A Challenge to Industry to Develop IoT-Upgradeable Lighting

Light-emitting diode (LED) lighting is becoming the standard choice in new construction or retrofits. Lighting is a unique element in a building to support IoT devices/sensors because luminaires and retrofit kits can power IoT devices/sensors, have physical space to support devices/sensors, and are dispersed throughout the building. Once the LED fixture is installed, it will be more costly and difficult to retrofit or replace the luminaire with the necessary capabilities to support IoT devices/sensors. The U.S. Department of Energy is challenging the lighting industry to produce lighting that can be upgraded after installation to allow for an IoT sensor/device to be installed in the lighting with minimal effort.

Internet of Things (IoT)

IoT is the term for "smart" or connected devices. By using data gathered from the devices/sensors, additional energy savings can be achieved and building operations can be improved. Example applications include:

Example IoT Applications

▶ **Improved energy savings** – Occupancy data captured from lighting controls can be shared with the building automation system to improve building operations. When spaces are empty, the temperature could be set back, resulting in optimization of heating and cooling.

▶ **Asset tracking** – IoT benefits also extend to business operations. Radio frequency identification tags can be placed on objects (e.g., medical carts in healthcare, major inventory in a distribution center) and sensors in the lighting can provide real-time information to the building staff about the location of assets. This can reduce staff time to find equipment.

▶ **Space utilization** – data gathered from the occupancy sensors can be used to assess how often spaces are used. This data can be shared to make better real estate choices, hiring decisions, maintenance scheduling, or other potential health function.

Many IoT applications exist and newer applications will continue to develop.

Benefits for Stakeholders

The development of buyer-driven, efficient lighting that can be upgraded with IoT sensors and devices in the future will benefit both building owners and manufacturers.

▶ Building owners save energy and labor costs. Building owners will have new opportunities to improve business operations and expand revenue opportunities.

▶ Manufacturers will have access to a new market for the IoT-upgradeable luminaires and retrofit kits. A standardized interface will allow for cross channel sales and new opportunities for IoT products and services.

Fixture Types

The challenge applies to both new luminaires and retrofit kits focusing on interior linear lighting applications: troffers, suspended lighting, low/high bay, and parking garages.

Objectives of the IoT Challenge

The objective of the Challenge is to encourage lighting manufacturers to produce efficient LED luminaires and retrofit kits with mechanisms to allow for upgrading to IoT sensors/devices after installation. Building owners and designers desire future-proof solutions that can take advantage of new capabilities and innovations as they become available over time. Key to this future-proof concept is a standardized mechanical and electrical interface between the luminaire or retrofit kit and the IoT sensor/device. A standardized interface (e.g., port or receptacle) enables sensor manufacturers to design with knowledge of the physical and electrical aspects of the luminaire or retrofit kit that will house their IoT sensor/device across multiple manufacturers and applications. For building owners and designers, the interface provides them a level of assurance that they can take advantage of IoT capabilities over time. The performance requirements of the challenge have been designed to deliver on these objectives.
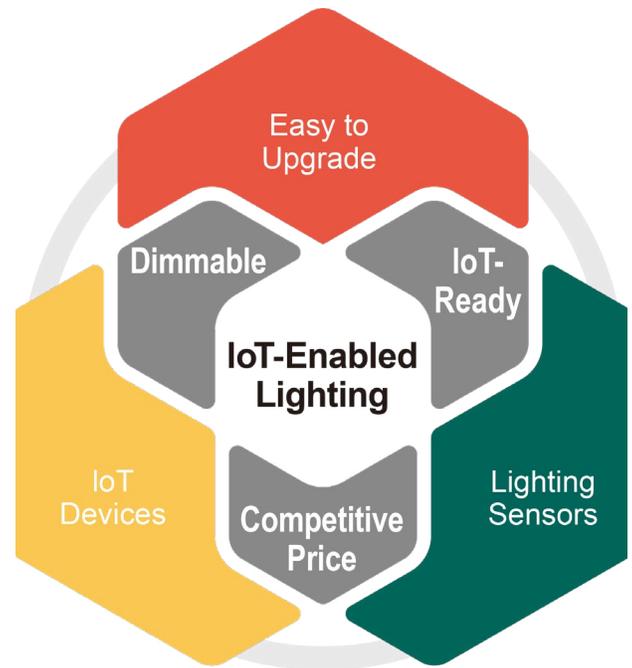
Performance Requirements

The performance requirements cover the efficiency and color qualities of the luminaire or retrofit kit, as well as the interface between the luminaire and IoT sensor/device. Key requirements include:

► The LED driver must be D4i-compliant. D4i encompasses multiple digital addressable lighting interface (DALI) standards and standardizes the power-supply requirements and smart-data capabilities between the luminaire and IoT sensor/device.

► The sensor interface must be in compliance with Zhaga Book 20. This standardizes the physical and electrical connection between the luminaire and IoT sensor/device.

► Beyond a mechanical interface, the electrical and data connection between the luminaire and retrofit kit also needs to be standardized. The D4i certification standardizes how data is stored as well as the electrical interface between the lighting and IoT sensor/device.

► The upgradeable luminaire or retrofit kit should have a small marginal cost compared to a non-upgradeable version. Cost information within the detail performance targets.

Find out More

Building owners, end users, specifiers, designers, engineers, and manufacturers should send an email to lightingchallenge@pnnl.gov to learn more about the challenge including the performance requirements and evaluation process, benefits of joining, and how to participate. More information can be found at the IoT-Upgradeable Lighting Challenge page.