IoT-Upgradeable Lighting Challenge

FREQUENTLY ASKED QUESTIONS (FAQ)

What is the goal of IoT-Upgradeable Lighting Challenge?

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.

What is the process for manufacturers to participate in this challenge?

- **Step 1:** Manufacturers can send an email to: lightingchallenge@pnnl.gov indicating an intent to participate. DOE will follow up with each manufacturer.
- **Step 2:** Manufacturers submit documentation describing how the product meets the performance targets of the challenge. DOE will review each submittal and work with manufacturers to verify product performance.
- **Step 3:** When the product passes Step 2, the manufacturer will submit a challenge-compliant luminaire for the challenge team to evaluate its upgradability.

How do end users, building owners, and building operators participate in this challenge?

All end users are invited to participate. Visit our website to fill out the form expressing interest to participate.

How do utilities and energy efficiency organizations support this challenge?

They should email lightingchallenge@pnnl.gov to indicate their organization's support of the challenge. Energy efficiency organizations may explore and encourage upgradeability in their own program, and utilities may explore offering upgradeability as an option in their incentive programs based on future energy-savings potential.

What is the anticipated timeline for implementing this challenge?

It is expected products will be introduced, tested, and verified for the challenge within one year.

What are IoT Applications?

IoT refers to the interconnection of devices in everyday objects, enabling them to send and receive data. Luminaires, sensors, and many other devices and systems within buildings can be interconnected to share data. The processed data can enable improved operations or new value propositions. Two examples related to IoT and lighting include space utilization and asset tracking.

- In *space utilization*, typically the occupancy sensor in the luminaire not only turns off the lighting when the space is not occupied, but also transmits occupancy data to a secondary system. The secondary system can perform analytics over time and inform the building manager that a 12-person conference room is only used 15 percent of the time. Building managers can then use this information for planning purposes to improve the utilization of spaces.

- *Asset tracking* (also known as Real-Time Location Systems) typically utilizes radio frequency (e.g., RFID) or Bluetooth tags on objects. A device in the ceiling can interact with the tag enabling the system to determine the physical location of an object. For example, asset tracking can be used by a clothing retailer to determine which products customers are most interested in if a tag is on a hanger providing data about how often the hanger was moved. Or in the healthcare sector, asset tracking can help hospitals better manage and track equipment that may be used in many rooms, and thereby save time in locating equipment while allowing for fewer equipment purchases. Lighting plays a critical role in IoT applications because luminaires are above all other objects, they have a readily available power source, and there is a dense network for luminaire in spaces creating a location grid.

Why should I install an IoT-upgradeable luminaire?

If you are waiting for the "killer IoT application" or the value proposition to be figured out but need to upgrade your lighting now, you would want to install an IoT-Upgradeable Luminaire or retrofit kit. If you install a simple (not IoT / connected) lighting system now, when in the relatively near future you want to deploy IoT technologies, it may not be cost effective to retrofit or replace the existing lighting system to support IoT or to install and power as stand-alone devices.

Do I need lighting to take advantage of IoT or to make my building smart?

No, IoT technologies can be deployed many ways. However, lighting is a good platform for IoT technologies for many reasons, including:

- Luminaires and retrofit kits contain power; thus, you do not need to worry about a battery for your IoT sensor or device.
- Lighting is located in every room in a building and typically arranged in a standardized grid that can serve as a location grid. Lighting is located above most other elements in the room providing good line of sight.
- Some sensors needed for IoT applications are already part of lighting controls (e.g., occupant or presence detection devices); thus, the same type of sensor for multiple data streams can be utilized, thereby reducing material and labor costs.

Has the lighting industry undertaken any efforts to standardize upgradeability?

The industry has been working to standardize various aspects of upgradeability that would enable building owners and managers to install new IoT luminaires in a plug-and-play fashion. Beginning in 2017, an industry consortium called the IoT-Ready Alliance began work to develop a standard socket and plug concept for luminaires that would allow IoT devices to be installed into the future. In 2019, the IoT-Ready alliance effort was merged into an international effort by an organization called the Zhaga Consortium. The Zhaga Consortium is a European-based consortium that develops standardization "books" focused on modularity. Book 20 of Zhaga focuses on developing a standardized interface for sensors on luminaires. A standardized mechanical and electrical interface helps future proof a luminaire. IoT sensor/driver manufacturers can design to a standard rather than designing around proprietary mechanical size and connections.

Beyond a standardized mechanical and electrical interface, the sharing and storage of data needs to be standardized. In May 2019, an organization called the DiiA announced a D4i standard and certification for smart LED drivers to support smart lighting and IoT applications in coordination with Zhaga. D4i-compliant drivers are addressed by many digital addressable lighting interface (DALI) standards and provide a standard method for sharing and storing data between sensors and LED drivers. There are numerous D4i-compliant drivers already available on the market. Requiring a D4i-complaint driver also allows for future-proof luminaires, as Io-T devices/sensors can be designed knowing how the data will be transferred from the sensor to the driver.

In the United States, via a ANSI-NEMA C.137 working group, another smart driver component standard (ANSI C137.4) was published. Major luminaire and component manufacturers have developed drivers that follow the ANSI C137.4 standard and are introducing "smart" drivers. All of these efforts complement one another in developing a future of plug-and-play upgradability and interoperability for lighting and IoT devices. The ANSI C137.4 standard aligns with the D4i specification.

Can we ensure a luminaire can be "future-proofed" in terms of its upgradeability with the technology and market in rapid state of change?

Future-proof technology is an often-requested feature as the concept of future upgradeability is discussed. Preparing for the future is a delicate balance because the luminaire needs to be ready today to accept an existing technology, but also able to support future needs and technology without becoming obsolete. The best way to future-proof IoT-upgradeable lighting is for the lighting to be a platform for the IoT device/sensor and technologies that can change in the future be part of the sensor. Shifting the "smart" or connectivity aspects of the IoT system from the luminaire to the sensor module limits the luminaire being obsolete in

the future. If the LED driver (power supply to the LEDs) is the appropriate type, the luminaire can power and support future IoT devices.

What are the most applicable interior luminaire types being considered?

The most common/applicable luminaire types are interior linear pendants, high and low bay pendants, and troffer luminaires. In addition to having a form factor that could accommodate an upgradable sensor, these are all common, large volume luminaire categories that could benefit from cost economies of scale in terms of adding an IoT upgradable feature. In contrast, the size limitations of track lighting and downlight luminaires may be too small to allow for an IoT sensor or device to be installed in the luminaire. In addition, decorative pendants may be large enough to support an IoT sensor or device, but those luminaire types are specified based on appearance and typically not ideal for a standardized platform for an IoT sensor or device.

What will it cost?

The IoT-Upgradeable Lighting Challenge is reviewing data and working with potential end users and manufacturers to get a sense of the acceptable and anticipated costs. To date, potential end users have provided a target price compared to a standard non-upgradeable luminaire or retrofit kit of roughly 5-10 percent incremental cost OR possibly no more than $30. The final incremental cost target for luminaires or retrofit kits that meet the IoT-Upgradeable Lighting Challenge will be determined soon under the advice of stakeholders.

Will utilities provide higher incentives or rebates for IoT-upgradeable lighting?

Conversations with utilities and energy efficiency program providers suggest that some are interested in this concept. The IoT-Upgradeable Lighting Challenge is researching this question to determine what and how incentives could be offered.

How do I stay informed about the status of the IoT-Upgradable Lighting Challenge?

Sign up at lightingchallenge@pnnl.gov to keep informed of updates on the IoT-Upgradable Lighting Challenge.