

Luminaire Level Lighting Controls: The Future of Intelligent Lighting



ASK THE EXPERTS

Q&A with Chris Meek, Associate Professor of Architecture at the University of Washington

As the commercial lighting industry continues its steady move towards more advanced controls and lighting solutions, for many experts, all signs point to networked lighting controls. And when it comes to truly intelligent, flexible lighting with non-energy benefits, the future could be Luminaire Level Lighting Controls (LLLCs).

Can you give us a short summary of your experience in the lighting industry?

I'm a faculty member in the Department of Architecture at the University of Washington, and I've been in the lighting industry for almost 20 years with a focus on energy efficiency, daylighting and controls. My background is in architecture, but I also do research on building performance, energy and lighting and human experience.

Where do you see the lighting industry headed?

That's a big question. I think a lot of progress has been made in energy efficiency just through the transformation of LED. From an energy efficiency standpoint, a lot of future savings will come from the improvement of existing buildings: there's a lot of poor quality, inefficient lighting out there in the wild. Buildings that were built more than five or six years ago are ripe for LED retrofits and controls retrofits, and therefore for new energy efficiency savings.

I think there's also a lot of interest in the relationship between light and health, and in the ways that lighting impacts human wellness. We're starting to

look at how daylighting can help support the effective entrainment of the circadian rhythm, or your body's natural sleep-wake cycle. I think that trend will continue for the next decade or more.

In the near term, we're going to see continued innovation in the form and capability of fixtures. When LEDs first came out, the goal was to emulate existing lighting technology. I think the next step is rethinking the look, feel, application and size capabilities of LED fixtures. And we're already starting to see more low-profile and elegant fixtures being developed.

What do you want people to know about LLLCs?

They're really flexible and adaptable. They're plug-and-play: you can just hang them up, energize them, and immediately they'll meet code and be super energy-efficient. Plus, they can be installed in parts and the pieces—ideal for an owner who wants to retrofit their building but maybe doesn't have the budget to do it all at once. And because LLLCs are a unique, self-contained luminaire control system you don't have to go in and do a comprehensive controls upgrade to install them.



What are your favorite use cases right now for LLLCs and why?

Offices are a great example: productivity and flexibility are key, and therefore providing advanced controls is too. LLLCs can be regrouped on the fly with just some programming controls. They will also be durable, but easy to take down and reprogram if you need to adjust.

I've also heard some compelling cost cases in schools. Schools have complicated lighting controls to meet requirements for things like fire alarms and notification systems, especially in main corridors. That means running a lot of low-voltage cable and other hardware and wiring. Using LLLCs in classrooms allows a school to consolidate and simplify its central control system to common areas. It's a straightforward but impactful simplification.

When it comes to the biggest reasons LLLC systems are installed, we hear a lot about non-energy benefits and the growing cost savings potential with utility incentives. What do you see as the top reasons for specifying and installing these systems?

Cost and flexibility. You can reconfigure and reprogram the way that you control an LLLC system locally, with wall switches and other controls. But I think the real benefit is that you don't have to rely on a built-up control system from a lighting control panel. You just install the fixtures and, right out of the box, they're already commissioned for

daylight sensing and for vacancy or occupancy sensing. Having the ability to hang the fixture that immediately meets code without touching anything else in the building can mean a huge cost reduction.

You'll also benefit installing LLLCs in spaces where you're not certain about configuration, or in spaces that you expect to change frequently. Whenever you simplify something, reduce labor for set-up and installation and make future upgrades easier for yourself or for an owner, you save.

What advice would you give to architects who are still hesitant about considering an LLLC system in their next project?

Lighting controls aren't necessarily something that architects would have on their radar, so my advice would be that architects work to better understand lighting technology and how it can serve them. What I think they will find is that LLLCs end up serving their purposes best. That goes for retrofit spaces in particular, but also for new construction where downstream flexibility is critical.

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Q&A with Shaun Darragh, Senior Lighting Specialist at Lighting Design Lab

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Can you give us a short summary of your experience in the lighting industry?

I've been a lighting designer for more than 30 years. I've done everything from running design studios to a brief stint in technical sales for lighting. Currently, I'm the Senior Lighting Specialist for Lighting Design Lab, which offers lighting technology services and resources to electric utilities, energy efficiency organizations and trade professionals.

Where do you see the lighting industry headed?

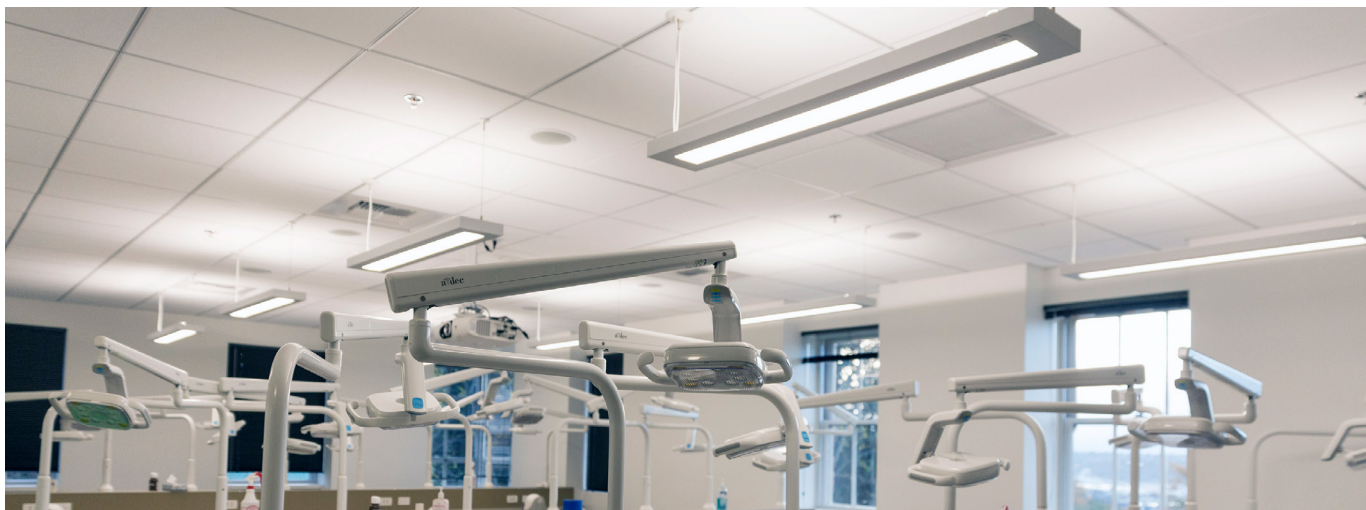
First, I think we will see a major shift towards interconnectivity: we'll see building systems all working together in a unified way. I've done projects with interconnected systems and there have been a lot of barriers, but I think communication methods will become more integrated with the use of wireless and Bluetooth devices.

I also think there is going to be a greater emphasis on the quality of light. The industry is realizing that it's time to improve the quality of our light sources and focus on color fidelity. In the past, we saw a big push to maximize light efficacy without respect to quality – now quality needs to catch up.



We know that office buildings, schools, hospitals and warehouses represent some of the best use cases for LLLCs because of additional non-energy benefits with many systems (like building system integration). What are your favorite use cases right now for LLLCs and why?

I agree with that list, and I would add in multifamily residential buildings as well. Generally speaking, any place with a need for large area lighting will benefit from LLLCs. The savings potential with these systems is enormous. LLLC systems also ease maintenance and improve longevity. In LLLC systems, each individual fixture has a sensor that can be programmed to speak with all the other



fixtures in any way you'd like – they become part of a unified whole that speaks a common language. It's super powerful.

When it comes to the biggest reasons LLLC systems are installed, we hear a lot about non-energy benefits and the growing cost savings potential with utility incentives. What do you see as the top reasons for specifying and installing these systems?

The first case in which I would typically use an LLLC system is new construction because LLLCs simplify maintenance, allow you to choose your control zones and make design and installation easier – you don't have to do any wiring. LLLC systems are also strong when it comes to retrofits. In a building retrofit situation, because you already have power in the ceiling, installing an LLLC system is just programming– all you need is a mobile app in many cases. It all comes down to simplification of design, maintenance and reconfiguration.

What advice would you give to designers who are still hesitant about considering an LLLC system in their next project?

The hesitation I see most frequently is cost. Upfront, a luminaire equipped with LLLCs is more expensive than one that's not. But LLLCs are simpler to install and require and less wiring than less expensive luminaires, which means lower labor costs. My advice would be to check if your utility offers incentives on these products. Many utilities are now

offering incentives on LLLCs, and sometimes they're big enough to cover the total added cost of the fixtures.

Is there anything else people should know about LLLCs?

I teach a lot of lighting classes for a wide spectrum of audiences, and the biggest thing I do is to try to make LLLCs seem less scary. They used to be very complicated, but today they're very simple. There's no need to be afraid anymore!

The second idea that I teach is that people are coming to expect inherent flexibility with their technology. The example I always give is cell phones: 20 years ago, whenever I made a call it sounded like I was in a fish bowl. I didn't question it; that was just the expectation at the time. Today, cell phones have evolved: we now expect and demand higher quality. Greater expectations for our technology, including lighting, are all part of the digital revolution – and anybody in the design or construction fields that doesn't understand the power of systems like LLLCs will be left behind.

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Q&A with Damon Bosetti, Technical Manager at DesignLights Consortium

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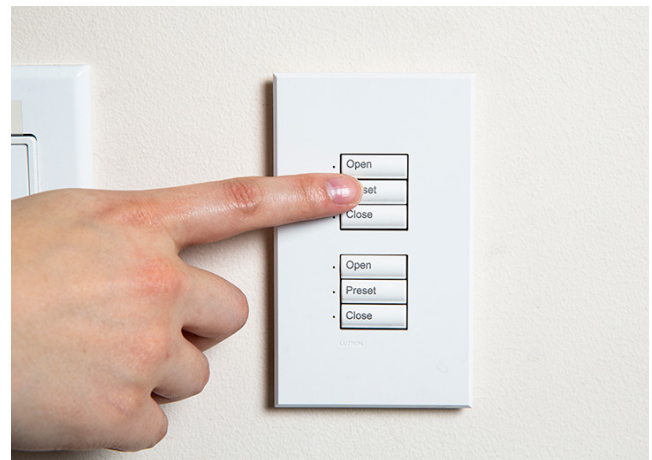
I'm a technical manager at the DLC, a non-profit whose mission is to drive efficient lighting through thought leadership, technology and collaboration. I focus on horticultural and networked lighting and spend my days working to get the lighting industry to accelerate its transition to the newest solid state lighting and control technology.

Where do you see the lighting industry headed?

The energy-related benefits of increasing efficiency will continue to guide the industry. And while we're improving slowly now, we'll eventually see fixture efficacy in the range of 200 lumens per watt. And LLLCs and other networked controls help cut the energy consumption of already highly-efficient sources by an additional 50% or more.

Also, until now physical wiring has defined the behavior of lights in a facility. If you wanted to change what the switch did, then you needed to pull more wire—at great cost. I've begun thinking of the future as one of software-defined lighting, in which the physical fixture's installation does not drive

considerations of control and sensing. Just like a computer can change what it does with new software, a building's lighting will be as flexible and responsive as its firmware and software allow.



What should people know about Luminaire Level Lighting Controls?

LLLCs make lighting controls easier for both designers and installers. You no longer need to figure out where to place sensors – they're already built into every fixture. You also don't need to install separate sensors and deal with associated wiring and mechanical challenges – again, they're pre-installed.



LLCs are a great way to future-proof your lighting design against unknown changes in your facility. Building in sensing and control points at each luminaire maximizes a system's flexibility, which allows for all kinds of behaviors that can save energy while improving the way people experience the space.

The same aspects that make LLCs relevant in the energy space are going to give them great dual-use capabilities for non-energy benefits, or NEBs. The sky's the limit with ubiquitous sensing and data collection: the data that these systems will collect will help us find answers to questions we don't even know to ask yet.

What are your favorite use cases for LLCs right now?

LLCs are already delivering value to early adopters in specific vertical markets. Sensors in every luminaire allow LLCs to deliver precise data about location, for example. In hospitals, that can mean that medical staff, patients, and portable equipment get to the right place at the right time. In warehouses and retail, the same technology can map occupancy patterns and help place products based on their popularity. In schools and office conference rooms LLCs improve efficiency and support a suite of new lighting experiences. LLCs are also a great "thin end of the wedge" for slowly diving into the concept of improved

building automation. By letting a few extra sensors piggyback on the lighting control and communication network, users can experiment with a "Building Management System-lite" experience at a very reasonable cost.

What advice would you give to people who are still hesitant about considering an LLC system in their next project?

Try before you buy, and start small, Find two or three system manufacturers on the DLC Networked Lighting Control's [Qualified Products List](#) (be sure to filter for interior and Luminaire Level Lighting Controls), and ask them to arrange a demonstration with real hardware and software. Don't just read the brochure: get a feel for what it's actually like to work with a system. You'll find that manufacturers have put a lot of work into developing products, and that those products have improved dramatically from even just a few years ago.

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Q&A with Steve Mesh, Principal at Lighting Education & Design

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Can you give us a short summary of your experience in the lighting industry?

I have had a 39-year career in the lighting industry, most of which I've spent as a lighting designer or consultant. I've worked to design lighting and improve sales at some pretty amazing companies, and I've also taught for 35 of those years. I gained a lot of knowledge working on many different sides of the industry.

Where do you see the lighting industry headed?

That's a tough question. It's confusing right now because the industry is in flux. I like to tell my students that a few years ago I thought I'd be able to coast for decades on my knowledge of incandescent lightbulbs – but that knowledge is worthless now. You constantly have to learn new things.

There are also major changes in who is buying the technology and what they're doing it with it. One example is Lighting as a Service, which is a whole new model for how innovative lighting can be financed. Due to initial cost, people might avoid buying networked lighting control systems. The idea behind Lighting as a Service is that the end user leases a lighting system, rather than owning it. It's kind of like computer software: you pay an annual fee to use it instead of buying up-front, and then upgrade when a new model comes out.



When it comes to the biggest reasons LLC systems are installed, we hear a lot about non-energy benefits and the growing cost savings potential with utility incentives. What do you see as the top reasons for specifying and installing these systems?

Flexibility, flexibility, and flexibility. As a designer, I want maximum flexibility at any time, with anything, on any project. LLCs give you the most flexibility for a networked lighting control system: if you don't have LLCs then you're always restricted in some way. For example, you may be restricted because groups of fixtures are wired to one control device and there's no way to split them apart later. If a designer wants the most flexibility, they should choose LLCs.

Also, with LLCs you achieve a greater level of granularity. For both installation and commissioning,



you don't have to make complicated decisions about which components of the system talk to each other because it's on a per fixture basis – and any decision you do make you can easily undo.

We know that office buildings, schools, hospitals and warehouses represent some of the best use cases for LLLCs because of additional non-energy benefits with many systems (like building system integration). What are your favorite use cases right now for LLLCs?

To me, saying that LLLCs work better in one building type over another seems like an artificial distinction. I could easily make a strong case for using these anywhere. I teach a class on behalf of the DesignLights Consortium, or DLC, and in that class we actually look at a couple of different project types for spaces like offices and warehouses. Inevitably, we conclude that it's easy to make the case for LLLCs in any space, because the underlying benefits that make LLLCs so valuable are applicable anywhere.

What advice would you give to designers who are still hesitant about considering an LLLC system in their next project?

I think we should start by talking about the reasons why people are hesitant about LLLCs so we can figure out how to overcome them. Cost, for

example. Many utilities offer incentives on LLLC systems that can offset the increased per-fixture cost. And, easier installation can also offset higher equipment charges by reducing labor costs.

Beyond that, some people may be hesitant due to the perceived complexity of specifying, installing or operating an LLLC system. LLLCs, however, actually streamline installation. Wiring an LLLC fixture is about the same as wiring any other fixture a contractor might have worked with before. In terms of operation, it's also similar. Once you install it, the per-fixture granularity is even simpler than other new control systems.

In my view, the benefits of installing an LLLC system far outweigh any possible difficulties. And anybody can learn how to do this! I originally went to art school, and I'm now an expert in networked lighting controls with a 39-year career in the industry.

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