Savings, Sustainability & Security

A Holistic View of Commercial Lighting

Lighting decisions impact far more than energy consumption

While it is true that lighting has important implications for a building's efficiency and carbon footprint, it also affects functionality, occupant health, and the building's overall attractiveness to occupants.

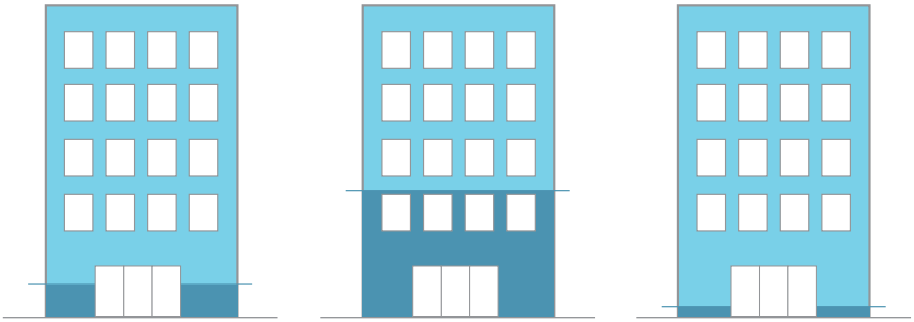
Cost Reduction

Integrated with other building systems, LED lighting solutions significantly enhance operational control. By adding sensors that monitor occupancy, dimming, daylighting, or tuning, a building manager can elevate a system that is already environmentally friendly to one that takes the entire building to the next level of technological sophistication and efficiency.

Smart Buildings

Also called connected buildings, automated buildings, or intelligent buildings, smart buildings are structures that integrate technologies together to better automate processes and/or help to improve performance. Such smart buildings do not merely sense and monitor what happens in the building, they continuously learn, adapt and respond to changes in the environment.

Among the systems that can be integrated into a building automated system (BAS) are heating, ventilation, air conditioning, lighting, physical security, fire detection, elevators, AV, wayfinding, and blinds.



10%
Contain Smart Technologies[1]

40%
Have Some Built-In Smart Technology[1]

1-2%
Only Integrate Technologies To More Fully Realize Their Potential[1]

LED lighting solution is a natural technology to incorporate into a smart building design. A lighting solution can be the anchor technology for a broader smart building system, which can potentially open a wide range of possibilities for data collection, increased efficiencies, and cost savings.

1. BSRIA, "Global Trends in HVAC & Smart Technologies," 2022

Centralized Monitoring

A centralized LED lighting solution presents a range of operational benefits all by itself. For example, a building manager can control lighting from a centralized location during an emergency. Lights in multiple locations can be dimmed or turned off when they are not in use, or activated when, for example, a car or person enters a parking lot.

When integrated with other building systems, a lighting solution can become much more powerful.

A combined lighting and mechanical system requires 50% fewer sensors compared to two discrete solutions. The efficiency that is created not only helps to drive cost savings, but it also allows easy data sharing between the two systems. Lighting sensors configured to detect building occupancy can help a building manager make more informed decisions about HVAC control.

And that is just for a single building. Efficiencies greatly increase as other buildings are integrated into the same central system, permitting decisions to be made across multiple properties from a single location.

Gathered data can further be stored and used for analytical purposes. Utility consumption can be evaluated on a tenant-by-tenant basis across several buildings. Combined data from multiple systems can be flowed into analytics applications to allow more informed decision making across a multi-building campus.

As a general rule, the more visibility a building team has into centralized system data, the more opportunities there are for increasing efficiencies.

Light for Productivity

Light can have a significant effect on alertness, which has important implications for productivity. Effective lighting has been shown to significantly reduce downtime and increase productivity on a per-square-foot (throughput) basis.[2]

However, human alertness is just one dimension of a total productivity story. For manufacturers who make use of robotics on the production floor, a more efficient lighting solution can greatly increase sensor functionality.[3]

Taken together, it is clear that lighting can go a long way toward improving your building's occupant outcomes and provide superior end user experience.

2. Research Report: Lighting for Healthy Buildings, Guidehouse Insights, Published 4Q 2021
3. Control Automation, Uncontrolled Machine Vision Lighting for Infrared and Robots. September 21, 2022. https://control.com/technical-articles/uncontrolled-machine-vision-lighting-for-infrared-and-robots/

Emergency Lighting

Emergency light fixtures are battery-backed fixtures that illuminate critical areas when the normal electrical supply is interrupted by a utility failure. Emergency lighting is most frequently found in building exits and other essential traffic paths to facilitate evacuation.

Because emergency lighting is intimately connected to security, it has traditionally been regulated by strict design and installation codes. For that reason, there has been little innovation in the area of emergency lighting. However, a series of new advancements is set to change this.

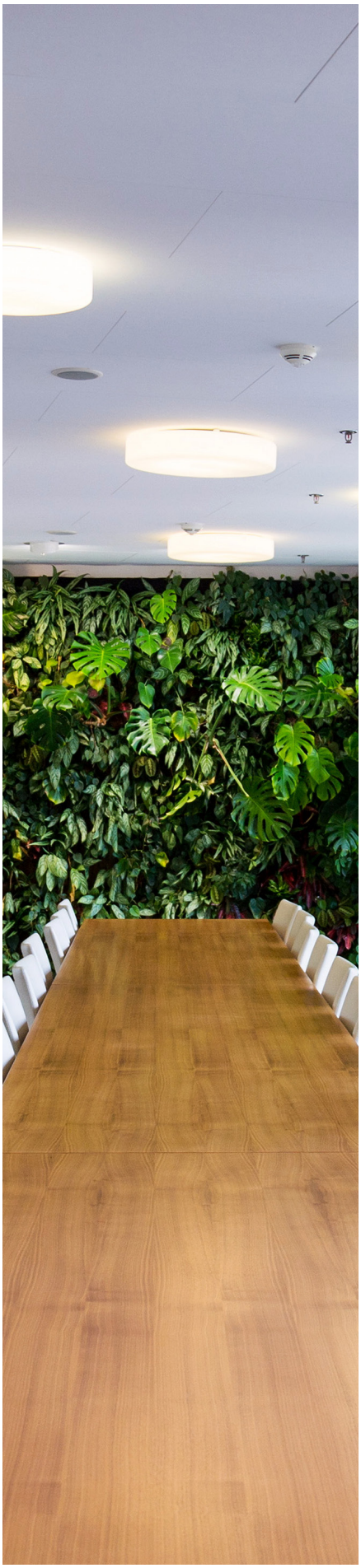
Lighting manufacturers are currently producing smart emergency fixtures that are both more efficient than conventional fixtures and cost less to maintain. The latest emergency lights feature automatic self-testing and self-reporting capabilities, all at a lower energy usage.

Available technologies include LED exit signs, combination emergency and exit lights, battery-operated (versus line voltage-operated) emergency drivers, and inverter systems that convert DC battery power to standard AC to provide lighting power backup under emergency conditions.

Smart Streetlighting

Smart streetlighting is most often talked about in the realm of city planning, but it can also be leveraged on an office campus, a university campus, or a hospital complex. Smart streetlighting utilizes a combination of several smart technologies and LED lights to help improve, security, and environmental quality, while at the same time drive efficiency.

A typical smart streetlighting solution leverages a combination of photosensors, smart controllers, wireless systems, software, and data analytics. The technologies are combined to give system operators more control over lighting output, and enhanced abilities to operate security cameras, detect outages, and monitor air quality and ambient sounds.

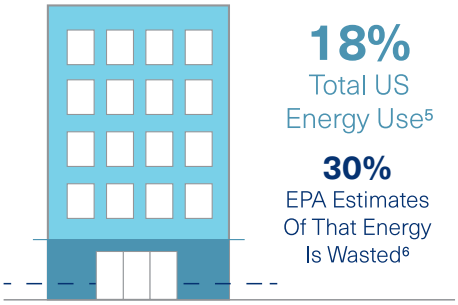


Sustainability

Of all issues driving building owners to reexamine their operations, sustainability is among the most important. In a recent CBRE study, nearly 70% of commercial real estate organizations cite greenhouse gas reductions as a top organizational goal. [4]

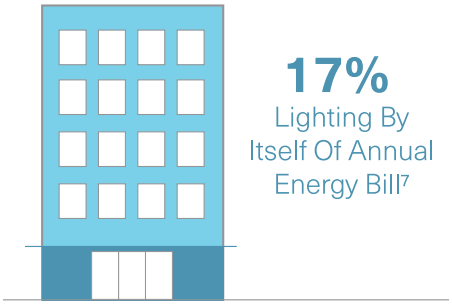
As more states and localities become seek to lower emissions, the environmental costs of maintaining existing technologies, from power generation to HVAC, are coming under scrutiny.

Lighting is no different. The push to lower energy consumption has motivated increasing numbers of building owners to think about new technologies, and perhaps for the first time take a hard look at the costs associated with conventional lights — their cost to purchase, install, and maintain, as well as their lifetime energy consumption.



18%
Total US Energy Use[5]

30%
EPA Estimates Of That Energy Is Wasted[6]



17%
Lighting By Itself Of Annual Energy Bill[7]

Such high costs have made lighting an inviting opportunity for economization, as more building owners come to realize that with a single upgrade they can lower their bills, increase control over their systems, and take a significant step toward realizing their overall sustainability goals.

Sustainability Starts with LED

Whether an office space, retail store or manufacturing plant, LED can make a big difference. LED fixtures are at least 75% more energy efficient than traditional incandescent light bulbs.[8]

Add in the fact that the life of an average LED bulb is between 30,000 and 50,000 hours — compared to 1,000 for incandescent — and the cost saving argument for LED lighting quickly becomes overwhelming.[9]

That said, energy consumption and bulb life are only the beginning of LED lighting's many advantages. LEDs are less expensive to install and to maintain. And, because existing fixtures can be easily updated to LED, old fixtures can be kept out of landfills (indeed retrofitted older fixtures can potentially add value to commercial real estate projects). Because LED permits more control over where and when light is applied, it helps minimize light pollution.

4. Strengthening Value Through ESG: Survey of Global Property Professionals, CBRE, Feb. 28, 2023.
5. U.S. Department of Energy—Energy Information Administration. Annual Energy Outlook 2020. Table A2 Energy Consumption by Sector and Source. https://www.eia.gov/outlooks/aeo.
6. US Environmental Protection Agency, https://www.epa.gov/sites/default/files/2016-04/documents/promoting_energy_efficiency_with_energy_star.pdf
7. U.S. Information Administration. Energy Commercial Buildings Energy Consumption Survey (CBECS)
8. U.S. Department of Energy. https://www.energy.gov/energysaver/led-lighting
9. ZLED Lighting. https://zled-lighting.com/news/led-life-expectancy/

Occupant Comfort

Building livability is another of LED's major advantages. A well-designed and implemented LED solution can add value to a building by making it more comfortable and more productive.

The quality of indoor spaces has not always been a prime consideration for building owners seeking to attract tenants. But at a time when buildings have come to compete with homes as potential workspaces, the value of attractive, comfortable spaces becomes clearer. Good light is not only pleasing, but it also helps employers attract and keep the high-value workers they want.

Indeed, a survey by Future Workplace found that air quality and comfortable light were the two wellness perks that matter most to employees.[10]

The Human-Centric Lighting (HCL) Movement

Studies have shown that light, whether naturally or artificially produced, has a significant effect on human health. Biomedical research has revealed that the spectral profiles of light emitted by fixtures impact circadian physiology, with important implications for cognitive performance. Translation: the color and intensity of light has consequences for alertness, productivity, emotions, sleep quality, and general well-being. This awareness of the effects of lighting on health has led to a broad-based movement within the lighting industry toward what has become known as human-centric lighting (HCL). The assumptions of the HCL movement are straightforward: people spend the majority of their waking hours under artificial light; light impacts health; there are therefore powerful reasons to ensure that the light that people are exposed to is good for them. Light needs to be the right intensity and tuned to the right color. It should also have a minimal amount of glare and flicker, which has been shown to have adverse health effects.[11]

HCL solutions take all these and other factors into account. They include in their design advanced features like dimming and color-tuning to mimic healthy natural daylight. Specialized controls can even allow building occupants sitting at desks, in cubicles, and in offices to individualize their lighting.[11]

Put it all together and it's possible that we are currently in the midst of a revolution in lighting, one in which employers and building owners are not only perceiving the importance of light but are leveraging it in the interest of positive human outcomes.

Light and Physical Security

It is understood that well-lit spaces have a big advantage when it comes to preventing slips, trips and falls — to say nothing of the security advantages that come with intelligent lighting of both indoor and outdoor spaces.

A major advantage of LED solutions is that they allow building managers to apply exactly the amount of light that is needed, exactly when and where it is needed, at locations ranging from stairwells to corridors, exterior spaces and surfaces, and parking lots.

Sanitizing Light

The COVID pandemic heightened interest in light as a disinfectant technology. While it is true that light can be used as a disinfectant, only light in specific wavelengths has sanitizing effects, such as ultraviolet UV-C light, or germicidal ultraviolet light (GUV).

It is the high frequency of UV-C light that makes it useful against pathogens like viruses and bacteria. The light scrambles their DNA and RNA codes, triggering mutations that either kill them or prevent them from reproducing.[12] Currently UV-C light, which is outside the visible range of humans, is being used in some highly specialized applications, such as in hospitals, to sanitize and purify air as it passes through HVAC systems. That said, sanitizing light has yet to be adopted on a widespread basis. While a market for disinfectant lighting is definitely present, it is still considered to be emerging.

10. Future Workplace. https://futureworkplace.com/ebooks/future-workplace-wellness-study/
11. Research Report: Lighting for Healthy Buildings, Guidehouse Insights, Published 4Q 2021
12. New York Magazine, March 19, 2021 https://nymag.com/strategist/article/does-uv-light-kill-germs-best-sterilizer.html

The Trane Difference

When designing a lighting solution, it is important to consider several factors: the building's current function, the building's potential future function, your overall business goals, and the systems you already have in place. With this information in hand a customized lighting solution that meets your goals — and works for your budget — can be created.

Trane specializes in just these kinds of solution design engagements. Our difference is in our approach. First, we only work with brands that align with our quality standards. Second, and just as importantly, we leverage our experience.

At Trane, we know how buildings function. We also know the construction retrofitting process inside and out, from conception to design to implementation. We have seen our systems installed in virtually every type of building, in virtually every situation, which means there's little that surprises us. And, we do not have to reinvent the wheel every time we set out on an installation.

We pride ourselves on meeting our customers where they are in their lighting journeys, working together to identify both near- and long-term goals, and designing future-ready lighting solutions that not only meet the needs of today, but set them up for success tomorrow.

For more information, visit Trane.com/EnergyServices

Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit *trane.com or tranetechnologies.com.*

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