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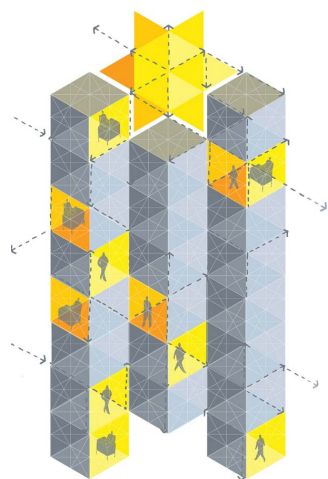
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AN ENERGY EFFICIENT STRATEGY

Balancing Energy Savings And Payback Periods For Commercial Office Lighting Control Solutions

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By David Raezer



Mark McGinnis

Looking to improve energy efficiency? Lighting controls are a good place to start. A Cleantech Approach (CTA) May 2010 research and analysis report, "Lighting Controls: Savings, Solutions, Payback and Vendor Profiles," concludes that lighting control solutions for commercial offices can reduce electricity consumption by 35 percent to 55 percent. However, since payback periods on the initial investment can range from three to 11 years, those involved in these decisions should choose carefully.

Effective management of lighting is fundamental to a sound energy efficiency strategy. It's a smart approach given 20 percent of commercial buildings' overall energy expenses and 38 percent of their electricity expenses go to lighting. With an eye toward reducing electricity consumption associated with lighting, CTA's findings indicate that the two most impactful technologies include lighting controls and next-generation lighting such as LEDs. Of the two, CTA recommends lighting controls as the better first step toward reducing energy consumption, given that these solutions carry lower technology risk and less up-front cost than next-generation technologies.

LIGHTING CONTROLS

With lighting controls, businesses can easily control the behavior of their lighting assets (i.e., when lights turn on and off, or how and when lights dim) to eliminate wasted light and excess electricity consumption, while meeting employee needs for their work environment.

There are two critical factors to consider when choosing a lighting-control solution: explore the potential payback as well as each vendor's unique technological approach. CTA's research found that, often, not enough time is spent examining how quickly a given lighting-control solution will allow purchasers to recoup their initial investment. Accordingly, undertake a thoughtful examination of a building's or space's energy-use profile. Given the age of and general technology employed in today's commercial office buildings, it is likely that there are opportunities to reduce energy use with simple strategies such as daylighting, occupancy control, and scheduling. This examination will yield a general cost basis from which a pay-back period can be calculated.

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. The findings indicate:

- Cost of the solution: Having reviewed solutions from 13 lighting controls vendors, lighting control solutions for commercial spaces typically cost between \$1 to \$2.50 per square foot, installed. Incentives tend to be regional (i.e., overlapping federal, state, and local tax credits; and lower insurance costs that are sometimes offered to more energy efficient assets), so CTA did not include them in their calculations.
- Assessing the potential for electricity reduction: After running a detailed scenario analysis, CTA concluded that control solutions have the potential to reduce electricity expenses by 35 percent to 55 percent, at least in situations where next-generation, ultrahigh-efficiency technologies have not been deployed. (CTA assumed a constant price per kilowatt hour for electricity of \$0.12.) CTA's report provides a framework that readers can use for their own situations, since 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.

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- Implied payback periods: Assuming this 35-percent-to-55-percent range for electricity savings, paybacks on the initial investment in lighting control solutions generally range from 2.7 years (implying 55 percent electricity savings with a solution that costs \$1 per square foot installed) to 10.7 years (implying 35 percent electricity savings with a solution that costs \$2.50 per square foot installed).

CTA also examined five control strategies that lead to electricity savings, all of which should be considered as part of a control solution. These five leading control strategies are:

- 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: Adjust lighting levels according to the availability of natural light. The more natural light that enters an office space, the less the lighting infrastructure needs to deliver.
- Task tuning: Control lighting according to specific task and working environments, optimizing light output where it is needed.
- Occupancy control: Lights are turned off when occupancy sensors detect that there is no one in a room or area. As building occupants move, the solution dynamically responds to user-traffic patterns, providing light only when and where it is needed.
- Scheduling: A scheduling strategy enables lights to be turned on and off at appropriate, predetermined times and locations throughout the building during workdays, evenings, and weekends.

FRAMEWORK FOR UNDERSTANDING VENDORS' APPROACHES

The other important consideration is to evaluate each vendor's technological approach. Certain solutions are optimized for certain environments; be sure that you select a solution that is optimized for yours.

Lighting control solutions vendors (and brands) profiled in CTA's May 2010 report included: Acuity Brands (Synergy Lighting Controls, SensorSwitch, Lighting Control & Design); Adura Technologies; Cooper Controls; Delmatic; Encelium; EnOcean; Leviton Manufacturing; Lumenergi; Lutron; Philips (Dynalite, Lightolier Controls); Schneider Electric; Universal Lighting Technologies; and WattStopper. (But CTA does not recommend vendors nor do they endorse a particular strategy for lighting controls.)

While all of these vendors employ sophisticated, centralized, software-based approaches, they often differ on the framework through which they deliver functionality. The chief differentiators among these solutions are their respective communication method and control intelligence dispersal.

COMMUNICATION METHOD

This refers to the connection between elements in the network (lighting fixtures, sensors, and switches) and an aggregation device, and can be wired or wireless. The aggregation device collects the data and brokers communications between the peripheral devices and the central management console, where the lighting network is monitored and control parameters are set. Wired connections require the data to be transmitted over low-voltage wiring. Wireless connections can be achieved in one of two manners: data sent wirelessly (usually using ZigBee or EnOcean protocols) to an aggregation device or data sent over the existing powerline network with no low-voltage wiring.

CONTROL INTELLIGENCE DISPERSAL

This refers to how lighting control intelligence (parameters for how the network should operate) is dispersed and where it resides. With this, there are four options:

- Intelligent, ballast-based strategies: Here, vendors look to leverage the intelligence that resides in the ballast itself. (A ballast is required to control the starting and operating voltages of electrical gas discharge lights, especially fluorescents.) All strategies can control ballasts, but ballast-based strategies distribute intelligence locally; where they then execute the parameters set by the centralized software console.
- Intelligent, node-based strategies: In 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: Here, vendors distribute lighting control intelligence directly from the central management console to intelligent sensors and switches; there is no aggregation device.
- Control-panel-based strategies: And with this, all of the intelligence is administered through control panels that typically reside 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.

David Raezer and Romahlo Wilson are Partners at Cleantech Approach (cleantechapproach.com), an independent research and advisory firm that identifies market-ready sustainable strategies. A complimentary copy of CTA's report, "Lighting Controls: Savings, Solutions, Payback and Vendor Profiles" containing payback analysis and vendor profiles, can be downloaded by ARCHITECTURAL LIGHTING readers at cleantechapproach.com/ArchitecturalLightingMag.

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