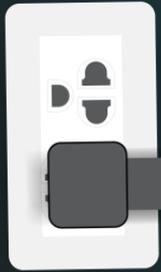


Unlocking



Understanding The Complete Return on Smart Building Investments



Smart building technology that offers greater control over major electrical loads such as lighting and HVAC results in lots of obvious energy savings return on investment (ROI) for forward-looking businesses. These benefits alone are often impressive, and the energy savings payback for upgrades to these controls comes swiftly.

But companies that make their smart building investment decisions based on only kilowatt-hour calculations may be missing the full picture. The economic and business impact of centralized control reaches far beyond. As organizations decide how far to go with their smart building upgrade projects, they need to become more sophisticated about their calculations to ensure they're making the best projections. Doing so will allow them to make accurate decisions about when, why and how they modernize their buildings.

Check out the following considerations as you work through your own ROI projections. Some

of them may be clearly evident and already on your list, but chances are you will find a few that your organization didn't consider in its initial back-of-the-envelope estimates.

OBVIOUS ROI

Dramatic savings from lighting, HVAC and plug-load control form the cornerstone of any effective ROI argument prior to a smart building investment. So, before we get to the "plus" part of ROI+, let's take a minute to review the fundamentals of energy savings that come from enhancing centralized controls.



CASE STUDY

Lighting Control Savings

ORGANIZATION

 **TRANSWESTERN**[®]

FACILITY

12-story multi-tenant office building; 3,500 fixtures

LOCATION

Washington, D.C.

ANNUAL KWH SAVINGS

986,100 kWh at \$.158/kWh

ANNUAL ENERGY COST SAVINGS

\$155,000

ANNUAL MAINTENANCE COST SAVINGS

\$20,000

PAYBACK

One year

OBVIOUS ROI: LIGHTING

As one of the largest energy drains on any expense sheet, lighting typically makes up around 40 percent of the total energy cost in commercial settings. A good lighting management system can help reduce that expense considerably by giving you the ability to control the amount of light when you want, how you want, all from a central location.

That stands in stark contrast with the reality at most facilities today.

“Historically, the only interaction companies have had with their lighting was a wall switch and a bill,” explains Dave Bisbee, program manager of Sacramento Municipal Utility District’s customer advanced technologies group. “Control was a black box. What we’re hoping is that these kinds of control systems will be

a game-changer for how companies think about and interact with lighting, which is a big part of how they use energy.”

Natalia Evstigneeva realized firsthand how frustrating that lack of control can be the night she drove by one of her company’s buildings and saw “it was lit up like a Christmas tree.”

Evstigneeva, senior vice president portfolio manager for Transwestern Real Estate, a real-estate investment management and advisory firm, knew there had to be a better way to provide lighting for late-night workers without illuminating the whole building. By installing lighting control across the building, her firm could better manage zone lighting to meet tenant needs without overlighting the facility.

ENERGY SAVINGS

The advantages are even more dramatic when scaled across not just a single building, but multiple buildings or campuses, which have traditionally been managed separately. The consolidation of lighting controls provides the ability to mix and match the benefits of several adjustment techniques based on your organization's needs and objectives. Take advantage of all of them, and you can stand to achieve a combined savings of up to 70 percent on lighting.

Combine these benefits with the additional energy savings afforded by LED lighting, and the potential savings can be 90 percent or higher. The advantage of this combination is the additional fine-tuning afforded by certain LED fixtures that can be preinstalled with wireless functionality, offering unprecedented per-fixture control versus zone control for not much more per fixture during already scheduled LED upgrades.

CHANGE		SAVINGS
	Timers: Dim and turn off lights when rooms are unoccupied	Up to 40%
	Photosensors: Adjust electric light levels to take natural light into account	Up to 20%
	Occupancy sensors: Adjust lights based on occupancy detection	Up to 40%
	Task tuning: Dim lights to reduce maximum light levels for each space	Up to 20%
	Personal control: Individuals set light levels to suit personal preferences	Up to 10%
	Demand response: Reduce lighting levels to take advantage of demand response incentives from utilities	Variable
	Combined savings	Up to 70%

THE PROBLEM WITH PROGRAMMABLE THERMOSTATS



The manner in which the customer uses the programmable thermostat – or their behavior – actually drives the potential for savings.²

ACEEE Study: Destined to Disappoint: Programmable Thermostat Savings are Only as Good as the Assumptions about Their Operating Characteristics



Network-based control systems potentially reduce energy use of already low-energy HVAC systems by about **50 percent**³

OBVIOUS ROI: HVAC ENERGY SAVINGS

Lighting control is only one piece of the energy use puzzle for commercial and industrial facilities. Typically the biggest expense comes from HVAC, which accounts for 51 percent of all commercial building energy use.¹

Many organizations have installed programmable thermostats as a way to reduce that expense through improved control over temperature settings. Unfortunately, these same organizations are finding they're not achieving the savings they projected from the upgrade. The culprit? Poor configuration.

Studies have shown that most programmable thermostats are left to be managed by individual building

occupants, who typically do a poor job of optimizing their settings for maximum energy savings. Without centralized control, these advanced thermostats are essentially like a dusty tool in the garage.

Wireless network control of HVAC gives facilities management greater power to knock the proverbial dust from programmable thermostat benefits by automatically managing them and ensuring the right people can oversee their use.

For maximum savings, organizations can piggyback this consolidated control right on top of the same systems used to manage automated lighting control.



OBVIOUS ROI: PLUG LOAD ENERGY SAVINGS

Plug loads, the third-largest electric draw in commercial buildings, present a growing opportunity for building managers to achieve ROI savings. As the experts behind California's Public Interest Energy Research program point out, the number and power of office machines and computers continue to ratchet up plug-load consumption.⁴

Often times, the ROI math just doesn't stack up for investments in controls for plug load alone. But when added to a networked system designed to also control lighting and HVAC, plug-load control can sweeten the ROI pot for minimal extra investment. Such a system makes it possible to control plugs through scheduling, occupancy detection or in response to peak-demand reduction incentives from utility companies.



Scheduled controls alone can produce an average energy reduction of 48 percent in plug loads⁵

ROI +

Now that we've covered the basics of obvious energy savings, let's dig into the advantages of smart building technology that are less likely to grace your company's ROI projections. These benefits can add both direct and indirect returns for control systems, which are important factors for making the business case to the C-suite.

ROI+: Utility and Tax Incentives



Utility incentives can play a huge part in most companies' upgrade ROI and payback projections. Depending on your utility program, these incentives could equal anywhere between 20 and 60 percent of project costs. Most utility companies across the country typically offer:

- Rebates for installing energy-efficient HVAC and lighting equipment that typically start ramping up only as companies invest beyond the bare-minimum efficiency requirements.
- Rate discounts for peak-demand energy conservation that can be maximized only through smarter lighting and HVAC controls.



Uncle Sam may also contribute enough perks to make a significant bump in ROI and payback. Here are some of the big ones:

- **Environmental Policy Act of 2005 (EPAAct):** EPAAct Section 179D offers sizable deduction incentives for lighting and HVAC investments that reduce energy use. *Though EPAAct expired in the beginning of 2014, lawmakers are at work to retroactively extend it from Jan. 1, 2014, through the end of 2015.*
- **HVAC Tax Incentives:** New tax incentives for HVAC replacements can place design, equipment and installation of related costs under eligibility for deductions.
- **Cost segregation:** New buildings and major renovations can use a lucrative tax incentive called cost segregation, which allows some eligible building project costs to be depreciated quickly for tax purposes.

“

Start with your dream project and calculate utility and tax incentives from there. Sometimes people work backwards and say, I'd really like to do 10 things but budget-wise I only have X dollars and can only afford six of them. But sometimes if you integrate the combination of energy savings, utility rebates and tax savings, that may result in a project for the same cost or less if you do all 10 things you initially wanted to do rather than compromising at six.

—Charles Goulding, Attorney/CPA
President of Energy Tax Savers, Inc.

”



Darker is Smarter

Turning the lights down may not just make your building smarter from an energy savings perspective. It may well make your employees smarter. A study from University of Toronto shows people become more rational and negotiate better when lights are dimmer.⁶

ROI+: Employee Comfort & Productivity

During the past decade, the types of documents and machines that employees work on have drastically changed. Typical employees are no longer paper jockeys, instead conducting work on backlit screens. Meanwhile, offices are dominated by more open space and lower cubicle walls. This lends itself to growing populations of workers who would turn down their own lights if it didn't mean pulling the plug on co-workers who require a brighter environment.

Unfortunately, most office buildings today don't come equipped for any level of lighting customization.

“Typical old school lighting was a three-lamp fixture. The wall switch affected the entire workspace,” says Bisbee of Sacramento Municipal Utility District. “You might compromise, but nobody wins.”

Per-fixture and zone-based controls change that situation entirely, putting greater control into the hands of employees—and improving their comfort and productivity in the process.

According to Bisbee, in the case studies he has witnessed at Sacramento Municipal Utility District, workers generally turn down lighting levels. Overall lighting costs are saved, but even the workers who need more



Good lighting can be expected to increase productivity by about 8%⁷



Employees make **44% more mistakes** when a room is too cold than at optimal room temperatures⁸

Savings from a typical lighting improvement project:

 *\$700,000 in energy⁹*

\$14,000,000 in productivity

lighting are accommodated.

“One of the great benefits for having this level of control is that people who work in cubicle environments have much greater satisfaction when they can control the light over their heads,” Bisbee says.

The more comfortable employees are, the more efficient they’ll be on a day-to-day basis. This goes not only for lighting conditions, but temperature settings as well. Studies have shown that when temperatures are too cold, employees make more mistakes.

This efficiency quotient can be one of the most forgotten and impactful ROI+ elements of all. If you think about it, employee wages by square foot within a building are several orders of magnitude higher than energy costs, so slashing energy savings in half may save a company \$1 per square foot per year. But improving productivity by just 5 percent could save 10 times as much or more.



CASE STUDY

Variability of Worker Lighting Preferences

ORGANIZATION



LOCATION

Sacramento, CA

CONTROLS/UPGRADES IMPLEMENTED

Wirelessly controlled zone control with motion sensors and daylight sensors, plus fixture-by-fixture LED lighting control and temporary wall-switch control for more employee control

ANNUAL ENERGY COST SAVINGS



ROI+: Reduce business risk



Studies have shown¹⁰ that temperature and lighting have a stronger influence on customers staying within and returning to retail stores than any other atmospheric factor, such as décor, parking or accessibility. When stores are too hot, customers leave, resulting in an immediate loss of revenue.

Similarly, retail and food service chains depend on outdoor signage and lighting to denote when stores are open or closed. When signs and lights unexpectedly go out, an otherwise open restaurant may look closed to potential customers. That's yet another revenue killer.

Retailers and other businesses concerned about consumer attraction and retention in stores should consider the top-line revenue assurance offered by centralized control of lighting and temperature controls and monitors. These controls not only offer automated adjustments for optimal lighting and temperature settings, but also alerts when systems go down so they can be fixed with as little revenue disruption as possible.

This can mean a huge upside for chains that manage many retail facilities at once.

ROI+:

Operational Efficiencies

On-call maintenance infrastructure can be incredibly expensive. While central controls for lighting and HVAC can't eliminate these costs, they can greatly reduce them.

For example, in one story related by the former vice president of facilities for a major retail clothing chain, this company contracted with a network of local contractors across the country to be on call for immediate maintenance should store thermostats ever stop functioning. The cost of a truck roll alone was \$200 per hour, and they frequently were made for thermostat configuration changes that could have been fixed remotely had they been tapped into a wireless network.

Maintenance Savings of Centralized Control

Organizations can do preventative maintenance with fewer workers when they have fully consolidated visibility into how all of their systems operates day to day. For example:



The facility manager knows a piece of equipment has a maintenance schedule that requires service after it has been cycled 6,000 times.



Before central tracking, there was no way to know how many times individual equipment was cycled. Maintenance is reactive in this case — emergency maintenance is dispatched with the equipment breaks



Monitoring makes it possible to know when that equipment hits 5,000 cycles so cheaper preventative maintenance can be scheduled before failure

The savings can add up considerably in these cases.

ROI+: Operational Efficiencies



FOOD SAFETY: By placing temperature sensors within freezer and refrigeration units, one Southwest restaurant chain was able to leverage existing control system infrastructure to monitor and log freezer temperature when power outages strike. This ensures food safety without having to throw away inventory unless temperatures rise to an unsafe level.



GOVERNMENT COMPLIANCE: Several states institute safety regulations that stipulate banks must have lights checked on monthly or other periodic intervals at ATMs to reduce crime. Banks can easily comply with these regulations without a costly crew to make on-site visits by instituting networked lighting controls.



INDUSTRIAL MACHINE EFFICIENCY: One major industrial facility bumped up its returns on a smart building project by not only tying lighting and heating into its network controls, but also using them to control engine-block heaters on forklifts to keep them warm but efficient in cold weather. Other industrial facilities are starting to use these controls similarly for fans, pumps and other equipment.



HIGHER RENT: Smart building technology can be essential to LEED certification and LEED certification frequently garners higher rental rates—bringing an approximate 5 percent premium on rents¹¹

Putting The ROI Picture Together

Clearly, the ROI picture for an energy control framework is more than energy savings alone. As organizations begin to add estimates for considerations such as utility and tax incentives, employee productivity, operational efficiency and customer satisfaction, the ROI and payback picture looks drastically different than when calculating kilowatt hours alone. These added considerations are potential game-changers that are well worth the effort by facilities, energy and sustainability managers and executive leadership to add to the investment analysis.





Daintree Networks is a trusted provider of the industry's smartest building energy management solution. Daintree's ControlScope™ is an open standards-driven energy management and monitoring solution for lighting, temperature and other energy control. The solution delivers up to 70 percent energy savings, plus operational efficiencies and occupant-friendly work environments, while providing actionable decision-making information through Big Data analytics. Using Daintree's Enterprise Internet of Things™, or E-IoT™, approach, the solution can also support monitoring of other environmental conditions from a networked ecosystem, including air quality, humidity, food, safety and more.

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