The Next Generation of Wireless Lighting Control Technology

Faster Installation. Simpler Maintenance. Easier Scalability.

STEINER

EXECUTIVE SUMMARY:

The introduction of the first light dimming technology was a breakthrough in its day, and today, the lighting and lighting control industry has moved into the wireless digital age via the growth of LED technology and advanced sensor-based controls that support the fixtures. With the digitalization of light, the lighting industry has once again begun to revolutionize how lighting can be controlled to be more efficient, provide improved light quality, integrate with other systems, and collect rich data. A network of LED lights can be controlled with new levels of ease and precision using commercially available intelligent lighting modules and networking solution. This report covers how this next generation of wireless lighting control technology is transforming the industry.

A GROWING MARKET

Every year thousands of commercial buildings are built or undergo renovation. Each of these units has the opportunity to benefit from lighting controls that save energy, reduce maintenance costs and improve workforce productivity.

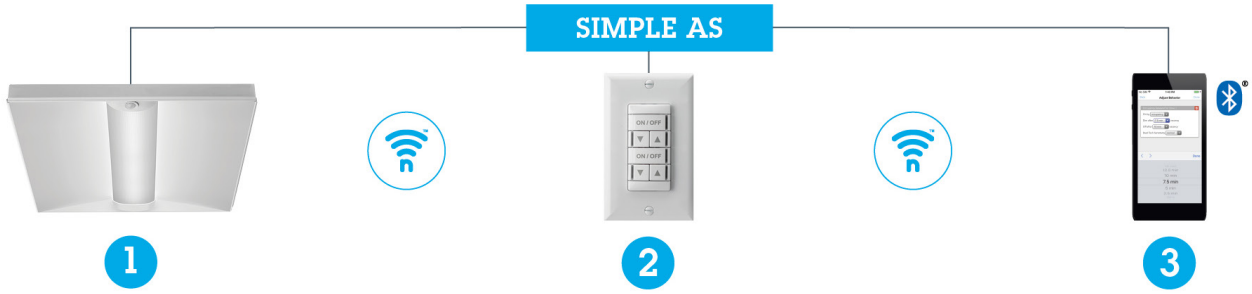
In fact, the 2012 Commercial Buildings Energy Consumption Survey by the U.S. Energy Information Administration found that the number of new commercial buildings grew 14% from 2003 to 2012, and the footprint of those buildings is getting larger. Contrasted to new construction, the survey found that 60 percent of U.S. commercial buildings were constructed before 1980. These figures represent a tremendous opportunity for contractors and MROs. Demand will be high for time and labor-saving products and solutions.

Wireless lighting technology fits the need for those solutions.

Companies throughout the lighting and lighting controls industry are developing new wireless technology. Two of these new wireless, digital products include:

• **Lutron Vive:** a wireless lighting control solution for new and existing commercial buildings. Vive wireless solutions offer a multi-strategy approach that accommodates an array of budgets and current performance needs, while maintaining flexibility for future needs of your building.

• **Acuity Brands nLight® AIR:** a simplified wireless lighting control solution that works in tandem with Acuity Brands' diverse group of commercial LED lighting fixtures that are embedded with smart sensors, as well as wireless wall switches that give users the ability to regulate devices on any handheld device.



1

Install nLight® AIR enabled fixtures. The embedded smart sensor helps to achieve energy code compliance.

2

Install wireless battery powered wall switch. Multiple configurations available to meet the needs of your customer.

3

Download the CL*AIR*ITY app, pair the fixtures to the wall switch and configure the lights to match your space.

These products make it easier-than-ever to bring energy-savings and maintenance efficiencies into new and existing commercial buildings. When additional lighting is needed, they are easy and quick to install. Installers and designers can start with a single room or one or more lighting zones. Then, as needed, the systems can expand to multiple rooms, and then to whole buildings. All of which can be monitored and controlled from a central location or even a smart communication device. Because an LED fixture's typical rated lifetime is up to 50,000 hours, far exceeding the life cycle of other lamp types, maintenance is reduced and are more cost efficient.

Traditional installation can be labor intensive and complex to set up. Wired solutions require all the necessary equipment for executing wired terminations, a relay pack and a remote-mounted occupancy sensor. Additional cable will be needed to run from the relay pack to the sensor.

For new buildings, wireless technology can be installed quickly and without the need for miles of conduit and wire. The technology can be placed where needed allowing for creative interior design choices without the worry of running cable to fixtures.

For retrofitting, wireless allows the existing infrastructure to remain with LED fixtures installed in place and wireless devices placed where needed. Difficult and sometimes previously impossible locations or applications can be outfitted with wireless components. Installation can be accomplished in minutes with little impact on the surrounding work area.

As compared to wired systems, wireless lighting control solutions offer several advantages right from the start, according to Pat Foley, controls project manager for KSA Lighting and Controls, a Hanover Park, Ill.-based lighting agency that represents Acuity Brands' lighting and control products. They are easier to design, and faster to install and set up than wired systems, and more cost effective in terms of time and material costs. Wireless is flexible and scalable and offers greater opportunity for centralized monitoring and control.

COMPLYING TO BUILDING CODES

To build and maintain energy efficient commercial structures, energy codes and building standards now require sensor installations in many commercial spaces. These code requirements include ASHRAE 2010, ASHRAE 2013, IECC 2022, IECC 2015, and California Title 24-2016.

While these rules and regulations encompass the breadth of a building's energy usage, the codes also tackle lighting efficiency.

Because as much as 17% of a commercial buildings energy usage is lighting related, according to the energy consumption survey, the focus on lighting has led to the development of new technologies that are more capable than previous lighting controls iterations.

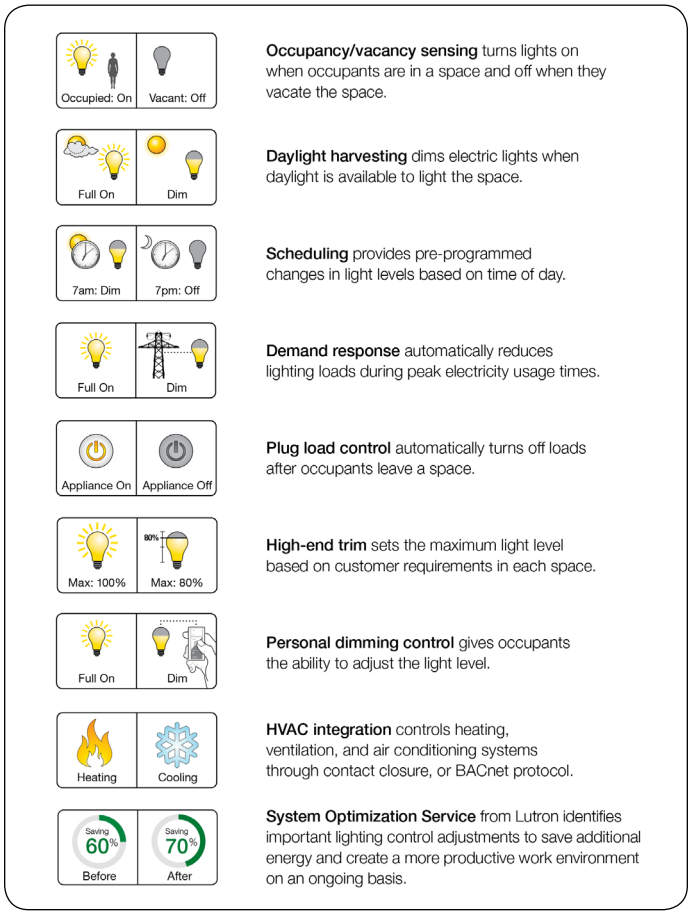
Today's sensors provide a broad and expanding range of information to the lighting controllers. Sensor technologies such as Vive and nLight AIR can help meet building energy codes out of the box. The intelligent controls can work on their own and make decisions based on multiple inputs such as the amount of ambient light, time of day, location, and user preference.

(See Chart 1)

These industry and municipal codes require more advanced lighting control systems in retrofits and new construction, and specifiers and contractors are increasingly called on to include lighting controls in their project proposals.

The codes require lighting engineers to design lighting systems that meet prescribed power allowances. In recent years, the two main strategies to accomplish this have been occupancy-based control in which lighting is turned on when a space is occupied and turned off when the space is unoccupied. This could be accomplished with timed-switches or sensors that determine if a person is in the room.

The ANSI/ASHRAE/IES Standard 90.1 and the International Energy Conservation Code (IECC) are two prevalent energy codes governing lighting, with some municipalities, including Chicago, having specific energy codes.



Source: Lutron®

Chart 1

	Control Requirement*	Code Provision	Code Summary*	Space Type								
				Private Office	Open Office	Conference, Meeting, Multipurpose Room	Classroom, Lecture Hall, Training Room	Lobby	Corridor	Restroom	Non-Exit Stairwell	Warehouse
ON-OFF CONTROL	Manual-On or AutoOn ≤ 50%	C405.2.1.1.2	Automatically controlled spaces must be controlled to automatically turn the lighting on to not more than 50% power.	✓	✓	✓	✓					
	Full Automatic-On	C405.2.1.1.2	Automatically controlled spaces are allowed to turn on to full.					✓	✓	✓	✓	✓
	Auto-Off ≤ 50%	C405.2.1.2	Occupancy sensors shall automatically reduce lighting in ware-house aisle-ways and open areas by ≤ 50%									✓ (or)
	Full Auto-Off via Occupancy Sensor	C405.2.1.1.1	Fixtures must automatically turn off within 30 minutes of all occupants leaving the space.	✓	✓ (or)	✓	✓	✓ (or)	✓ (or)	✓	✓ (or)	✓
	Time-Switch Controls (via System Controller)	C405.2.2.1	Each area of the building not provided with occupant sensor controls shall be provided with time switch controls. These areas must also be provided with a manual override switch.		✓			✓	✓		✓	
	Light Reduction Controls	C405.2.2.2	Spaces shall have a manual control that allows the occupant to reduce the connected lighting load uniformly by at least 50%.		✓ (or)						✓ (or)	
	Manual Control (Local Switch)	C405.2.2.3	Areas shall incorporate a manual control to allow occupants to turn fixtures off.	✓	✓	✓	✓	✓	✓	✓**	✓**	
DAYLIGHT CONTROL	Daylight-Responsive Controls	C405.2.3.1/2	Daylight-responsive controls shall be provided within each space with sidelight and toplight daylight zones totaling > 150W.	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: Acuity Brands®, "IECC 2015 nLight Applications Guide"

Table 1

Building codes are often specific as to what the lighting controls should do, and when they should do them. *(See Table 1)* For instance, the IECC allows engineers to design with occupancy sensors in lieu of time-switch-based devices and systems. The IECC 's Regulation C405.2.2.2 mandates that occupancy sensors be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, storage rooms, janitorial closets, and other spaces 300 sq. ft. or smaller enclosed by ceiling height partitions, according to Foley.

Acuity Brands' IECC 2015 nLight Applications Guide reports that occupancy sensors for these spaces must shut off lights after 30 minutes of being unoccupied. In addition, the occupancy sensor must be manual-on or 50% auto-on/50% manual-on. (Manual-on occupancy sensors are also known as vacancy sensors.) Full automatic-on is acceptable in public corridors, stairways, restrooms, primary building entrance areas, lobbies, and where occupants would be endangered due to potential safety and security issues.

Foley said that contractors, MROs, installers and others are looking for wireless controls that lend themselves to easier install and maintenance processes. In addition, some end-users are drawn to wireless technology because it is a green, more energy efficient product and the number of control options are growing.

Adds Jacob Hurwitz, controls designer for KSA: "In the Chicago market, all wires go through conduit, so in addition to it being easier to work with, installation costs are lower because wireless technology means less conduit used."

LUTRON VIVE

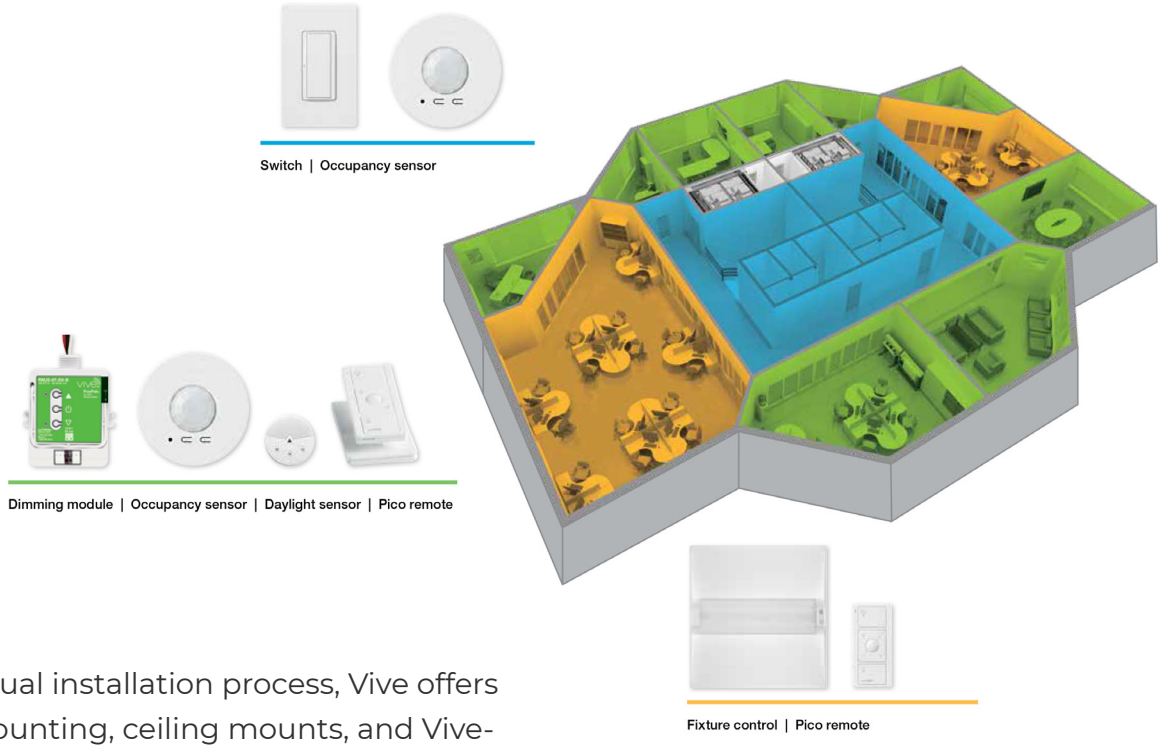
Vive is simple enough to deliver basic energy savings, i.e. occupancy sensors, and robust enough to apply additional lighting control solutions such as time-clock scheduling, energy and system monitoring, demand response, load shed, and seamless integration to Building Management Systems via BACNet with software that works on any smart device.

(See Chart 1)

Vive lets you combine lighting-control solutions to maximize efficiency. Depending on the application, the installer can pair occupancy/vacancy sensing, daylight harvesting, scheduling, demand response, plug load control, high-end trim, personal dimming control and even HVAC integration, says Eric Lovingfoss, manager of distributor sales for Elmhurst, Ill.-based Archibald & Meek, a local lighting agency, representing Lutron products. According to Lovingfoss, the Vive wireless control system can be installed as much as 70 percent faster than traditional wired lighting control solutions. This reduces labor costs and minimizes disruption among workers and those utilizing the space.

"Vive is a scalable, flexible lighting control solution that easily transforms a building one step at a time, or as space needs change, and helps address energy-saving issues," says Lovingfoss "For contractors, Vive represents a reliable, simple, time-saving product that's versatile enough to control all light sources in any size commercial building. This product addresses the needs of customers on many levels."

Lutron Vive features a centralized control and integration unit called the Vive Hub. The wireless hub communicates with various devices including remotes, sensors, lighting controllers and plug-load companies. The company's Clear Connect® Wireless technology can establish communications with lighting and building controls at a range of 71 ft. Clear Connect operates on the 435 MHz band wave, a band wave chosen, the company says, because it is less busy. In fact, the FCC puts limitations on the amount of traffic that can operate over this wavelength.



For the actual installation process, Vive offers wallbox mounting, ceiling mounts, and Vive-enabled fixtures on a standard junction box. Wallbox mounting allows contractors to replace an existing switch in a standard wallbox to control a group of lights, and it requires no new wiring. For the ceiling mount, the company's PowPak dimming/relay modules mount on a standard junction box in the ceiling to control groups of lights. It saves installation time by eliminating wiring down through walls. Vive-enabled fixtures have wireless control and sensing built into the fixture.

For example, if a contractor or MRO is replacing a switch in a restroom where there is currently a toggle switch on the wall, the installer takes out that toggle switch and puts in either a wireless switch or a dimmer into that location without any new wiring. Commissioning the switch can be as simple as depressing a button on a remote control for several seconds.

One benefit of easy commissioning is if the installer and the person that will use the controls are not one in the same, says Lovingfoss.

The person doesn't have to climb on a ladder to find the load controller. The app or web-based programming enables the user to find nearby devices based on RF signal strength. Simply flashing the fixtures from the app is all that is needed to program pico, occ/vac sensors and daylight harvesting devices.

Vive can also be tied into building management systems. A simple ethernet port ties Vive to other building systems. The BACnet/IP protocol is the primary means of integration. BACnet is embedded or native in the Vive wireless hub, which means no external interfaces or gateways are required to communicate with other systems.

For instance, Vive can work with a buildings' heating, ventilation and air conditioning system and utilize its occupancy/vacancy sensors to heat and cool individual rooms, floors or whole buildings. While some buildings have already begun integrating HVAC control into their building SOPs, in the future this capability might be required by code.

ACUITY BRANDS NLIGHT® AIR

Acuity Brands nLight® AIR platform is the wireless extension of its nLight digital lighting control platform. The fully wireless lighting control system boasts a five-tier security architecture with Data Encryption, Authentication of Devices, Communication Encryption, Limited Anonymity of Devices, and Verification of Device Firmware as part of its security protocols.

Foley says that nLight AIR is ideal for building owners and contractors who want to seamlessly upgrade facilities to LED lighting control solutions that comply with state energy code requirements for both indoor and outdoor applications.

The nLight AIR control system consists of nLight AIR-enabled LED luminaires equipped with eldoLED® LED drivers, wireless battery powered wall switches, and a mobile configuration app, CLAIRITY®, for quick startup. The systems can use a building's existing wiring, which can reduce installation costs and accelerate return on investment.

Acuity Brands ships its nLight AIR-enabled luminaires with a smart environment multi-function sensor integrated to the fixture. The multi-function sensor detects and shares motion, daylight, and temperature data. According to Foley, the multi-function sensor is factory integrated and tested. In this way, he says the wirelessly networked lighting control platform is deployed automatically with each installed luminaire.

Multiple Acuity Brands luminaires and relight kits are available for the new nLight AIR lighting solution including the WL, BLT, and VTL LED luminaires from Lithonia Lighting® and Peerless® LED luminaires for commercial projects.

Each nLight AIR control device features a dual wireless radio solution with both 900MHz and Bluetooth® Low Energy (BLE) communication technologies. The 900 MHz band is ideal for indoor and outdoor intra-zone communications, controller-to-zone communications on integrated networks, and firmware upgrades, according to Hurwitz. The BLE wireless technology is best for commissioning, diagnostics, and remote wall switch management as well as smart building applications such as asset tracking and wayfinding.

Acuity Brands nLight AIR enabled luminaires can be programmed by smart phone with the company's CLAIRITY app. The app features a touch-based user interface that gives users real-time feedback and acknowledgments during the start-up process. It enables complete configuration of nLight AIR devices and can use default or customized wall-switch configuration, occupancy and daylight sensor settings, and sequence of operations commands. The CLAIRITY app registers and verifies users before use for added security and continuity, and is available on Google®, Android®, and Apple® iOS devices.

The nLight AIR control system also features its rPODB series of wall switches that the CLAIRITY app can remotely manage. Under normal usage and conditions, the batteries pre-installed in the rPODB switches are designed to last for 10 years.

Acuity Brands says that the nLight platform's architecture enables easy future upgrades to smart buildings with minimal investment. The company further reports that new features and applications such as SensorView® and BACNet integration with real-time configuration and performance monitoring as well as indoor positioning and non-lighting IoT sensors, can be easily and cost effectively added.

CONCLUSION

The next generation of wireless lighting control technology is ushering in a multitude of benefits for contractors, MROs, designers, installers and end-users. For both new construction and retrofit projects on existing commercial buildings, wireless lighting control solutions, including Lutron Vive and Acuity Brands nLight® AIR, provide faster installation times, simpler maintenance, and easier scalability.

For more information and to speak with an experienced Steiner lighting controls application engineer, please call **1-800-STEINER (783-4637).**