Past as Prologue:

What's Ahead for Solid-State Lighting?

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Connected lighting systems ensure light is delivered only where and when it's needed—and much more.

Over the last decade, solid-state lighting (SSL) has evolved from a novelty to a viable option for most general lighting applications. Back in 2005, some likened the lighting market to the Wild West—not only because early SSL products didn't match the performance of the technologies they were intended to replace but also because a lack of standards caused a great deal of confusion that was compounded by exaggerated performance claims.

Today we're seeing a new landscape. With SSL as a viable option for almost all applications and industry-standard test procedures widely used, there's general acknowledgement that, for the majority of lighting applications, SSL will eventually become the dominant technology. It's beginning to feel a bit like the Wild West again. The replacement of today's lighting infrastructure with increasingly controllable SSL products (e.g., controllable for luminous flux, white-point, chromaticity) begs consideration of what could be achieved by integrating other microelectronic components, such as network interfaces and sensors, into lighting devices.

Systems made up of connected lighting devices could become data collection platforms that enable even greater lighting energy savings in buildings and cities, and much more. This ability to collect and exchange useful data and possibly even serve as a backbone of the fast-emerging Internet of Things (IoT) offers the potential to enable a wide array of services, benefits, and revenue streams that enhance the value of lighting systems.

Right now, however, that potential is still on the table, as technology developers try to strike a balance between minimizing configuration complexity, agreeing on how to achieve interoperability between devices and systems that need to be able to share usable data, and realizing the ability to measure and report key performance metrics such as energy consumption.

Not There Yet

To get everyone talking about how to most effectively work together toward these goals, the U.S. Department of Energy (DOE) held its inaugural Connected Lighting Systems Meeting in November in Portland, Oregon. The event brought together lighting technologists, their counterparts from the semiconductor and IT industries, utility personnel, and many others to start a cross-cutting dialogue about how best to take advantage of the imminent collision between lighting systems and the IoT.

Gabe Arnold of DesignLights Consortium™ spoke about why it is important that lighting systems evolve and what those evolved systems might look like in the near future. He noted that until now lighting controls have seen limited deployment and have not always met energy-saving expectations. This is due, he said, not only to their complexity (which is driven in part by a lack of standardization) but also to a lack of knowledge of how to design, install, commission, and operate them—all of which lead to higher costs, as contractors bid up their prices to cover themselves.

Mr. Arnold posited a future in which sensors, intelligence, communication, and even energy measurement are incorporated into every device and luminaire and are integrated and standardized so that costs are dramatically lower than today. In such a scenario, we'd purchase lighting the way we now buy cars—a basic model to which various advanced features could be added.

Some of the necessities for achieving that vision were outlined by Michael Poplawski of Pacific Northwest National Laboratory, who emphasized the importance of energy reporting, noting that "you can't manage what you can't measure." He stressed the need for interoperability, so that multiple devices, applications, networks, and systems can work together and reliably and securely exchange data.

The challenge, of course, is agreeing on common platforms and protocols that facilitate the transfer of useable data among lighting devices, other systems, and the cloud. Several groups are establishing some order and consensus in this area.

Mr. Poplawski moderated a panel featuring representatives from the ZigBee Alliance, the AllSeen Alliance, oneM2M, and the Open Interconnect Consortium. Each is working on a different aspect of, or taking a somewhat unique approach to, interoperability. In the process, they are demonstrating how industry can simultaneously compete and collaborate while working toward a common goal.

DOE's primary goal in hosting the Portland meeting was to foster this kind of exchange and to ensure that energy efficiency—which could be significantly increased by providing intelligent SSL devices with data that allow them to optimize their performance—doesn't get lost in the shuffle amid all the other services and benefits connected lighting is poised to bring.

Some of these other benefits were highlighted by a panel that focused on recently installed systems. Kaynam Hedayat of Digital Lumens described how a system installed at Atlas Packaging not only saved energy but also provided occupancy data for path tracking through the warehouse, which led to optimized inventory placement and improved traffic flow. The system is also used to monitor the energy consumption of laboratory equipment for capital investment management, monitor the energy consumption of production equipment, and provide visibility into equipment utilization. (See "Tracking Occupancy Saves Energy," next page.)

Dan Cocosa of Google noted that, at his company's facilities, dimming the lights to 20 percent when occupants have vacated a space is a response adjusted according to demand. Google also plans to monitor energy consumption and use occupancy sensors to optimize building-space utilization. This will determine what entrances and exits people use the most and automatically control lights and HVAC.

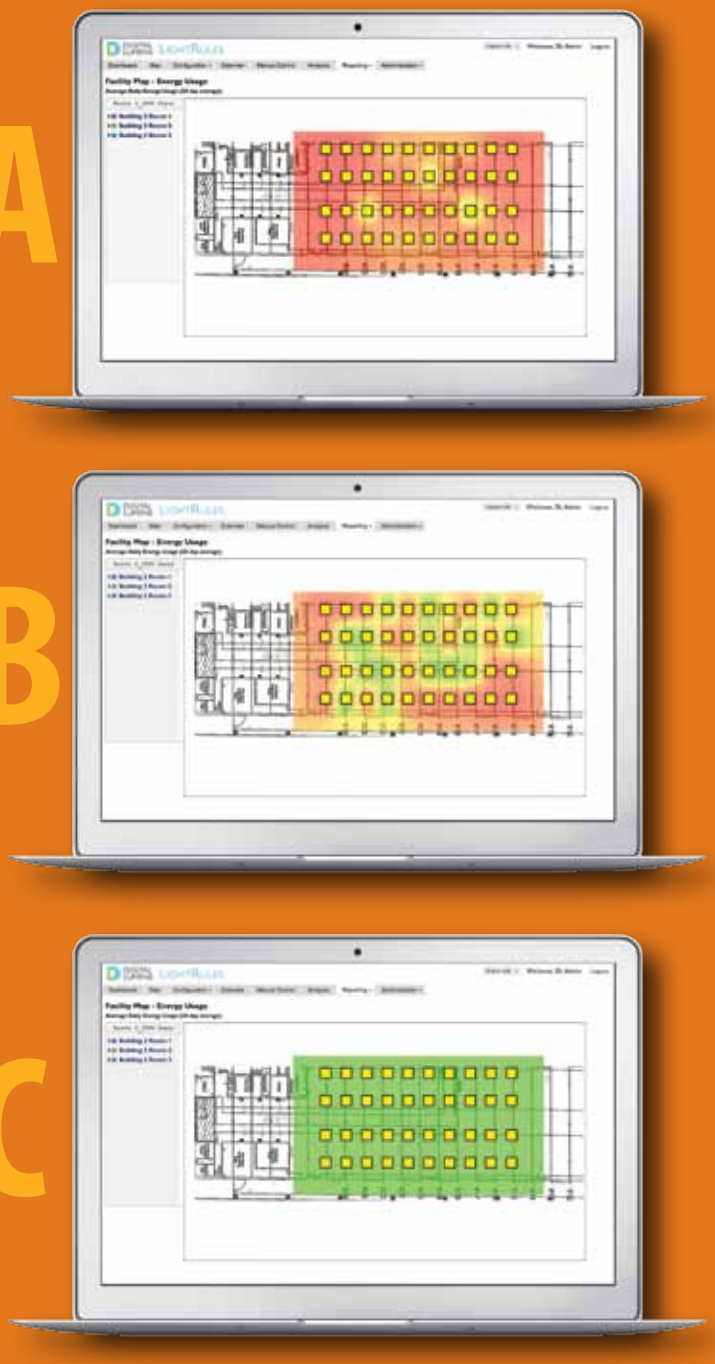
The potential of future connected lighting systems is multifaceted and seemingly infinite. To reach that potential, we must figure out where and how to collaborate. The DOE meeting in Portland was a first step and will be followed by a second meeting in June (details forthcoming). DOE also plans to provide technical support for various industry consortia efforts (in lighting and IT) and to conduct studies that test and characterize various aspects of installed connected lighting systems, providing manufacturers, specifiers, and users with critical information on emerging products.

Collaboration is essential if the promise of connected lighting systems is to be realized. It's well worth the effort because success will bring a whole lot more than energy savings.

Mr. Brodrick is the lighting program manager for the U.S. Department of Energy Building Technologies Program. To learn more about DOE efforts related to connected lighting systems, visit www.energy.gov/eere/ssl/connected-lighting-systems.

Tracking Occupancy Saves Energy

A system installation saved energy, provided occupancy data, optimized inventory placement, and improved traffic flow. Exhibit hall occupancy data reported by connected lighting at 9:00 am (A), 3:00 pm (B), and 9:00 pm (C).



Images courtesy of Digital Lumens