced lighting control systems based on the unique characteristics, operating conditions, and building management systems in three Fort Irwin, CA, buildings. The systems were designed to balance each location's cost of implementation, operation, and user comfort.

Researchers from LBNL measured the technologies' performance in a variety of scenarios while gathering empirical evidence to evaluate energy savings, demand savings, cost-effectiveness, payback time, system reliability, system maintainability, ease of installation, and user satisfaction. The impact on HVAC energy consumption was quantified using simulations. Cost analysis was performed using the Building Life-Cycle Cost Program (BLCC5).

INSTALLATION COST PER ft²*

	< 50K	50–200K	>200K
DYNALITE	$4.54	$3.39	$2.25
HYBRID ILDC	$5.64	$3.51	$2.79
OccuSwitch	$3.40	$2.25	$1.44

*Cost information is for reference only. Individual sites should do due diligence to determine local costs.

ALC WIRED VS. WIRELESS

- Wired networking increases reliability and building-wide connectivity and is best for new construction and major renovations.
- Wireless networking enables ALC functionality without the expense of installing dedicated control wiring and is better for retrofits.
- Many new LED fixtures include integrated wireless ALC, further reducing installation complexity and costs.

Demonstration Results

ENERGY SAVINGS

- Reduced lighting electrical energy consumption:

	METERED BASELINE	COMPARED TO 90.1-1989 CODE BASELINE
Dynalite	30%	43%
Hybrid ILDC	28%	79%
OccuSwitch	22%	62%

INSTALLATION

- All three systems met ease of installation and commissioning objectives.
- Surveys indicate that installation and commissioning was completed with minimal training.
- Hybrid ILDC installation is most difficult but did not present major challenges.
- Wireless ALC will likely reduce installation costs in older buildings.

OPERATIONS & MAINTENANCE

- All three systems met objectives of system reliability, system maintainability, and work plane illuminance.

SYSTEM PERFORMANCE

- No system-wide failures noted.

USER SATISFACTION

- Surveys indicate that installation and commissioning was completed with minimal training.

COST-EFFECTIVENESS

- Payback for typical systems:
  5.4–8.7 years in small buildings
  3.7–6.5 years in medium buildings
  2.3–4.3 years in large buildings
- Savings-to-Investment Ratio (SIR) >1 for all 3 systems.
- Payback is less than 7 years for all systems except the Dynalite system in small buildings.

Additional Resources

- **EW-201012 FINAL REPORTS AND TECHNOLOGY TRANSFER TOOLS**
  https://serdp-estcp.org/Program-Areas/Energy-and-Water/Energy/Conservation-and-Efficiency/EW-201012
- **TECHNOLOGIES USED AT DEMONSTRATION SITE**
  Dynalite, Hybrid ILDC and OccuSwitch Wireless, www.lighting.philips.com.

NOTE: Before incorporating new technology, refer to Unified Facilities Criteria (UFCs) and other appropriate guidance to ensure compliance with current requirements. https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc

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