Understanding the Potential of Connected Lighting Systems

Pacific Northwest
NATIONAL LABORATORY

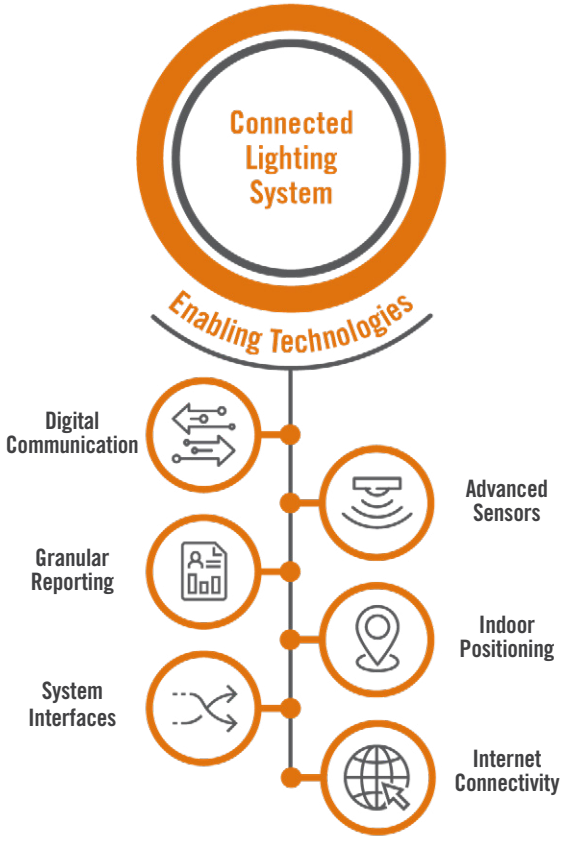
CONNECTED LIGHTING SYSTEMS

Connected lighting systems provide a platform where integrated control of lighting and other systems can enhance building performance. With detailed information, coordinated systems can deliver lower operating costs and improved return on capital, as well as enhanced occupant wellbeing and productivity.

THE CONNECTED DIFFERENCE

Connected Lighting Systems are networked controls with additional technological features. Connected system features include digital communication that sends commands and receives status reports. Advanced sensors detect occupancy (including counting the number of occupants), light, and other environmental variables.

Indoor positioning locates people and equipment. Internet connectivity and system interfaces distribute information and commands beyond the lighting systems.



UNLOCKING THE BENEFITS

Connected lighting systems provide a wide array of benefits for many different organizations, including commercial and government offices, educational and healthcare institutions, and retail and distribution facilities. Examples include:

Energy Conservation

Information gleaned from an array of lighting-mounted sensors enables granular system response, reducing waste in lighting and HVAC systems. Building occupancy analytics enable predictive system response and help to optimize allocation of energy sources in support of net-zero-energy strategies. Detailed energy use reporting supports improved resource allocation and zero-carbon strategies.

System Optimization

Information from lighting, HVAC, and other building systems–such as component temperature and run time–permits automatic, real-time optimization of performance. Such information can reduce energy consumption and extend the useful life of equipment. Real-time reports of equipment and component failure simplifies maintenance operations, as does an integrated dashboard.

Asset Tracking

Lighting provides a widespread and powered array of monitoring points that can track valuable assets in buildings. Asset tracking can optimize building operations in a number of ways. It facilitates access to critical equipment, increases equipment utilization, and reduces capital expenditure, often with rapid recovery of the incremental expense. Applications include any facility with portable and shared equipment where identifying its location in real time reduces lost operational time, equipment losses, or excess inventory.

Safety and Security

Sensor-based occupancy information (number of occupants and location) helps first responders organize their activities rapidly and efficiently, enhancing safety and security. The same data can be used to manage occupancy and traffic flow, which minimizes occupant density and lessens the risk of contagion. Like asset tracking, luminaire-mounted devices can identify and locate visitors throughout the building and provide information to building security systems.

Flexible Space Utilization

Analytics based on real-time space usage enable re-allocation (or modification) of underutilized space types compared with spaces in demand, without the time or cost of extensive study or a major renovation. This flexibility supports optimal architecture for workflow organization, and enhanced collaboration. The same analytics can also "right-size" facilities for typical daily populations, rather than for all employees.

Wayfinding

Wayfinding takes advantage of the density of luminaire-mounted devices, analytics, and often with an individual's own mobile device. Wayfinding supports traversing unfamiliar facilities, rapid access to conference spaces, flexible desk assignment, and emergency response, all of which benefit from occupants finding their way to specific locations reliably and efficiently.

Wellbeing

Employee wellbeing is increasingly seen as critical to an organization's success. A connected system supports wellness strategies by coordinating the control of heat, light, airflow and other building systems with granular input from environmental and occupancy sensors. Strategies to support healthy circadian rhythms utilize dynamic control of electric light by lowering the color temperature as the day progresses.

Interaction and Engagement

By leveraging the density of luminaires, indoor positioning can offer remarkable location accuracy in real time. Together with user-activated devices (e.g. cell phone), luminaire positioning enables targeted communications to users seeking to locate products in retail applications or view objects of interest in museums or corporate displays.

For More Information:

- Visit the ***Integrated Lighting Campaign*** website or email ***integratedlightingcampaign@pnnl.gov*** for more information on how to get involved with the campaign.
- Visit the ***DOE Better Buildings Lighting and Electrical Technology Research Teams*** page for more information on DOE resources.
- Visit the ***DOE Solid-State Lighting*** website for more information on DOE solid-state lighting research and development activities.

U.S. DEPARTMENT OF ENERGY

PNNL-SA-172387
April 2022