

## Designers Lighting Forum

# The Era of Smart Buildings Utilizing Power Over Ethernet.

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Managing Principal, Cresa

### **Peter Jacobson**

Lighting Specialist, Con Edison

### **Ronald Zeccardi**

Former President, BOMA New York

### **Mitchell Bloomberg**

Principal, International Lights, Inc.

### **Dario Gristina**

Chairman & CEO, CPL Group USA

### **Carol Jones**

VP - Integrated System Development, Axis Lighting



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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



## Introduction: Meet the Moderator and Panelists

### MODERATOR



**James A. Pirot**  
Managing Principal

**Cresa, Integrated  
Control Solutions**

### PANELISTS



**Peter Jacobson**  
Lighting Specialist

**Con Edison**



**Ronald S. Zeccardi**  
Former President  
**BOMA New York**  
Senior Director,  
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**Dario Gristina**  
Chairman & CEO

**CPL Group USA**



**Mitchell Bloomberg**  
Principal

**International Lights, Inc**



**Carol Jones**  
LC - VP, Integrated  
Systems Development

**Axis Lighting**

## Learning Objectives

At the end of the this course, participants will be able to:

- 1. Inform audiences why it is timely to consider energy savings measures via Power over Ethernet (PoE) lighting for commercial and industrial use.**
- 2. Explain what PoE is and how can it be implemented.**
- 3. Define the current and potential benefits of PoE for property owners and end-users.**
- 4. Summarize the costs behind PoE and inform attendees of existing incentives.**

**CRAIN'S**

By Joe Anuta

August 20, 2018

**New York City Council is working on legislation to reduce carbon emissions in large buildings by 20% between 2020 and 2030 and 80% by 2050\***

Councilman Costa Constantinides pledged his support for enacting an enforceable mandate as part of the city's broader goal, announced in 2016, of trimming carbon emissions 80% by 2050. Buildings in the five boroughs account for more than two-thirds of total emissions, which is why reform in the real estate sector is essential to fulfilling the overall pledge. Since the de Blasio administration's 80x50 plan came out, the administration and council have passed several measures, such as benchmarking requirements designed to nudge the industry in the right direction. But Constantinides's remarks Monday indicate that the council is now seeking legislation to give the city's efforts more muscle.

"I consider today a milestone in our quest to make New York City's buildings greener, our infrastructure more sustainable, and our air significantly cleaner," Constantinides said in a statement.

Monday's announcement follows an [environmental report released last week by the Urban Green Council](#), which held months of meetings hashing out a rough path to concrete legislation that would be acceptable to a diverse group of stakeholders, including large real estate owners such as the Dursts and Brookfield, and tenant advocacy groups such as New York Communities for Change.

The first recommendation of that plan, which New York Communities for Change said would be the focus of Constantinides' legislation, mandates energy reduction through a multi-step process in buildings topping 25,000 square feet. First, these structures would be scored on a yet-to-be-designed metric that would assess how efficient they already are, the idea being

## IN THE NEWS:

### NEW YORK CITY COUNCIL PLEDGES BUILDING LEGISLATION TO REDUCE ENERGY CONSUMPTION

“The first recommendation of that plan...mandates energy reduction through a multi-step process in buildings topping 25,000 square feet.”

\*80% BY 2050, KNOWN AS 80 X 50, IS A PROGRAM PURSUANT TO LOCAL LAW 66 OF 2014: A LOCAL LAW TO AMEND THE ADMINISTRATIVE CODE OF THE CITY OF NEW YORK, IN RELATION TO REDUCING GREENHOUSE GASES BY EIGHTY PERCENT BY TWO THOUSAND FIFTY.

# The Implementation of Power over Ethernet (PoE)

## Digital Ceiling – The Backbone of Smart Buildings

- PoE refers to the use of ethernet cables that are part of a structured IT network for the delivery of electrical power
- PoE enables a single cable to provide both a data connection and electrical power to PoE devices, such as wireless access points and lighting, adapters, switches and ports, phone systems, PoE cameras and LED lighting
- PoE provides efficient space utilization using a highly dense sensor network & individual fixture control to manage usage on: Lighting, HVAC, Security, Electrical Load, Personal Workspaces, Daylight Harvesting, Meeting Room Booking Systems and Much More

## The Implementation of Power over Ethernet (PoE)

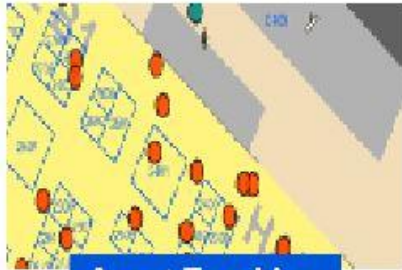
### Continued

- **Advances in energy efficient building solutions have allowed for the rise of PoE to become a viable power and control system for a complete Smart Building Solution**
- **As connecting historically static devices and systems to the Internet of Things (IoT) becomes increasingly common and competitively necessary, it brings the total number of potential devices in the IoT cloud well into the billions**
- **However, for smart lighting and other connected devices to become a reality, they need a universal ability to speak with each other**





# Network Lighting System Capabilities



**Asset Tracking**



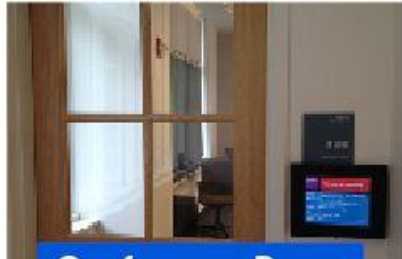
**Space Utilization**



**Indoor Positioning**



**Diagnose & Report**



**Conference Room  
Scheduling**



**Security**



**Energy Tracking**



**Integrate with  
BMS/HVAC**

## Perspectives on PoE Systems

### OEM Manufacturers

- Be open minded about the differences between traditional tech and POE tech- and hold the quality considerations closely
  - Each system will have distinctions, so testing is required for all systems for current, voltage, efficiency, dimming, lumen output and light flickering
  - Photometric testing (as well as electrical tests) should be done at different dimming modes
- Perform end of line production testing
  - Understand differences in system architecture, and their pros and cons
  - Form factors are different, but not terribly high impact as components are external to luminaire

## Perspectives on PoE Systems

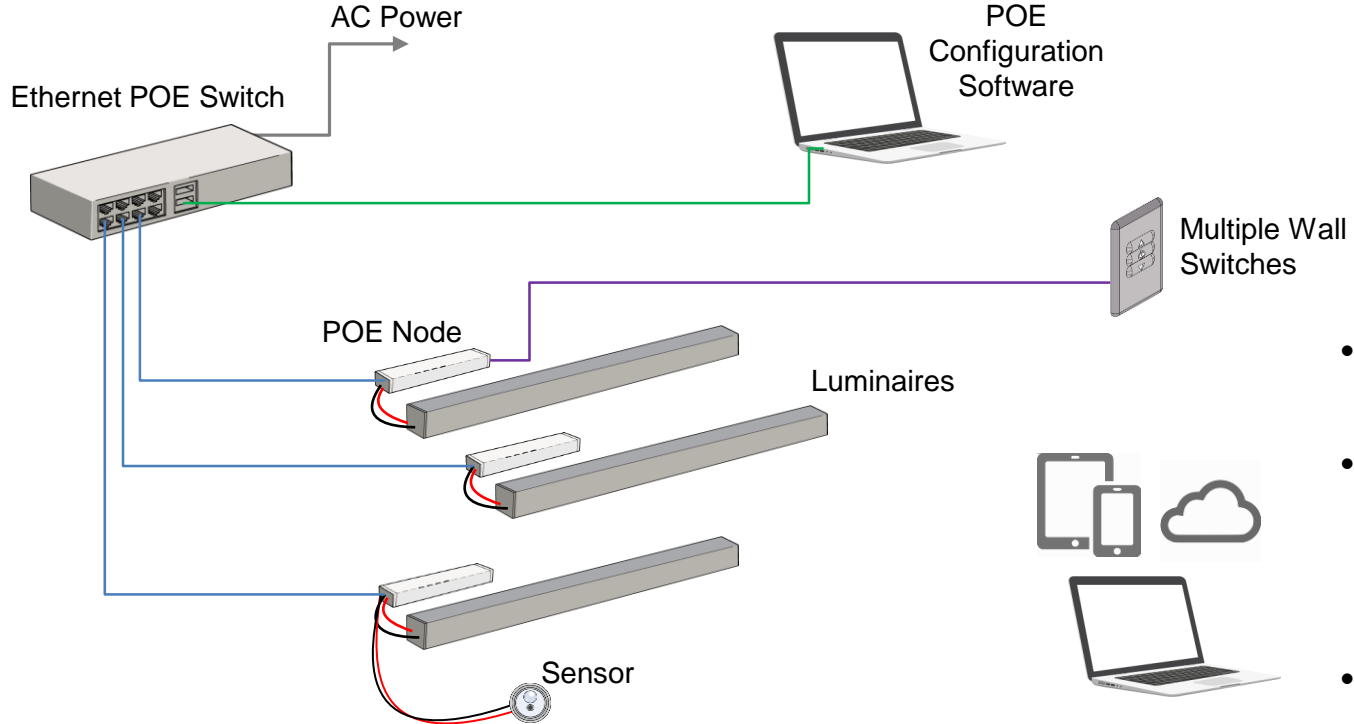
### Lighting Specifiers

- POE represents different value to different players, lighting specifier role is to protect design intent and quality
  - As new controls, IT and sensor technologies emerge and evolve, this competency will be a differentiator for those who come up the learning curve
  - Components are not standardized, so detailed testing should be requested from component manufacturers and OEM integrators
- Configuration is required in the field at time of installation, shop drawings should be precise to ensure proper output is achieved for each luminaire
  - Do not assume responsibility for new technologies or services that are not in specifier control, new contract language should be used

# Example System 1

### Wiring Legend

- USB Cable
- Power over Ethernet RJ45 cable
- Low voltage Wire
- LED power -
- LED power +



- Low voltage RJ45 wiring
- Low voltage DC wiring from POE Node to LED Boards
- POE Node integrates POE gateway and driver

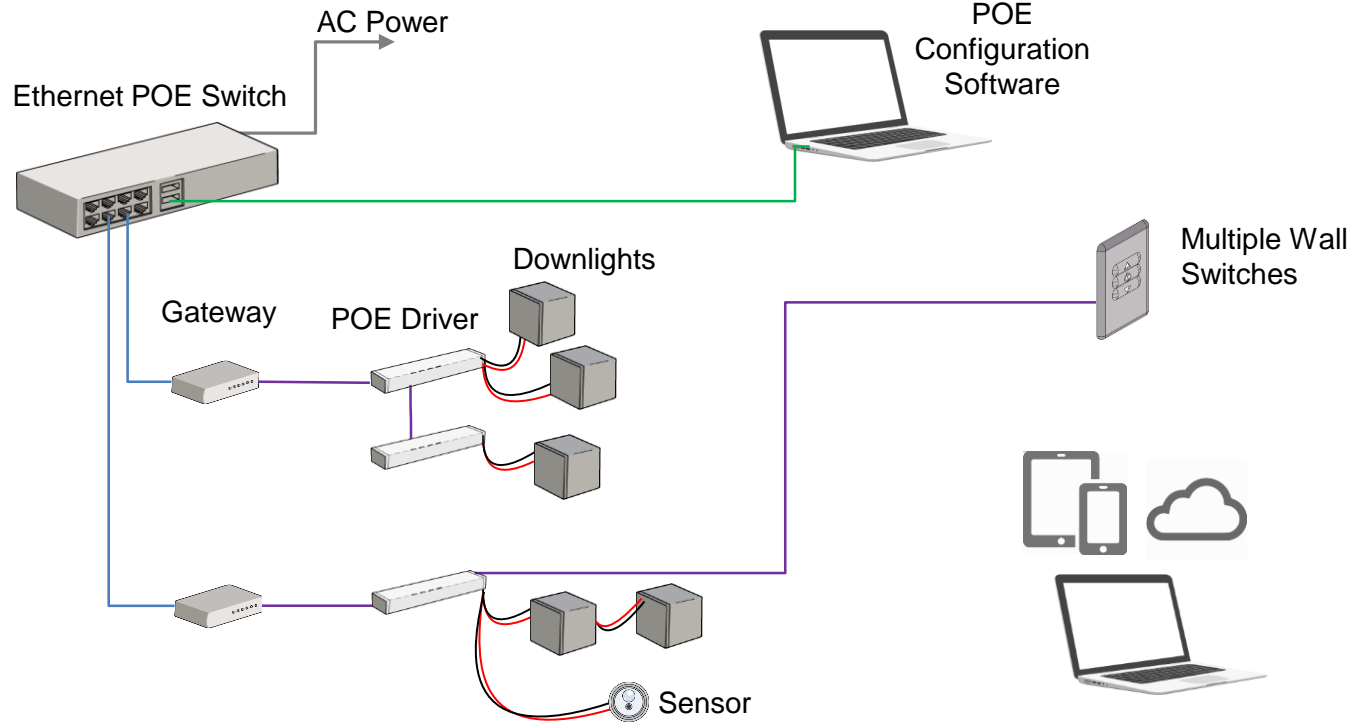
IT

POE INSTALL

CONFIGURE

USER

# Example System 2



### Wiring Legend

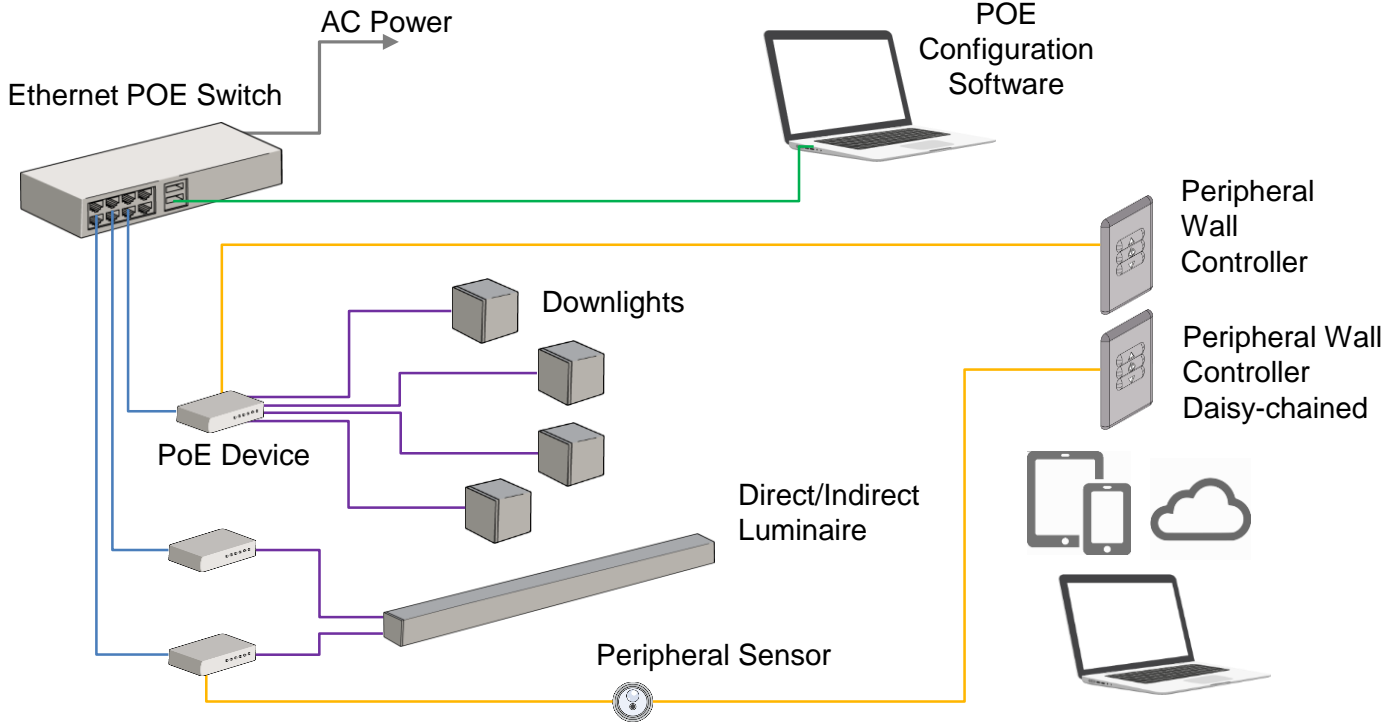
- USB Cable
- Power over Ethernet RJ45 cable
- Low voltage Wire
- LED power -
- LED power +

- Low voltage RJ45 wiring
- Low voltage DC wiring from POE Driver to LED Boards
- Daisy chain multiples up to 50 watts, into 1 port

# Example System 3

### Wiring Legend

- USB Cable
- Power over Ethernet RJ45 Cable
- Low Voltage Wire
- RJ45 Cable



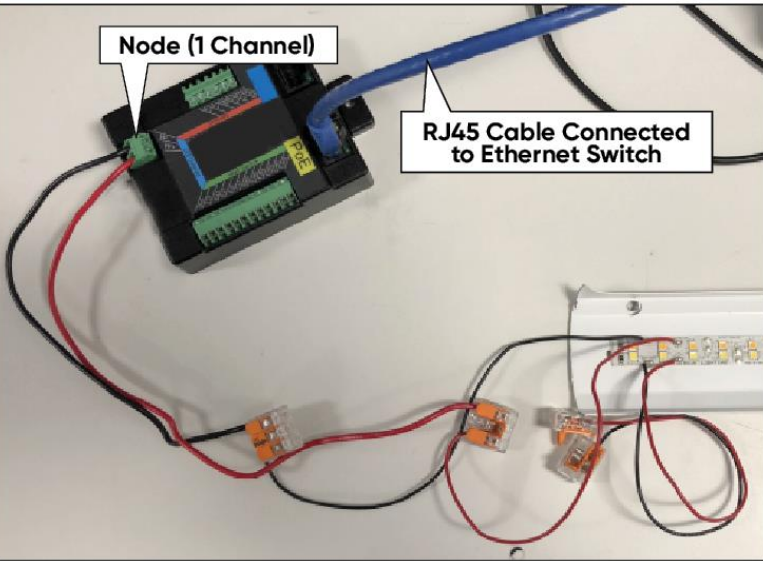
- Low voltage RJ45 wiring
- Low voltage DC wiring from PoE Device to LED Boards
- Daisy chain multiples up to 50 watts, into 1 port

IT

POE INSTALL

CONFIGURE

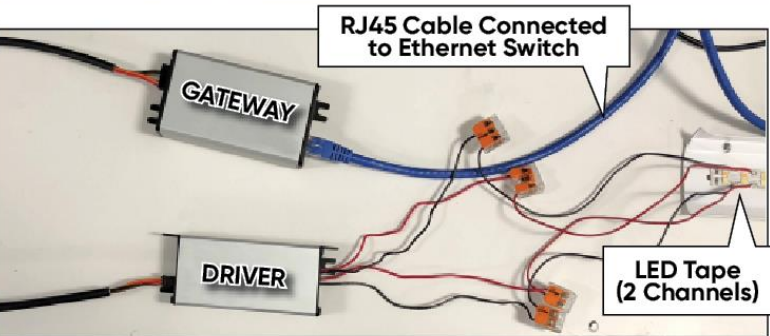
USER



## The Nuts and Bolts of Systems 1 and 2

### System 1:

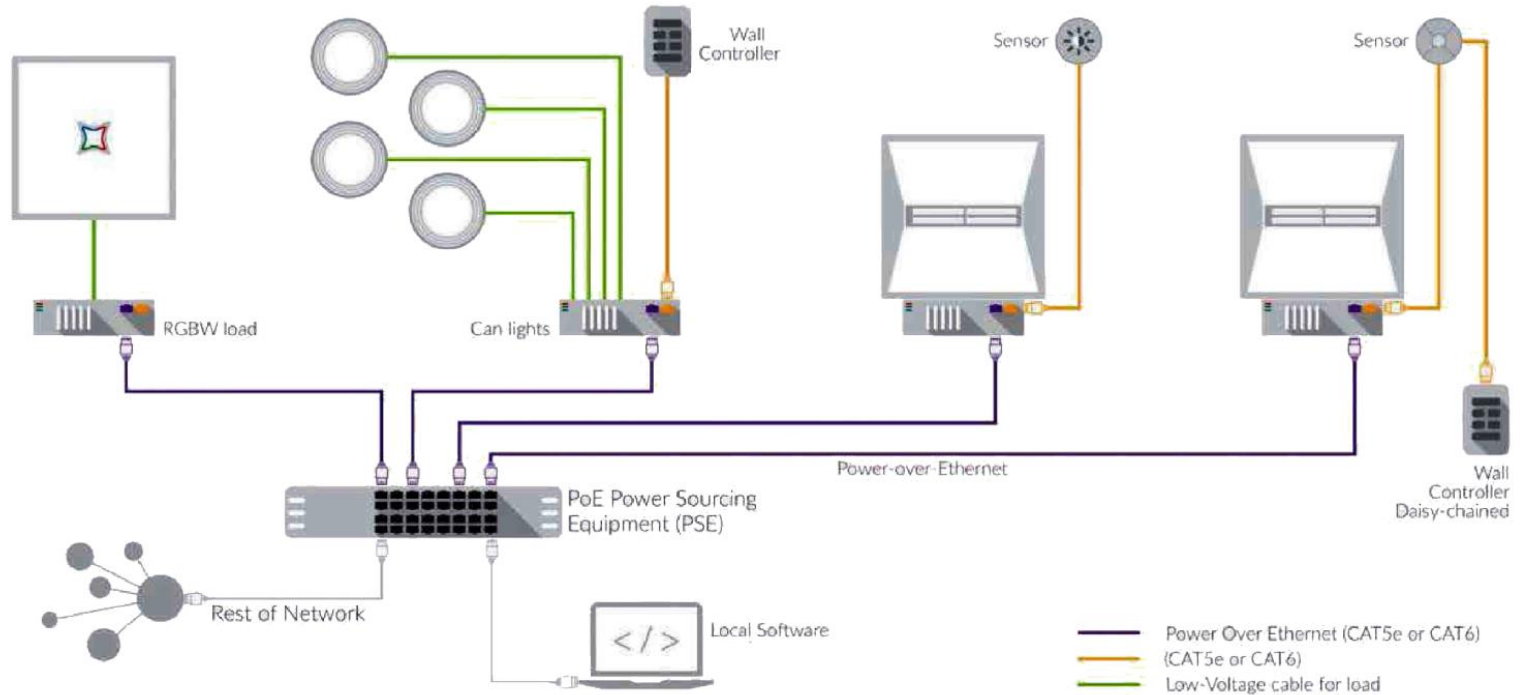
- Node Connected to LED Board & Ethernet Switch
- Form Factor:
  - Node: 4.54”(L) x 2.83” (W) x 1.1” (H)



### System 2:

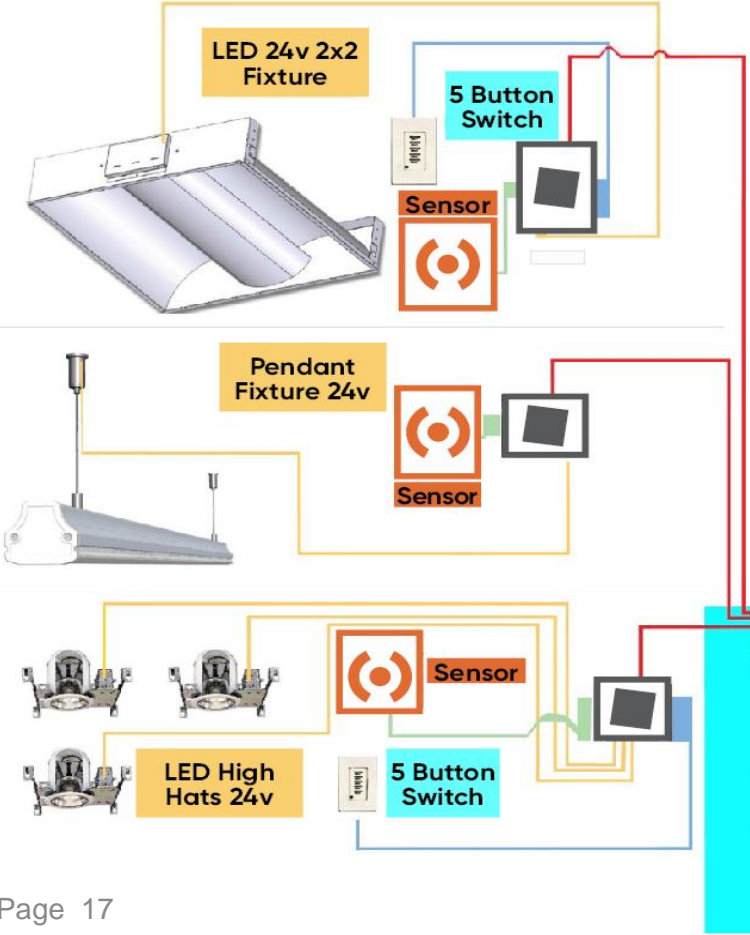
- Form Factor:
  - Driver: 4.59”(L) x 1.68” (W) x 0.79” (H)
  - Gateway: 4.73”(L) x 2.1” (W) x 1.0” (H)

## Detail for Wiring Devices & Fixtures to Network Node



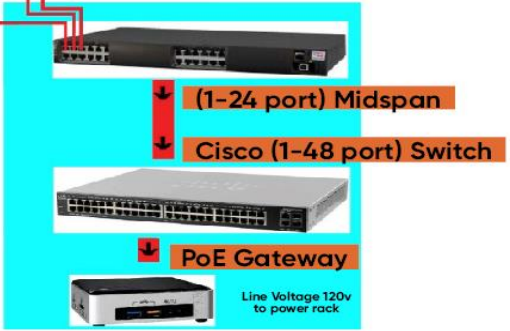


# Detail for Wiring Devices & Fixtures to Network Node

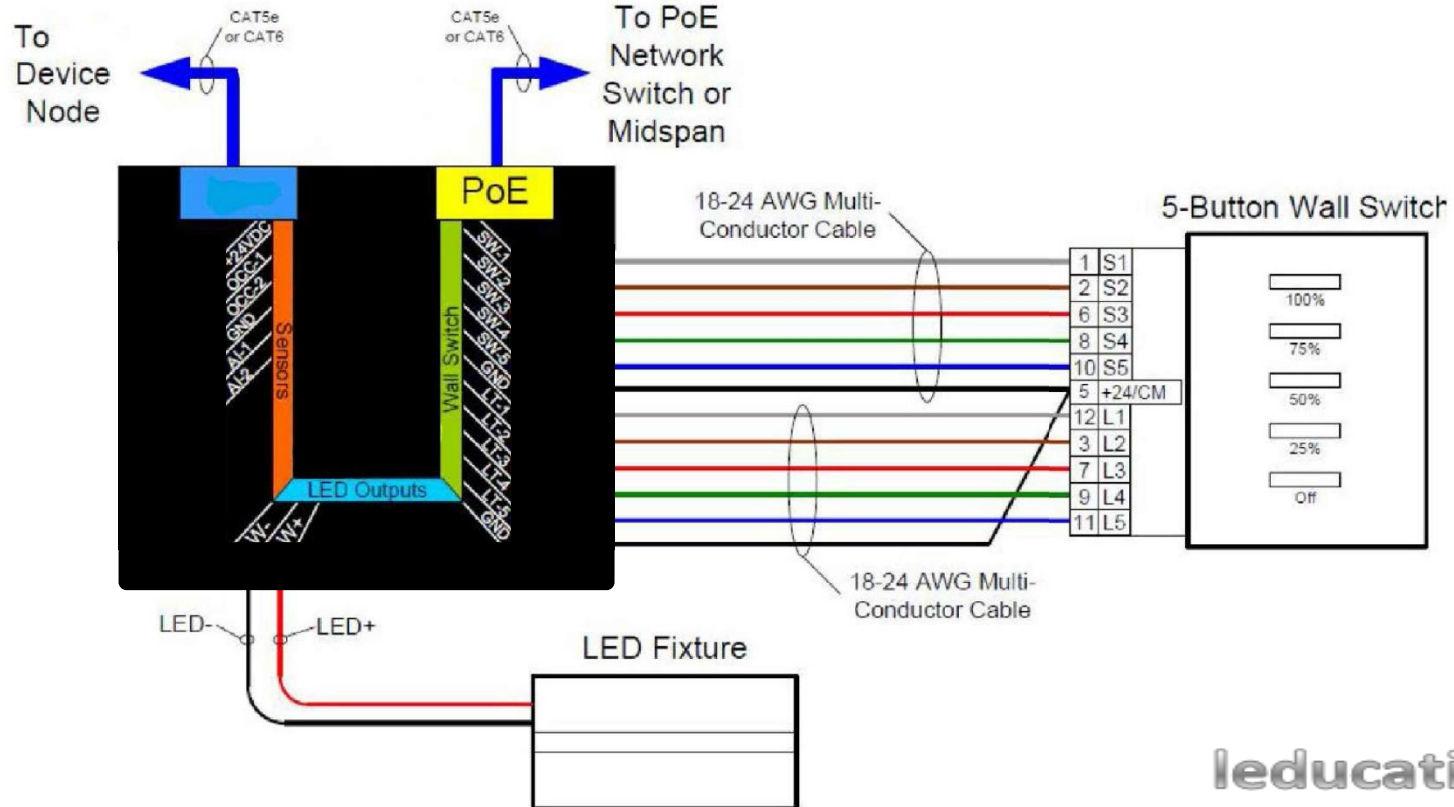


**Legend:**

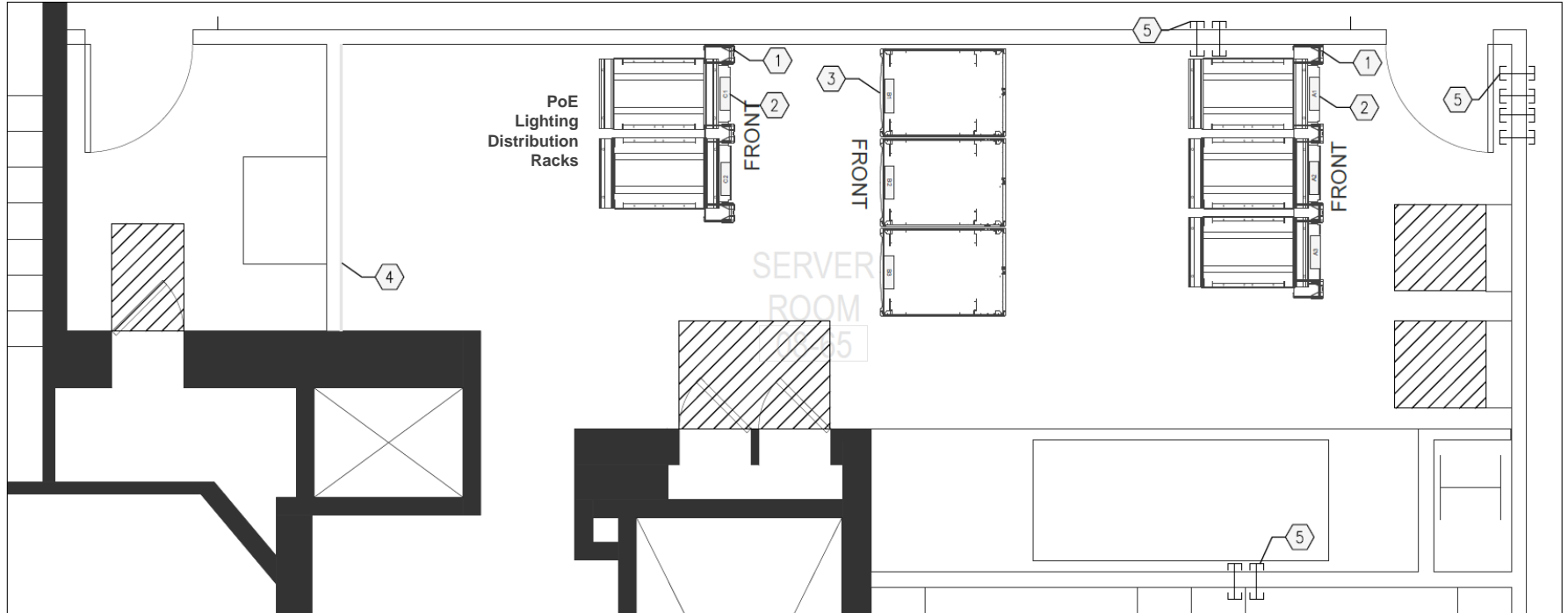
- CAT6 Plenum Wire
- 18/4 Plenum Wire
- CAT6 Plenum Wire
- CAT6E / CAT7 Plenum Wire



# Detail for Wiring Devices & Fixtures to Network Node



# PoE / IDF Room Diagram



## Cost Comparison: Line Voltage vs. PoE Lighting Evaluation • 100,000 SF Project

	Line Voltage	Power over Ethernet Licensed Electrician	Power over Ethernet Low Voltage Contractor
Furnish Lighting	\$1,035,000	\$980,000	\$980,000
Furnish Lighting Controls	\$321,000	\$323,752	\$323,752
Furnish Inverters	\$32,000	\$32,000	\$32,000
Conduit & Wire	\$219,000	\$0	\$0
Furnish CAT6 Cable	\$0	\$66,857	\$66,857
Install CAT6 Cable	\$0	\$171,000	\$95,000
Install Lighting & Controls	\$1,052,364	\$960,320	\$960,320
<b>Total</b>	<b>\$2,659,364</b>	<b>\$2,533,929</b>	<b>\$2,457,929</b>
<b>Total Per Square Foot</b>	<b>\$26.59</b>	<b>\$25.34</b>	<b>\$24.58</b>
<b>Total Savings</b>		<b>\$125,435</b>	<b>\$201,435</b>

## Cost Comparison: Standard Lighting Package vs. PoE • 12,000 SF Project

	Standard Package	Power over Ethernet
Lighting Package (including controls)	\$142,909	\$122,300
Electrical	\$177,900	\$195,500
<b>Total</b>	<b>\$320,809</b>	<b>\$317,800</b>
<b>Total per Square Foot</b>	<b>\$26.73</b>	<b>\$26.48</b>
<b>\$3,009 Total Difference   \$.25 per Square Foot</b>		

- Standard Lighting Package was to be standard LED fixtures with minimal control as mandated by code.

- PoE Lighting Package consisted of all LED fixtures, couple with PoE equipment (nodes), ethernet and wall switches, occupancy/daylight sensors and control software.

## Local Organizations & Smart Building Technology

- There are various agencies that work diligently with allies in the asset management, energy and environmental communities — as well as with elected officials and representatives from the City and State — to safeguard the efficiency, safety, quality and allure of commercial real estate throughout New York City.
- Operational and energy savings can be incurred by implementing new smart technology to allow for better control over lighting, HVAC, elevators, building card readers, security cameras, alarms, and overall building management systems

### Additional Considerations

- Plug Loads
- Energy Star Ratings
- Bill Intro No. 1253

## Energy Star Ratings



In September 2018, under the revised EPA protocol, Energy Star unveiled its new building scores. The scores of commercial real estate buildings in New York City fell disproportionately. In fact, one of our members saw the average score for their portfolio drop by 21 points

Buildings exceeding 25,000 SF will soon be sporting a conspicuous A to F letter grade at their public entrances. Modeled after the NYC's restaurant grades and similar building rating programs in Europe, Local Law 33 mandates building energy efficiency grades, starting in 2020.

Variability observed among buildings with different:

- Size
  - Age
  - Location/climate
  - Fuel mix
  - Geography
- Buildings that utilize steam energy incurred the largest ratings decrease
  - No heating degree day – only cooling degree days
  - Only the percentage of the building being cooled is calculated into the final score

## Average scores before and after the metric updates



Building Type	Average Score Before Update	Average Score After Update	Average Score Decline/Increase
All building types listed below	64	52	-12
Bank Branch	56	46	-11
Distribution Center	66	56	-10
Financial Office	64	56	-8
Hotel	53	54	1
K-12 School	70	57	-13
Non-refrigerated Warehouse	60	55	-5
Office	66	54	-12
Refrigerated Warehouse	57	49	-8
Retail Store	62	46	-16
Supermarket/ grocery store	65	59	-6



## Bill Intro No. 1253

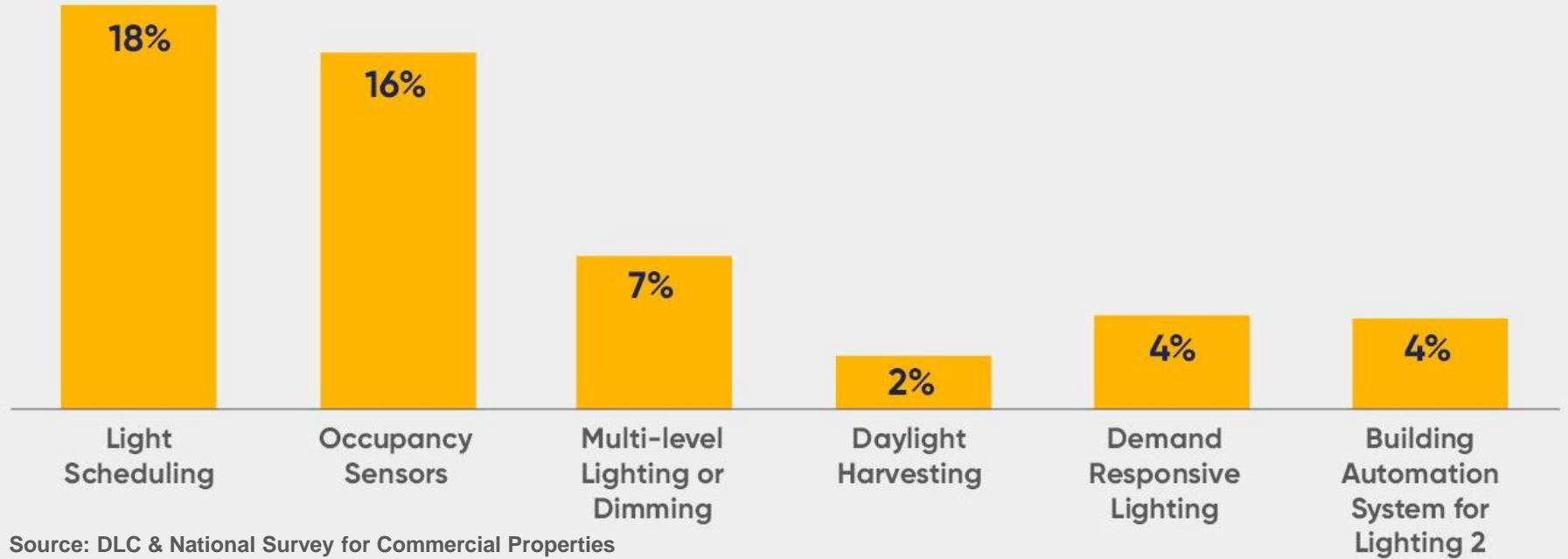
- The bill would establish an Office of Building Energy Performance (OBEP) within the Department of Buildings
- The goal is to **reduce 80%** of greenhouse gas (GHG) emissions from buildings **by 2050**
- The bill sets emission reduction **targets for 2022 and 2023**, as well as a backstop minimum emissions limit for 2024
- In the event the advisory board hasn't established a new metric for measuring GHG emissions – **as the bill requires to be done by the end of 2020** – and even more strict emission limits than the ones already set for 2023.

## Bill Intro No. 1253: Challenges

- The backstop measure simply isn't feasible for existing buildings in such a short time frame
- Failure to comply would result in large buildings performing major upgrades before 2024
- The targets are highly aggressive and non-compliance could result in fines in the hundreds of thousands of dollars per building
- Achieving the proposed targets on a building -by-building basis would force a shift from fossil fuels to electrification resulting in an increase in electrical consumption

Further collaboration with City Council and other organizations is important to establish a realistic backstop and achievable GHG reduction targets that will inevitably benefit the built environment and all New Yorkers.

## Market Potential: Percent of Commercial Buildings with Control Strategy



Source: DLC & National Survey for Commercial Properties

## C&I: Program Eligibility



- Energy / Utility customer that pays into SBC
  - Average monthly peak demand greater than 100kW
  - Application must be submitted before installation of any equipment
  - Customer must not have received an incentive from NYSERDA or another utility for the same measure(s)
- Must be existing facility (new construction not eligible)
  - Refer to the program manual for full details
  - Early contact with the business development team is necessary to coordinate the application process

## Testing and Reporting Requirements for Direct-Current (DC) and Power over Ethernet (PoE) Lamps, Luminaires, and Retrofit Kits

DC and PoE systems have the potential to:

- Reduce electrical losses from AC to DC conversions
- Integrate directly with DC generation sources such as solar and batteries
- Reduce installation costs
- Connect more readily to IT infrastructure for advanced lighting control

- These Requirements for DC and PoE Products enable high quality DC and PoE lighting products to be qualified and listed on the DLC SSL QPL

## Network Lighting Controls: 2019 Program Incentive - Example

- Gut rehab or tenant fit out when NYCEC is triggered
- Typical office space (code allowable watts)
- Allowable watts vs proposed watts (as per COM check doc)
- Incentive based on delta watts @ \$.25 per kwhr
- Allowable vs proposed could easily be 25-30 % savings
- Receive \$50.00 per networked controlled fixture on new LED fixture or kit
- Network Lighting Control system as per DLC QPL
- Fixtures connected to NLC do not need DLC listing

# Q & A Discussion

**This concludes  
The American Institute of  
Architects Continuing Education  
Systems Course**