

Lighting Offers Bright Future for Smart Cities

LED lights and ultra-smart controllers save energy and money

A big chunk of global electricity goes to lighting streets and public spaces in the world's cities, towns, and villages, making more efficient public lighting a huge target for contributions to a more sustainable world. Today, conversion from traditional lighting systems to LED technology is the key to energy and cost saving in all lighting applications. LED technology offers far greater energy efficiency, which reduces the electrical power required to generate a fixed amount of light, and the additional benefit of long-lifetime LEDs, which reduce maintenance and replacement costs.

In cities of emerging nations, LED lighting can be prescribed from the start. Where the public lighting infrastructure already exists, conversion to LED technology is increasingly underway or planned. Why? The city of Boston, by the end of 2012, had converted 40% of its 64,000 electric streetlamps to LEDs, producing about 35% savings (\$2.8 million) in annual electricity costs¹.

But energy efficiency and reduced maintenance costs aren't the only benefits. Unlike all earlier street-lighting technologies, LED lamps are dimmable, creating new opportunities to integrate smart public lighting into smart cities for even greater power savings. All previous public-lighting technologies, from the first electric-arc lights used in the 19th century to the high-intensity discharge lamps widely used today are either ON or OFF. As a result, most public lighting departments simply choose what times to turn all their lights on or off.

In contrast, LED streetlights provide variable output levels, opening up unprecedented opportunities for innovative lighting schemes that provide appropriate light for safety and convenience without wasting energy by producing more light than is needed. These schemes could consider local climate conditions, activity patterns, and even the operating hours of local shops, bars, and restaurants.

Not a lumen more, not a lumen less

A few strategically placed ambient light sensors could also enable a smart public-lighting system that gradually adjusts lighting output as the sun rises and sets. The

¹ <http://www.cityofboston.gov/publicworks/lighting/led.asp>

sensors could also reduce the streetlamp output under bright moonlight or increase light output to compensate for clouds, smog or heavy rain.

Another opportunity to save occurs late at night or in remote locations, when today's streetlights continue to burn at full power, even if they are unneeded. LED lamps can be gradually dimmed to suit local environment and traffic conditions, so, in areas where it is considered safe to do so, alternate streetlights could be gradually dimmed or turned off after a certain time.

In addition, most cities and towns have streets or areas full of shops, bars, and restaurants that when open project enough light into the street to minimize the need for public lighting. Again, ambient light sensors could make the public lighting system "smart," so it can decide, lamp by lamp, how much light to generate. Letting the lighting system incrementally adjust LED streetlamp output from off to fully on enables a paradigm shift in public-lighting policy to an entirely new flexibility of providing only as much light as is needed in any specific location at any specific moment no waste.

Command and Control

While LED technology has emerged as the key to new smart lighting technologies, it is no smarter than any other source of light; the "intelligence" in a smart street lamp resides in the network that implements the lighting policy and the power supply that controls its light output. ST, a world leader in semiconductor solutions for lighting applications², fully supports the transition to smarter lighting by providing the most cost- and power-efficient LED-lighting power-management platform. With this, lighting suppliers can offer compelling solutions to public lighting authorities around the world, accelerating the deployment of greener public lighting and increasing energy and cost savings.

For example, ST's award-winning³ STLUX385A digital controller for lighting was specifically designed to enable faster development and deployment of control schemes for innovative, energy-saving lighting systems. A unique set of peripherals on the controller greatly simplifies control and improves the performance of LED (and other) lights and the optimization of the lighting power supply. Six of these peripherals, called SMED (State Machine, Event-Driven) circuits, interact with each other and with external signals to control the power delivered to the lighting elements. In applications where the lighting adapts to ambient conditions, the SMEDs also process external commands to turn lights on/off or set dimming levels, control diagnostic signals from the load, and monitor and react to inputs from sensors.

² IMS Research: The World Market for Power in LED Lighting, September 2013

³ The STLUX385A was one of two ST products selected by a panel of independent industrial designers, engineers and members of the trade media as honored products displayed during the International CES in Las Vegas, Nevada, in January 2014.

Another example is the HVLED001 AC-DC power supply controller specifically optimized for LED-lighting applications. Operating directly from the rectified mains, the device uniquely integrates both high- and low-voltage circuitry on the same chip to eliminate the cost of external high-voltage circuitry. The high power factor (>0.9), low Total Harmonic Distortion ($<10\%$), and high power-conversion efficiency ($>90\%$) ensure compliance with the most stringent lighting standards in an efficient, compact, and cost-effective solution that drives LEDs in the power range from 20W up to 150W. The HVLED001 in a single stage configuration addresses the professional LED market for interior luminaires in shops, public buildings, hotels and restaurants, as well as in industrial facilities. In these applications, the combination of the inherent benefits of LEDs in terms of improved light emission efficiency, power consumption and operating lifetime with smart control enable new luminaire designs, with great flexibility in terms of shape and size, allowing lighting to increasingly become an integral part of the indoor architecture.

The HVLED001 also works seamlessly with the STLUX385A to provide an optimized two-stage solution where the HVLED001 provides a constant voltage to the STLUX385A that delivers constant current to three LED channels in smart street lighting applications.

ST's dedicated lighting control devices, allied with its rich portfolio of sensors, microcontrollers and wireless connectivity solutions as well as the Company's strong relationships with leading manufacturers of lighting equipment, provide a future-proof platform for smart lighting that is enabling the smarter streetlamps that will be part of smarter cities and a more sustainable world.

For further information:

- [STLux385A](#)
- [HVLED001](#)
- [LED Lighting](#)

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