

HOME	NEWS	ARTICLES	PRODUCTS	BUYERS GUIDE	JOBS	EVENTS	WEBCASTS	STRATEGIES
VIDEO	MAGAZINE	NEWSLETTERS	TECHNOLOGY	APPLICATIONS	RESOURCES	DIRECTORY	ADVERTISE	CONTACT US

Technology and Applications of LEDs

ARTICLES

< [Previous](#) [Next](#) > [Contents](#) (July 2010)

Lighting controls offer a reasonable first step toward improving energy efficiency Evaluation of thirteen of the leading lighting control vendors for commercial offices indicates that solutions can reduce electricity consumption by 35-55%, however payback can range from 2-10 years say David Raezer and Romahlo Wilson.

Lighting comprises 20% of commercial buildings' overall energy expense and 38% of their electricity expense. Accordingly, effective management of lighting infrastructure is critical to any energy efficiency strategy. In our opinion, the two most impactful, technology-grounded strategies for reducing electricity consumption associated with lighting include:

- Lighting control solutions (see CTA's Report on "Lighting Controls"); and
- Next generation lighting technologies, such as LEDs (see CTA's Report on "LED Benchmarking").

While both are critical to long-term efficiency improvements, Cleantech Approach (CTA) recommends lighting control solutions as a good "first step" toward reducing energy consumption, given that they carry lower technology risk and up-front costs than next-generation lighting technologies. They also enable users to capture immediate energy savings in anticipation of further technological improvements and price declines in next-generation lighting solutions. Furthermore, these solutions should be fully interchangeable with existing bulbs in today's lighting control systems.

Lighting control solutions enable businesses to reduce electricity consumption costs associated with their lighting infrastructure. With these solutions, businesses can easily control the behavior of their lighting assets (i.e., when lights turn on/off or how/when lights dim) to eliminate wasted light and excess electricity consumption and precisely meet the requirements of employees functioning within a given environment.

We believe that there are two critical elements that potential purchasers of lighting control solutions should consider: the potential payback of these solutions; and each vendor's unique technological approach. CTA's recent report offers a high-level framework for understanding and evaluating these considerations.

Understanding the payback on your investment

The first critical factor that should be considered as part of potential investment in a lighting control solution is a thoughtful examination of your building's/space's energy use profile. Given the age of and general technology employed in today's commercial office infrastructure it is highly likely that there are considerable opportunities to reduce your energy use through simple strategies such as daylighting, occupancy control, and scheduling (see descriptions of strategies below). This examination will yield a general cost basis from which payback (the time required to recoup the initial cost of a solution from resulting savings) can be calculated. It should be noted that payback is only a partial return on investment analysis for these solutions as some real estate owners and investors have sought to and successfully capitalized on "greener" assets through higher property values.

Accordingly, CTA used a proprietary approach to examine the cost of lighting control solutions, determine the range of potential cost saving opportunities, and calculate the resulting payback periods associated with the adoption of lighting control technology:

- **Cost of the solution:** Comprehensive lighting control solutions for commercial spaces, employing the full suite of potential energy consumption reduction strategies, typically cost \$1.00-2.50 per square foot installed. Given the regional nature of incentives (i.e., overlapping federal, state, and local tax credits; and lower insurance costs that are sometimes offered to more energy efficient assets) we did not include them as a potential price reduction to solutions.
- **Electricity consumption reduction potential:** These solutions reduce electricity consumption expenses associated with running lighting networks by 35-55% (in situations where next generation, ultra-high efficiency technologies have not been deployed); our analysis that lays out the assumptions underlying this range of potential reductions is available in the complete report. It should be noted that we assume a constant price per kilowatt hour of \$0.12 in our



LINKS

Channels

[Drivers & Control](#)

[Energy Efficiency & Sustainability](#)

Author

[David Raezer and Romahlo Wilson](#)



LED JAPAN Conference & Expo
Strategies in Light.

FREE Expo Pass + Early Bird Savings Now in Effect

Register Today!

Dimmer Controls

Superior dimming products for new and retrofit applications
johnsonsystems.com

Wireless lighting control

PLC and RF mesh Quickly installed at lowest TCO.
www.dimonoff.com

AWeber Email Marketing

99.34% Email Delivered. 11+ Years Free Support. Zero Risk.
www.AWeber.com

Lighting Control & Design

Full line of commercial lighting controls for any sized application
www.lightingcontrols.com

report. At CTA, we aim to provide a general framework that readers can adopt to their unique situations and believe that customers are in the best position to deduce any cost inflation or deflation in their electricity prices, including potentially large increases from clean energy legislation.

- **Payback period:** Assuming electricity savings only, paybacks on the initial investment in lighting control solutions range generally from 2.7 years (implying 55% electricity savings with a solution that costs \$1.00 per sq. ft. installed) to 10.7 years (implying 35% electricity savings with a solution that costs \$2.50 per sq. ft. installed).

Strategy	Savings (%)
Daylighting	35
Task Tuning	45
Occupancy Control	55
Scheduling	35

This 35-55% electricity savings range was achieved through the use of five strategies employed by best-of-breed lighting control solutions; all of these strategies would need to be used in order to achieve the savings and resulting payback that we lay out in the exhibit above.

Lumen maintenance: Lumen depreciation is the loss of light output as a fluorescent lamp ages. A lumen maintenance strategy addresses this problem by reducing power in response to higher initial lamp lumens, while increasing power as lamps age and phosphors degrade to maintain appropriate light levels.

- **Daylighting:** Daylighting allows the lighting control solution to adjust lighting levels according to the availability of natural light during the course of the day: the more natural light enters the office space, the less the lighting infrastructure needs to deliver.
- **Task Tuning:** Task tuning allows the solution to control lighting according to specific task and working environments, optimizing light output where it is needed.
- **Occupancy Control:** With this strategy, lights are turned off when the solution detects (with occupancy sensors) that there are no longer occupants in a particular room or area. As building occupants move from location to location, the solution dynamically responds to user-traffic patterns, providing light only when and where it is needed.
- **Scheduling:** A time scheduling strategy enables lights to be turned on/off at appropriate, predetermined times and locations during workdays, evenings, and weekends.

Understanding each vendor’s unique approach

In addition to understanding the overall value proposition of these vendors, we believe it is important to appreciate how each vendor approaches providing a solution from a technology standpoint. Why is this important? Certain solutions are optimized for certain environments; you want to be sure that you select a solution that is optimized for yours.

Lighting control solutions vendors range from large multinational companies to relatively new startup players with innovative technology. In our detailed report (which we are making available to LED Magazine readers), we have included detailed profiles of key lighting control solutions vendors and their respective offerings. Lighting control solutions vendors (associated brands) profiled include: Acuity Brands (Synergy, SensorSwitch, Lighting Control & Design); Adura Technologies; Cooper Controls; Delmatic; Encelium; EnOcean; Leviton Manufacturing; Lumenergix; Lutron; Philips (Dynalite, Lightolier Controls); Schneider Electric; Universal Lighting Technologies; and WattStopper. *It should be noted that CTA does not recommend vendors or endorse a particular strategy for lighting controls.*

While all of these vendors employ sophisticated, centralized, software-based approaches to administering their solutions, they often differ greatly on the architectural framework through which they deliver lighting control functionality. At the most basic level, the chief differentiators among these solutions derive their respective communication method and control intelligence dispersal.

Communication Method

What we term the “communication method” – wired or wireless – is a fundamental distinction that can be drawn among these solution providers. When we refer to wired versus wireless, we are referring to the connection between elements in the network (lighting fixtures, sensors, and switches) and an aggregation device; the aggregation device collects the control data and brokers communications between these peripheral devices and the central management console, where the lighting network is monitored and control parameters are set.

- **Wired** connections require control data to be transmitted over low voltage wiring to an aggregation device.
- **Wireless** connections can be achieved in two manners: (1) control data sent wirelessly (through the air), usually using ZigBee or EnOcean protocols, to an aggregation device; or (2) control data sent over the existing powerline network, with no low voltage control wiring, to an aggregation device.

Control Intelligence Dispersal

What we term “control intelligence dispersal” refers to how lighting control intelligence (parameters for how the lighting networks is to operate) is





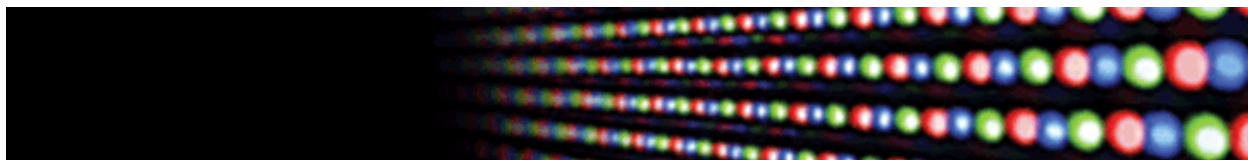
dispersed and where it resides.

- **Intelligent, ballast-based strategies.** In what we term ballast-based strategies, vendors look to leverage intelligence resident in the lighting ballast itself (a ballast is required to control the starting and operating voltages of electrical gas discharge lights, esp. fluorescents). While all strategies can control ballasts, ballast-based strategies distribute intelligence directly to the ballasts where it resides locally; ballasts then execute the parameters set by the centralized software control console.
- **Intelligent, node-based strategies.** In what we term node-based strategies, vendors install a controller or node that sits inside each fixture (next to the ballast); it is this intelligent node which is responsible for executing all control functionality according to the parameters set by the centralized software control console.
- **Intelligent, sensor-based strategies.** In intelligent, sensor-based strategies, vendors distribute lighting control intelligence directly from the central management console to intelligent sensors and switches; there is no aggregating, intermediary, intelligent device.
- **Control panel-based strategies.** In what we term control panel-based strategies, vendors do not supply an intelligent ballast or node. All of the intelligence is administered through control panels typically resident in electrical wiring closets. These control panels are responsible for communicating with all of the devices on the periphery and executing all of the light level parameters set by the centralized software control console.

A complimentary copy of CTA's report, "Lighting Controls: Savings, Solutions, Payback and Vendor Profiles" containing detailed payback analysis and vendor profiles, is available to LEDs Magazine readers and can be downloaded from www.cleantechapproach.com/ledsmagazine/.

About the Author

David Raezer and Romahlo Wilson are Partners at [Cleantech Approach](http://www.cleantechapproach.com/), an independent research and advisory firm focused on helping municipalities, global development organizations, and private businesses evaluate and devise sustainable, technology-enabled strategies.



Copyright © 2007-2010 PennWell Corporation, Tulsa, OK. All Rights Reserved. *LEDs Magazine* is part of PennWell's Technology Group, which also includes:

- Strategies in Light
- Strategies Unlimited
- OptoIQ
- Laser Focus World
- SmallTimes
- BioOptics World
- Vision Systems Design
- Lightwave
- Military & Aerospace Electronics
- Advanced Packaging
- ElectroIQ
- Solid State Technology

Designed by Kestrel Web Services