

Is PoE Right For Your Facility?

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November 14, 2018



TOPICS

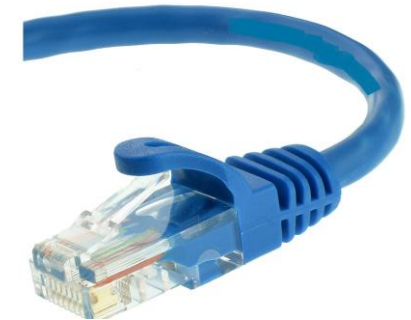
- Lighting Control System Capabilities and Considerations
- Power over Ethernet Background
- Hardware Terminology
- Operational/Design Considerations
- Advantages/Limitations
- Energy Savings
- Custom Program Incentives

LIGHTING CONTROL SYSTEM CAPABILITIES AND CONSIDERATIONS

- Sensing – e.g., occupancy sensors, motion sensors, daylight sensors, temp sensors
- Data collection and storage - luminaires and/or sensors either store data locally and provide it to the network controller
- Localized metering – luminaires collect data about their individual energy consumption
- Self-diagnostics – luminaires inform network controller of operational issues
- Location awareness - location of failed lights, asset tracking, location and flow of customers or personnel
- Luminaire and device power - power needs to be supplied to the luminaires and associated sensors via some type of wiring regardless of the controls implementation (unless battery operated)
- Retrofits – main challenge is working with existing lighting system and building infrastructure

BACKGROUND

- Power over Ethernet (PoE) technology enables both data and DC power to be transmitted via twisted pair cable
 - Initially used for Voice over Internet Protocol (VoIP) systems via proprietary technology developed by Cisco in 2000
- Relevant standard is IEEE* 802.3, IEEE Standard for Ethernet
 - IEEE 802.3-2012 incorporated 802.3at, which specifies transmission of DC power over Ethernet cables. Up to 25.5W delivered (enough to power an efficient luminaire) for cable runs of up to 100m.



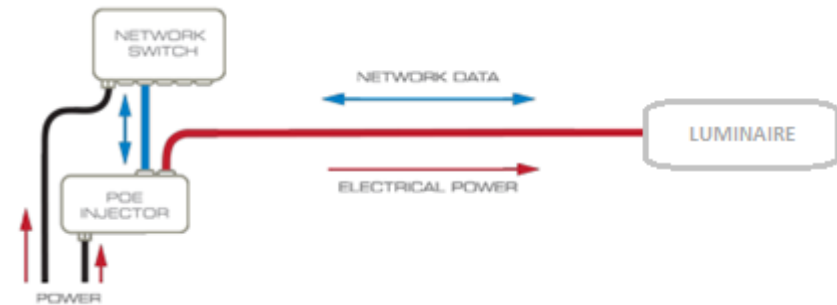
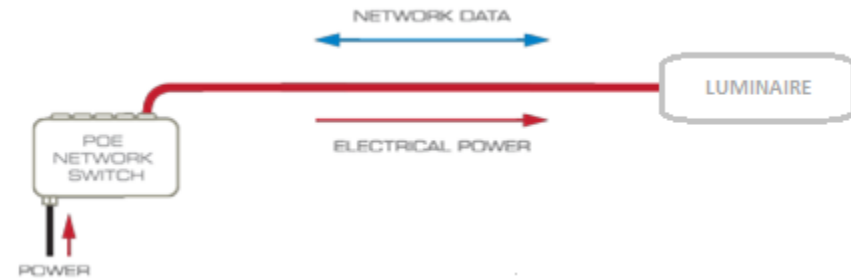
* IEEE – Institute of Electrical and Electronics Engineers

BACKGROUND

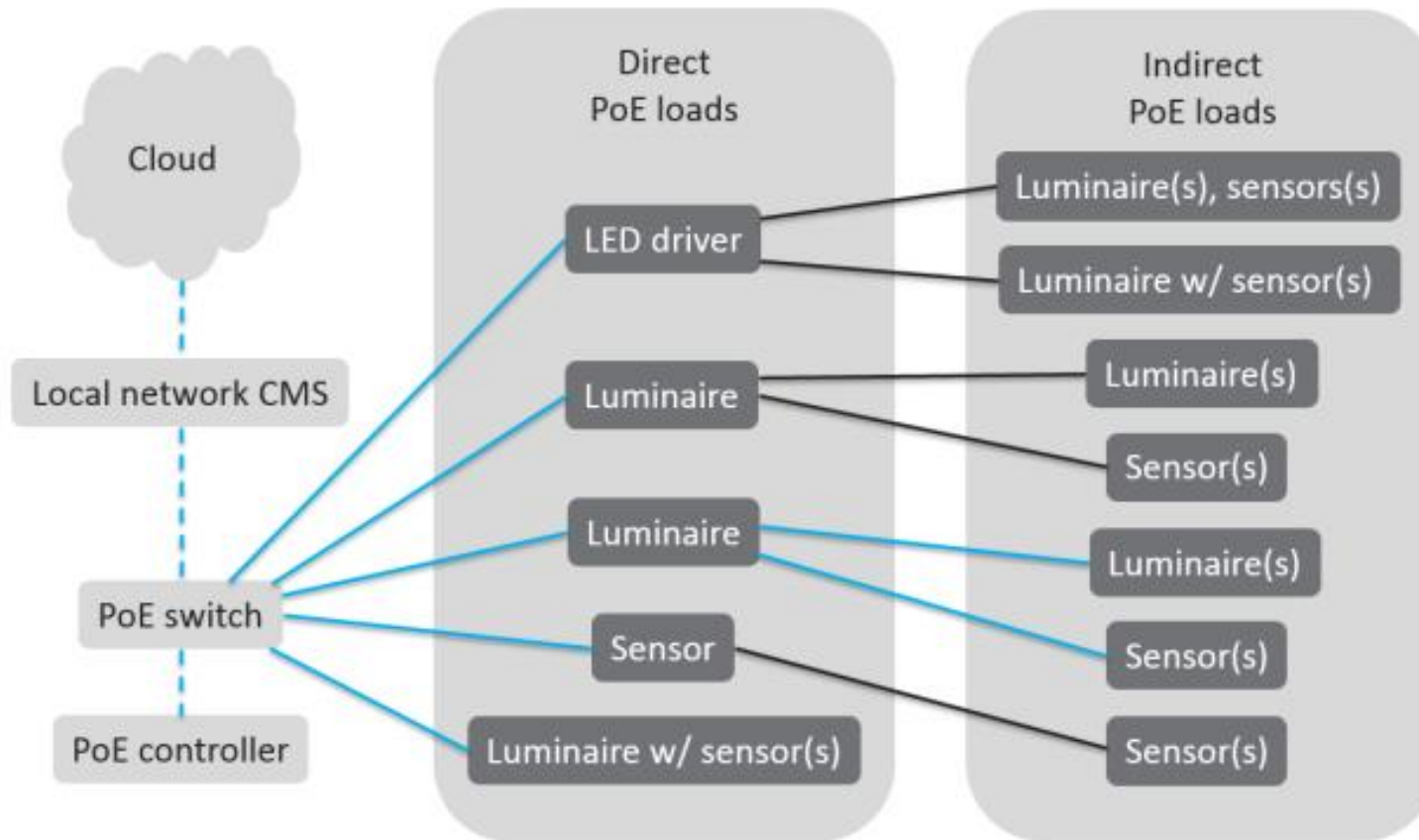
- The next-generation standard, IEEE 802.3bt, approved by the IEEE Standards Association Board September 27, 2018, specifies PoE enhancements:
 - Up to 90 W delivered for cable lengths of up to 100m
 - Lower standby power
 - Better efficiency for the current PoE power levels
 - Power set based on max power of connected device, resulting in better power delivery

HARDWARE TERMINOLOGY

- PD - Powered Devices – use electrical energy delivered through cable
- PSE - Power Sourcing Equipment – supplies electrical energy
- PoE Switch – detects whether a connected device is PoE enabled, and if so, supplies power in addition to data
- Splitter (or midspan) - introduces power onto an Ethernet cable
- Node – circuitry at the device which routes power and data signals



PoE LIGHTING SYSTEM EXAMPLE BLOCK DIAGRAM



Source: Solid-State Lighting Program, Building Technologies Office, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy -PoE Lighting System Energy Reporting Study Part 1 February 2017



OPERATIONAL CONSIDERATIONS

- Losses- due to Ethernet cable internal resistance, lowers the delivered power (more about this later)
- Power Outages – unlike standard lighting that comes back on immediately after power is restored, PoE lighting may require a system reboot. Battery backup for the switch(es) can mitigate, but adds to cost
- Interference – potential electrical noise generated by the PoE system that interferes with office wi-fi
- Equipment Compatibility – new products will need to be compatible with the PoE system

DESIGN CONSIDERATIONS

- Not a new technology but an expansion of the IT infrastructure already in place

Centralized Architecture

- All PoE switches located in a central hub
- Requires more cabling
- Most common

Distributed Architecture

- Smaller switches set up in zones
- Less cable
- Cable length limitation not an issue
- Maintenance and repairs more difficult- switches located throughout the building vs. central control room

ADVANTAGES OF PoE

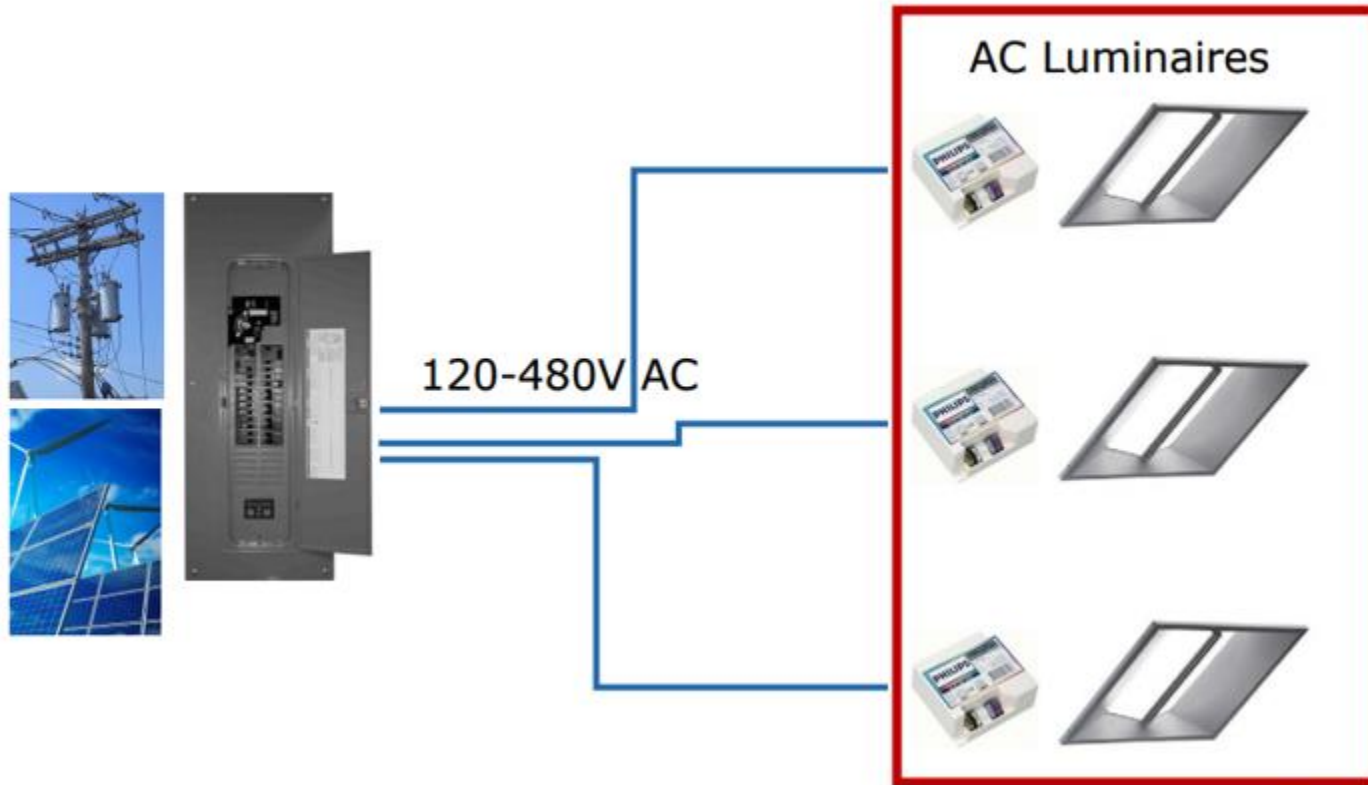
- Lower install cost – one line vs. two, electricians not required
- Safety – DC vs. AC, power is only supplied when a PoE device is detected
- Ethernet network based – reliable technology

LIMITATIONS OF PoE

- Delivered power limitation (90W)
- Cable length limitation (100m)

ENERGY SAVINGS

Traditional AC System Architecture

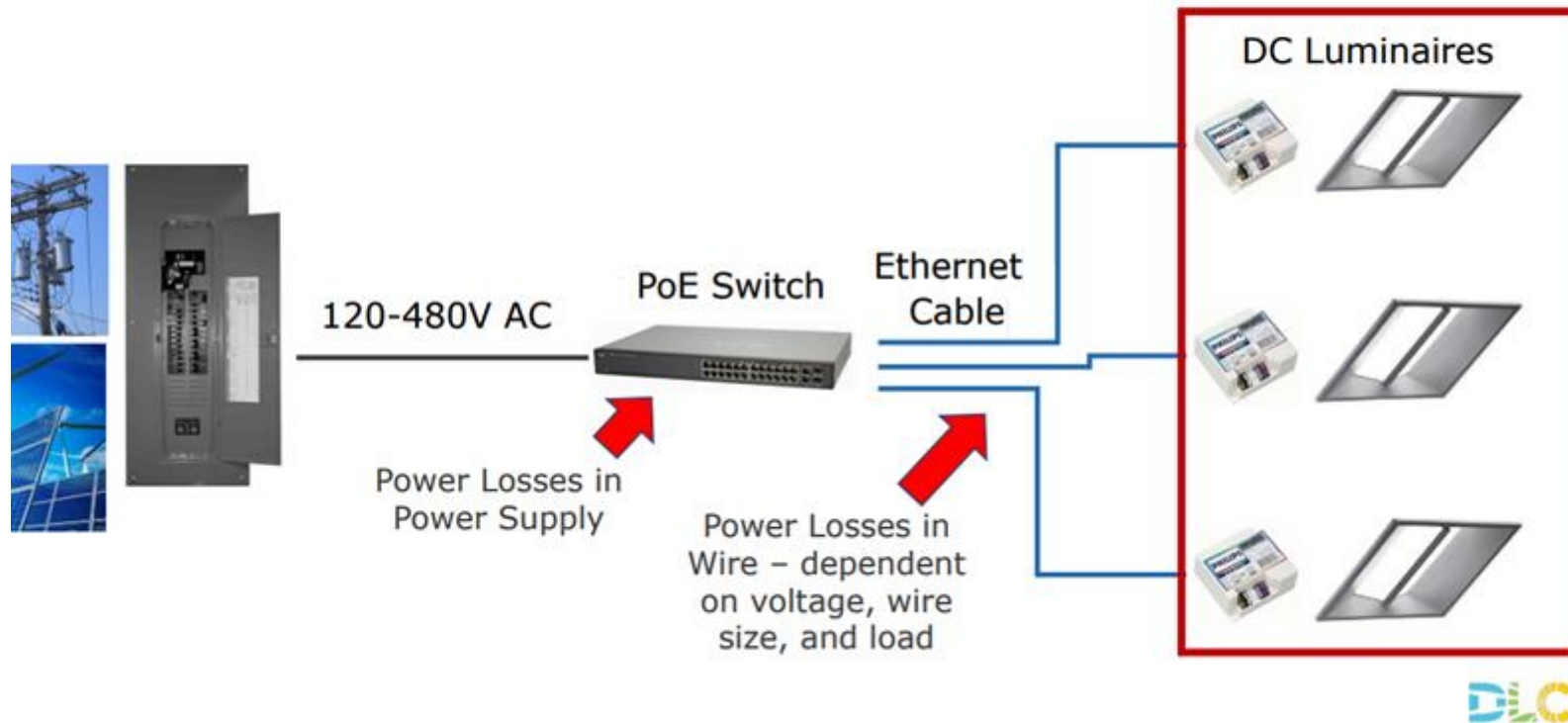


Slide courtesy of Design Lights Consortium



ENERGY SAVINGS

Example PoE System Architecture



Slide courtesy of Design Lights Consortium

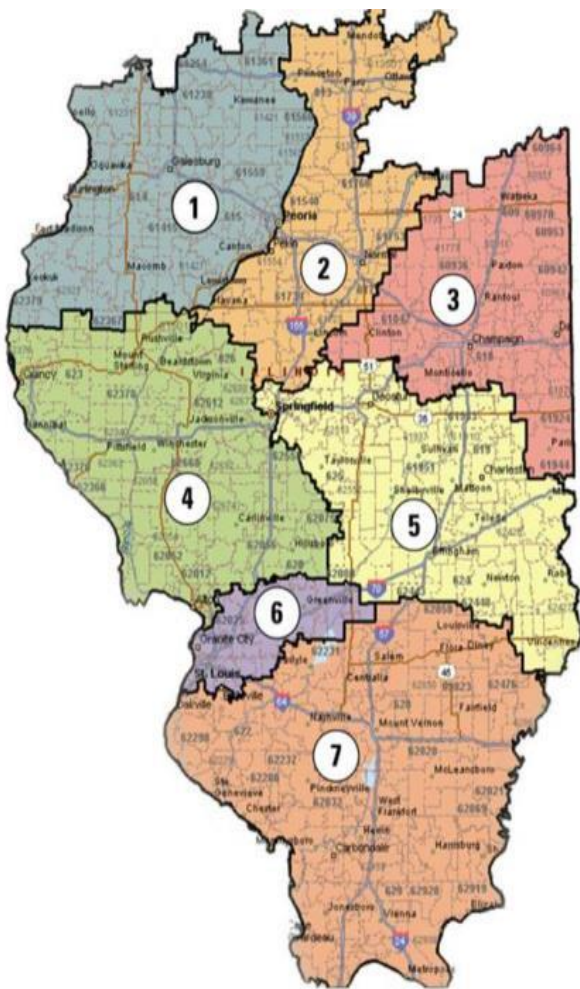


CUSTOM PROGRAM INCENTIVES

- PY19 custom program incentive for electric projects = \$0.08/kWh saved
- AIEE will coordinate with customer and ally to determine savings based on PoE system configuration
- AIEE is seeking projects for benchmarking, please contact your EA or me directly so we can start a conversation



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