When a city is home to two of the most renowned universities of academics and innovation in America, Harvard and MIT, it too had better embrace innovation and smart thinking. Cambridge’s commitment to sustainability as a key initiative goal demonstrates its mission to provide advanced energy efficiency and climate protection for its citizens. Cambridge successfully implemented what few cities have attempted: an LED streetlight conversion using adaptive intelligent controls to maximize energy efficiency and carbon reduction. While some cities have experimented with pilots, only Cambridge has embraced the early adoption of smart lighting technology to this degree.

In 2010, Cambridge launched its Sustainability Initiative, earning a Green City designation from the Commonwealth of Massachusetts. As part of the initiative, the city developed its plan and pledged to reduce 2008 CO₂ levels by 20% by 2013. The LED streetlight retrofit project was approved partially in response to this effort. The city wanted to improve maintenance and asset management as well. Cambridge completed the first phase of its installation of new LED streetlights in 2015, designed with intelligent lighting controls technology to slash the city’s annual streetlight energy usage.

Cambridge is the first U.S. city to complete a city-wide LED streetlight retrofit using adaptive controls that complies with Illuminating Engineering Society (IES) RP-8-14 standards for roadway illumination. The city achieved an 80% reduction in energy from the project, with a payback period of 4.36 years.
Converting to Intelligent Lighting with a Collaborative Project Team

In 2013, Cambridge hired Lam Partners to design a conversion of the city’s 7,000 high pressure sodium (HPS) streetlights to LED. The project team decided to include wireless adaptive controls in the design in order to capture significant additional energy savings beyond the LED upgrade as well as position the city to realize energy monitoring and other benefits. The city partnered with Echelon for the lighting control system being bundled with the new streetlight infrastructure. Other project contributors included Omnilite, who provided expertise on product selection and design assistance, and Dagle Electrical Construction, the firm that installed the new infrastructure. City electrician Stephen Lenkauskas and staff engineers worked with the entire project team to successfully implement the ambitious undertaking.

Starting in the summer of 2014, the first phase of the installation took nine months to complete. The upgrade replaced 4,900 cobra-type fixtures with LED fixtures. Each fixture included a Lumewave by Echelon™ TOP900-TL wireless control node connected to network gateways and the network central management system software. The second phase retrofitted the city’s 2,100 decorative fixtures using a variety of LED fixtures and the Lumewave by Echelon adaptive lighting control system. Echelon’s solution preserved the existing aesthetic provided by decorative lighting while modernizing their control. This phase began in the summer of 2015 and completed in 2016.

The state-of-the-art Lumewave by Echelon system creates a robust capability for meeting the city’s needs and allowing for real-time dynamic adjustability of light levels, enhanced energy conservation, and energy usage monitoring capabilities. The city benefits from more consistent and appropriate illumination border to border. Improved color and uniformity, reduced glare, and greatly improved color rendition increase visibility, security, and safety on the streets and sidewalks. Unwanted light trespass into homes and onto properties is reduced by specialized optical assemblies and by customized sequences of operation that adjust lighting output levels throughout nighttime hours in residential neighborhoods.

As far as we know, we are the first major city to deploy an adaptive lighting system city-wide. This has been an extremely successful process that has far exceeded our expectations and we’ve seen a savings of 80 percent (energy use) so far.

-Stephen Lenkauskas, City Electrician

Providing Responsive Light Level Control for Citizen Satisfaction and Safety

The Lumewave by Echelon solution enables responsive light level adjustment of each fixture to an appropriate, location-specific illumination level. Responsiveness is a primary benefit of the adaptive control solution in addition to energy savings. With the new lighting infrastructure, initial output at dusk is only 50% of possible output, minimizing the impact of high-intensity LEDs for residents while capturing additional energy savings. Subsequent dimming to lower light levels later in the evening occurs based on neighborhood-specific operational profiles, to levels as low as 30%.

Street lighting in 13 areas of Cambridge dims to 30% at 10 p.m., with approximately six smaller neighborhoods within these areas dimming to 30% at 8 p.m. The earlier dimming time in these six neighborhoods is due to residents being sensitive to light levels. Streetlights on main thoroughfares such as Broadway and Massachusetts Avenue dim to 30% at midnight and decorative lights in parks dim to 30% at 10 p.m.
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“As far as we know, we are the first major city to deploy an adaptive lighting system city-wide,” said city electrician Stephen Lenkauskas. “This has been an extremely successful process that has far exceeded our expectations and we’ve seen a savings of 80 percent (energy use) so far.”

Learn More
For more information about Lumewave by Echelon products call +1 408-938-5200 or visit www.echelon.com.