



Sustainability with Networked Lighting Controls

Designing for a Better World

Climate change has become a mainstream issue worldwide that affects humanity today and will increasingly affect our collective futures. According to [NASA](#), climate change is one of the most complex issues facing us today. Challenges like this become daunting when considered on an individual level. The first step toward impact is realizing that you can be part of monumental change. To quote the famous artist Vincent Van Gogh, *“Great things are not done by impulse, but by a series of small things brought together.”*

The Opportunity in Lighting to Reduce Emissions

When looking at the various causes of climate change, it is clear that our response must include a reduction in greenhouse gas emissions (i.e., CO₂ emissions). According to the [U.S. Energy Information Administration](#), the U.S. electricity generation in 2020 totaled 4.01 trillion kilowatt-hours, resulting in 1.55 billion metric tons of CO₂. When looking more specifically at commercial buildings in the U.S., [35% of this electricity is used for lighting](#). While LED lighting has tremendously helped decrease the energy consumption in lighting, there is another clear opportunity with lighting controls to reduce this energy consumption further.



Lighting consumes close to
35% of electricity used in
U.S. commercial buildings

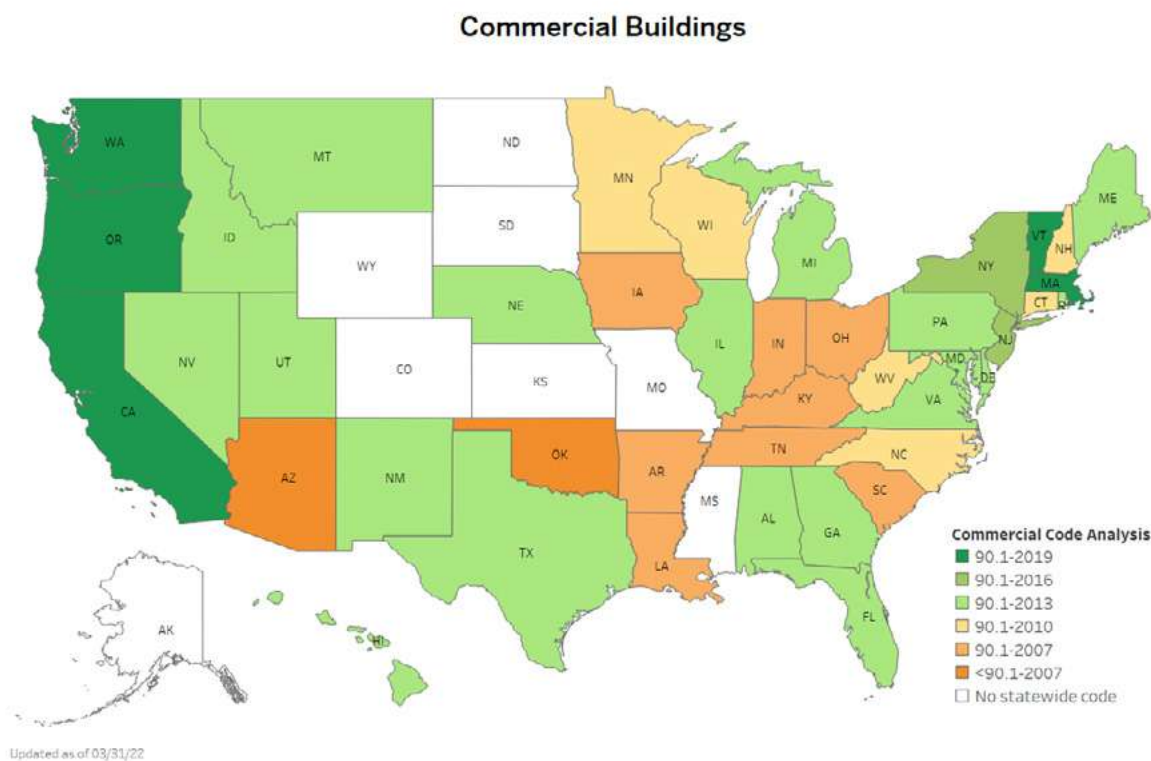
35%

The [DesignLights Consortium \(DLC\)](#) has provided independent verification of energy optimization with networked controls, resulting in an energy reduction of nearly half compared to LED lighting installed without controls. The energy reduction increases to a significant 63% when each luminaire has the capability of individual control.

However, the challenge has always been getting buy-in for networked controls on energy savings alone, since it is not always top of mind in new construction or retrofit jobs where time and cost reign supreme. Thankfully, there are various other reasons why networked controls make sense in nearly every application, and the first, most practical, is energy codes.

Energy Code Driving Networked Lighting Controls Adoption

Energy codes have been adopted in 84% of states in the U.S., with varying requirements depending on the state.



Typical requirements include:

- Occupancy sensors to prevent lighting use when no activity is present.
- Time-based controls that align with commercial operations.
- Daylighting sensors to prevent energy use when there is sufficient daylight in the space.

These strategies typically require some basic commissioning to achieve the desired result in what is referred to as a sequence of operations. With most states requiring this, an investment is required to purchase the controls, install, and commission them. Recalling the cost and time paradigm from before, the return on the investment has to be very clear. If the initial energy savings and ability to meet code compliance with networked controls do not resonate with buyers, then we need to go one step further to move the needle. Thankfully, we need not look further than the LED investment itself to find the final motivating factor.

System Life vs. Future Value

LEDs have become the norm in lighting due to their energy savings, cost, widespread availability, and substantially longer expected lifetime, when compared to previous lighting sources. This expected lifetime provides a significant amount of time before the system will be ready for an upgrade. During this time, business needs and users in a space are likely to change, which also leads to the potential for additional operational savings in the form of energy efficiency or avoidance of upgrades. However, this is only attainable if the current system is adaptable. This is where networked lighting controls shine, with their simplicity in the reconfiguration of spaces and the operation. While the energy code compliance will undoubtedly continue to drive the adoption of controls, the type of controls selected will limit or expand the ability to serve the users in a space and how much energy we consume.



Networked Lighting Control Benefits

There are significant limitations on what control operations can be achieved with basic lighting controls. While it is believed this is in the end user's best interest trying to stay within budget, significant energy savings opportunities are missed. The following are just a few of the strategies that networked lighting controls offer.

Trimming/Scene Control: Trimming is the ability to adjust the luminaire light level to the needs of the task. In the same DLC study noted above, this was recognized as a significant strategy to reduce energy consumption, and in practice, it makes perfect sense. Lighting designs need to ensure compliance to light levels, often resulting in spaces that are overlit. This can be easily adjusted to tune light levels to the precise amount of light appropriate for the space. Scene controls take this a step further by providing the ability to modify each luminaire's output for a specific task on-demand, providing a better experience for the user, while maximizing energy savings.

Support Zones: Support zones are another new concept promoted in the IECC 2018 code. In this strategy, areas like an open office are broken into multiple zones. The use of occupancy sensors allows for reducing light levels in areas supporting where motion is present. This reduces energy consumption in a majority of the open area while providing a more appealing visual design to illuminate where users are present in the space.

Controls Embedded Luminaires: Savings is not limited to where we can reduce lighting energy consumption. The very human process of installing, commissioning, and maintaining a lighting system provides several opportunities for savings. There is simply no easier installation of lighting controls than with controls embedded in luminaires. This eliminates the added cost of hardware installation, and in the case of wireless, can also eliminate any installation cost associated with wiring devices together.

Retro-Commissioning: Commissioning takes a variety of shapes, with contractors and manufacturer reps typically providing this service. While there is an end goal to meet in order to certify that the space is ready to be occupied, a building is a living space, with changes and upgrades taking place throughout the life of the building. With basic lighting controls, retro-commissioning is a labor-intensive process, with many choosing not to pay for it altogether. However, networked lighting controls provide the benefit of re-calibration, troubleshooting, and reconfiguration from a mobile app or computer remotely accessible. This extends not to just fixing errors but provides flexibility in changing business needs like hours of operation or reconfiguration of spaces. Also, many owners opt to achieve this through a managed service, that can provide on-site and remote support to ensure the system not only remains fully operational, but is continually optimized to drive further operational savings – including further energy reductions!

Grouped Response to Motion: Light is there for us to see. If we didn't have light, our work and tasks would be very difficult, if not impossible, to get done. Understanding that basic premise is important to realize how lighting controls play a vital role in this ultimate objective. One example of how this can play out in a real-world scenario is a lighting control behavior called grouped response to motion.

Grouped Response to Motion Scenario: In a parking lot at night, motion sensors can control lights to save energy when motion is not present. Walk under a light; it senses motion and turns the light on or brings the light up to a higher level. This means that an individual fixture has a higher light level, while the rest of the lot does not. As our eyes adjust to the higher light level, the rest of the lot gets much darker, restricting our ability to see our path. Similarly, if in a moving car, the motion sensors are too slow to adapt the lighting to light our path ahead. The only way to achieve energy savings and correctly provide the light we need is to have all the lights in a lot respond when one sensor sees motion. These scenarios to light our path efficiently are only achievable with a networked lighting controls system.

Building Management Integration: Building Management Systems are becoming increasingly popular, to manage multiple operational functions under one experience, and connect separate systems to achieve further operational benefits. One very popular integration is HVAC controls and lighting controls. By having networked lighting controls and connecting the system to HVAC controls, the temperature needs of a space can be managed by the presence of users in the space through the motion sensors already used for lighting controls. This has been shown to drive further operational savings, affecting more than just lighting but also the HVAC electrical demand in a space.

A Call to Action

Specifiers play a vital role in the design of lighting in commercial buildings. In shaping the design and direction for lighting, they have a responsibility to consider the needs of the owner and users of a space, code requirements, and budget conditions for the project. The specification items below highlight the features discussed, allowing for meaningful action in sustainability.

Requirement	Reason	Example Language
Trimming/Scene Control	Adjust the luminaire light level to the needs of the task. Scene controls provide the ability to modify each luminaire's output for a specific task on demand, providing a better experience for the user, while maximizing energy savings.	System shall support the ability to adjust the high trim level for luminaires. System shall support pre-preprogrammed scenes via wall switch or graphical user interface.
Luminaire Level Lighting Control	Lower cost of install and increased energy savings throughout the life of the system.	In the luminaire specification, add the requirement for "Includes provisions for luminaire level lighting control, including occupancy and light level detection".
Software Supporting Remote or Mobile App Configuration of the Space	Easier adjustment of settings by the occupant.	Remote programming of devices via personal computer or mobile application shall be supported.
Remote Management	Let the experts review and make adjustments to the lighting system remotely.	In Section 3 of the specification, under Service Agreements include a requirement for manufacturer to provide "Remote system performance checks and system optimization" for some length of time.
Group-Wide Response	Greater safety for occupants with increased energy savings.	System shall support a zone of lights responding in unison to motion sensor activity.
Building Automation Integration	Lighting and HVAC are a significant portion of a building's energy spend and are the biggest sources of comfort complaints. Building automation integration offers many benefits, such as improved occupant comfort, energy efficiency gains, maintenance and serviceability, improved data on the usage of the building, and improved building value.	System shall interface with third party building management systems (BMS) to support two-way communication using industry standard BACnet/IP protocol, BACnet MS/TP protocol, or RESTful API.

Conclusion

The breakthrough of electric lighting has shaped the rise of our industrial age, and we should not forget the fundamental reason for its existence: Lighting is here for us. It allows us to work, play, and see our environment so we can live our lives and continue the advancement of our society. As we look toward the future, networked lighting controls provide an opportunity to meet our fundamental needs while we address the challenges affecting our world, today and in the future.

While this won't be up there with the likes of Van Gogh, we have a saying around here that I think sums up our mission: We believe we **do well by doing good**. Doing your part to address a major challenge worldwide while sustaining and growing your business is not mutually exclusive. Specifying networked lighting controls is the next small step that can have a greater impact than you ever imagined.

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