lighting design lab

Unlock HVAC Energy Savings and Save Money by Integrating Lighting Controls

Presented by
Levin Nock, DesignLights Consortium™ Senior Technical Manager | DesignLights Consortium

May 6, 2025

Seattle City Light

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Webinar Procedures

- All attendees are on mute
- Submit questions at any time
- The webinar is being recorded
- Please take the after-class survey!

Look for the Questions icon in the top menu bar

Chat icon – disabled except for admin

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What Is This “Lighting Design Lab”?

- Seattle City Light's go-to resource for lighting and lighting controls since 1989 – 30+ years
- Formed by BPA and NW utilities to fill education needs for the transforming market
- Now expanded to include resources that support whole buildings
- Being rebranded!

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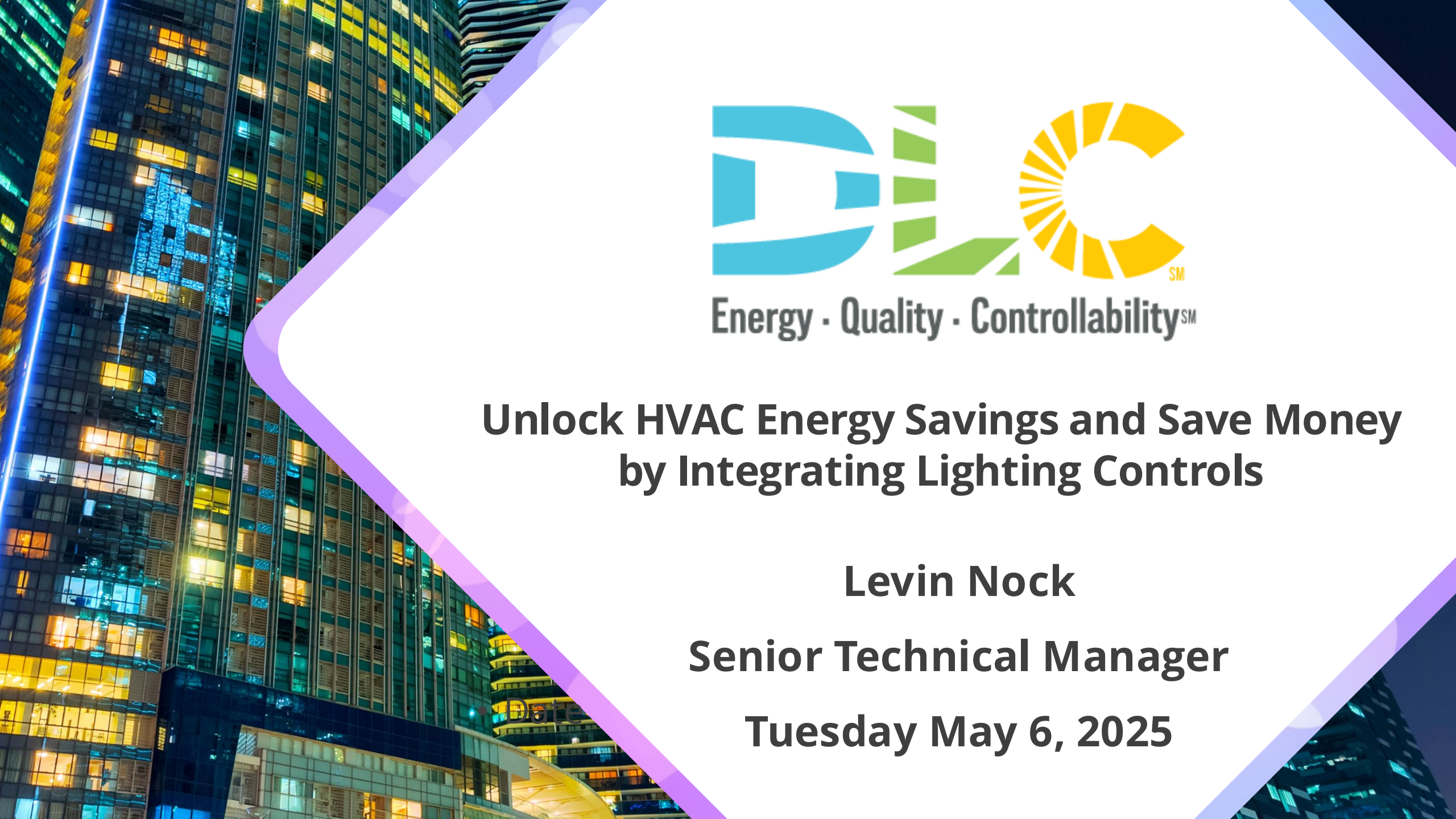
Upcoming Events

Course	Day	Time
2021 Energy Code Update Series – **Alterations**	Thu May 15	10:00-11:30 a.m.
Passive-First Design – Core Concepts and Benefits for Every Building	Thu Jun 12	10:00-11:00 a.m.
City Light's Distributed Interconnection Handbook	TBD	TBD

Event	Day	Time
Seattle City Light Trade Ally Office Hours	Fri May 16	9:00 a.m.

Stay up-to-date at LightingDesignLab.com and by subscribing to our newsletter.



Energy · Quality · Controllability℠

Unlock HVAC Energy Savings and Save Money by Integrating Lighting Controls

Levin Nock

Senior Technical Manager

Tuesday May 6, 2025

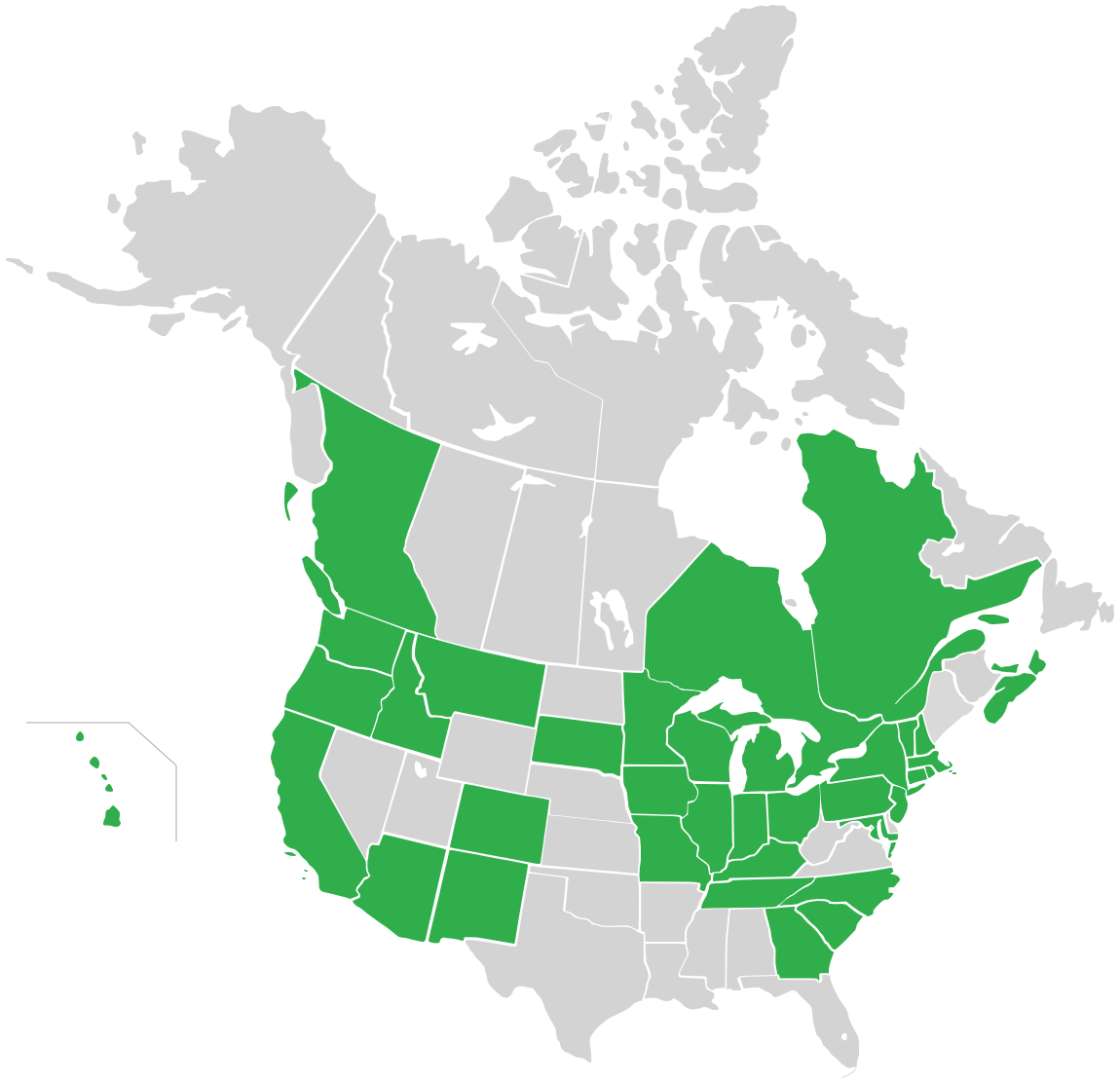
GoToWebinar Logistics

Questions Pane about contents

Chat Pane for technical difficulties

What is the DLC?

- Non-profit
- Lists of high-quality energy-efficient lighting products



The DLC is supported by 65 Member programs throughout the U.S. and Canada.

Agenda

1. Introduction and Context
2. Explore the DLC Integration Toolkit
3. Standardized Digital Protocols for NLC
4. Conclusion
5. Questions and Answers

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1. Introduction and Context
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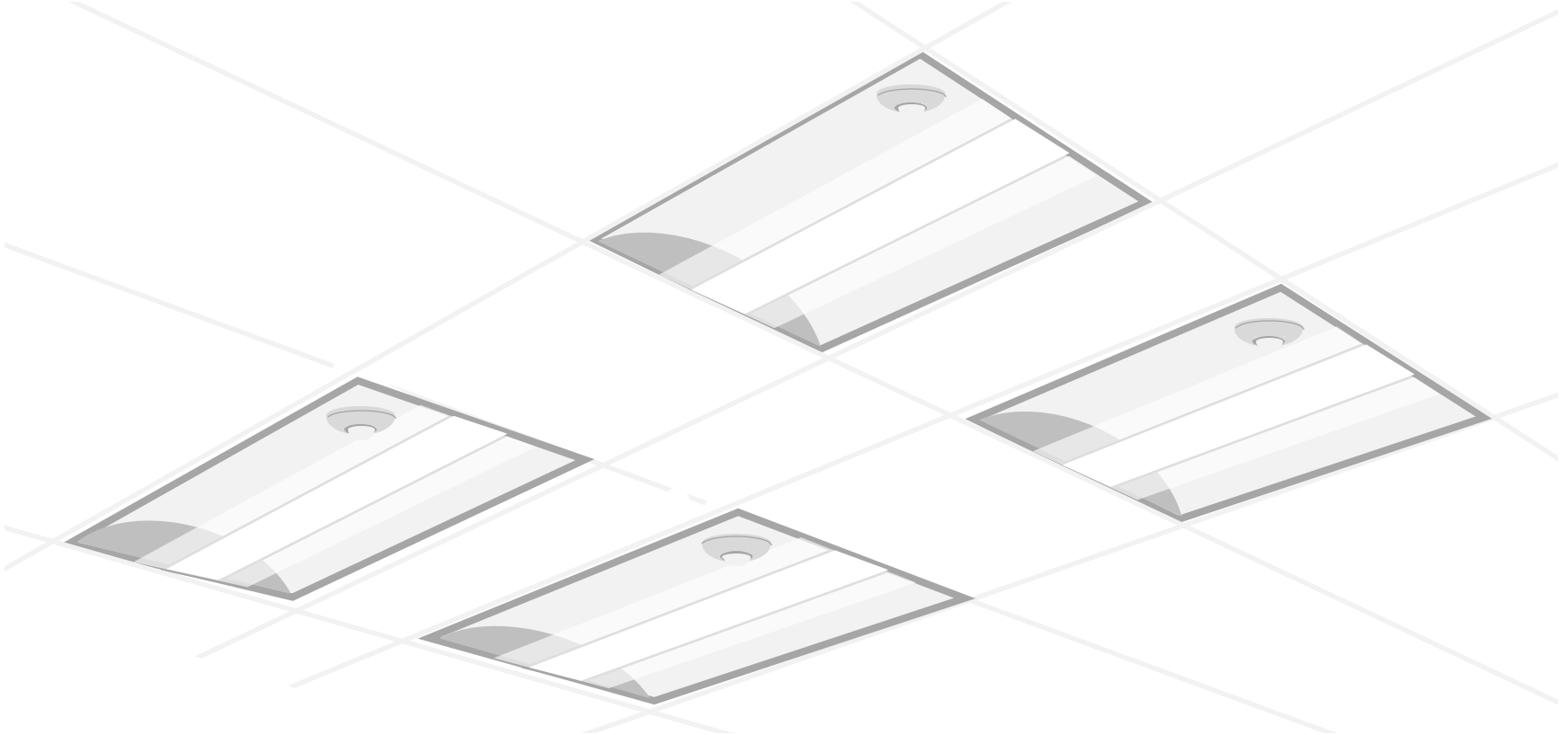
Affordable, reliable energy savings

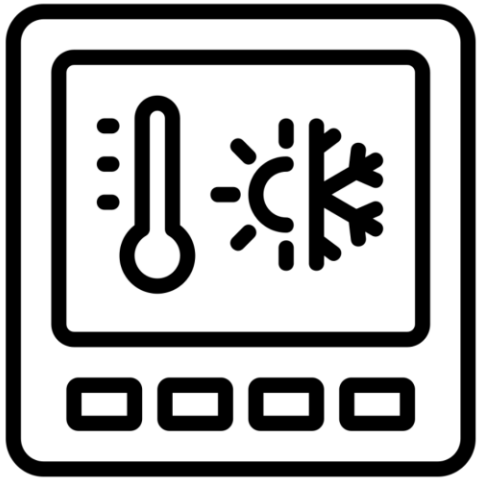
Efficient LED baseline

Slow NLC uptake

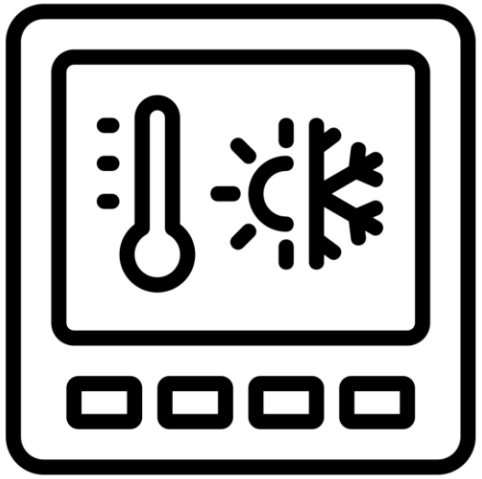
Powered, Networked, Ubiquitous Occupancy Sensors



NLC Occupancy Sensors can inform HVAC controls

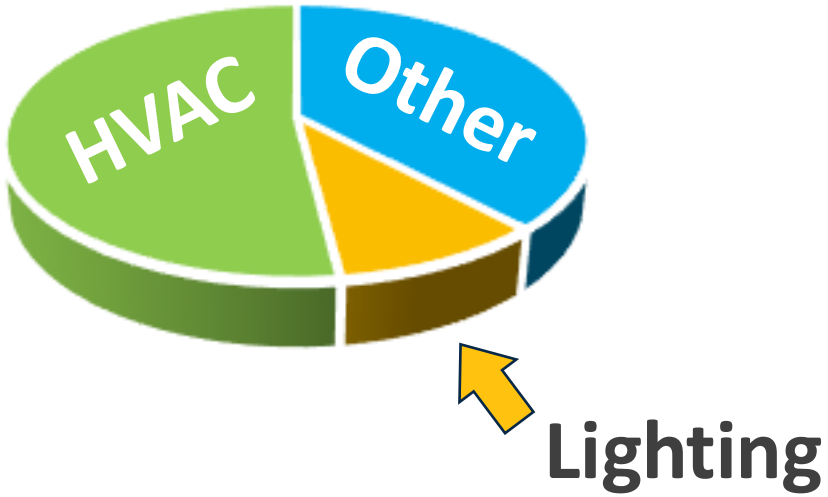


NLC Occupancy Sensors can inform HVAC controls for **Occupied Standby Mode**.



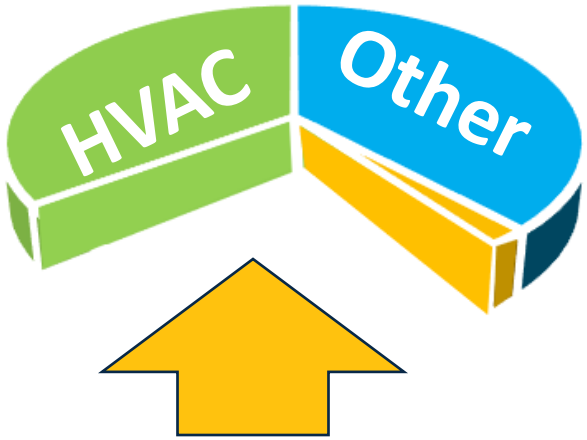
Energy use in commercial buildings in 2018

Lighting	10%
HVAC	52%
Other	38%



CBECS (Commercial Buildings Energy Consumption Survey), US EIA, 2022

In suitable buildings, lighting retrofits with NLC-HVAC integration save over 20% of the whole building energy load.



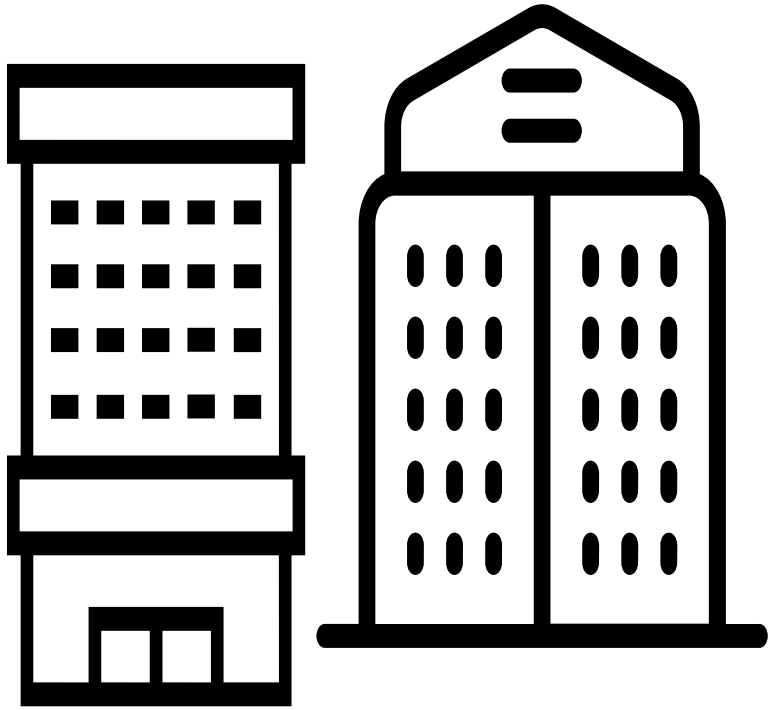
Deep Savings

Rebates

Incentives

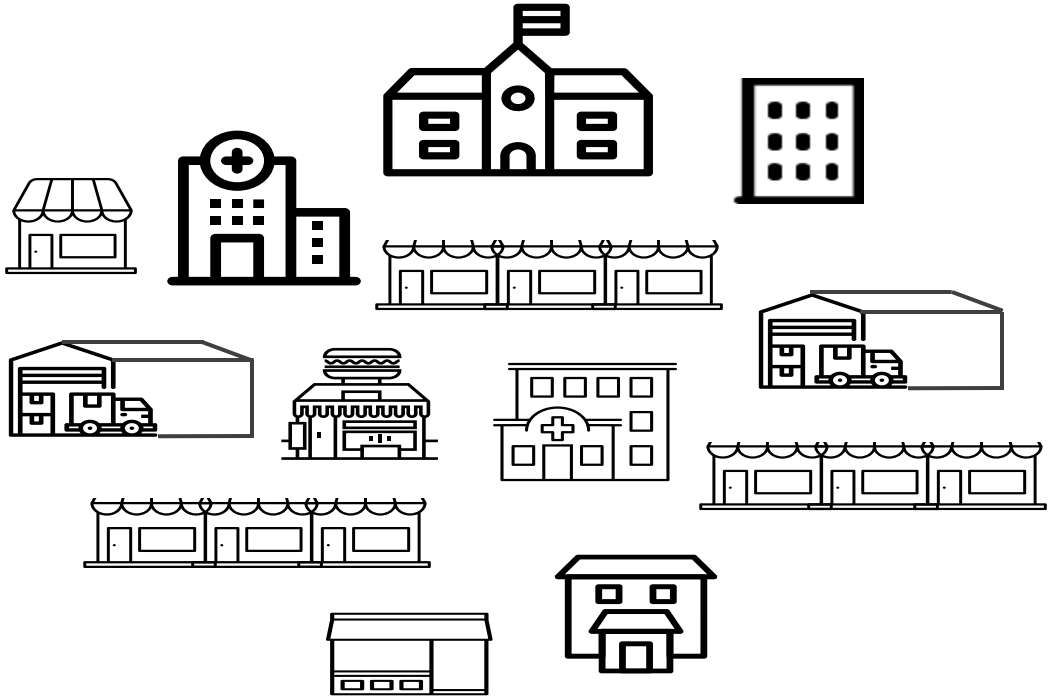
Lower Energy Bills

Large Buildings
Digital Now



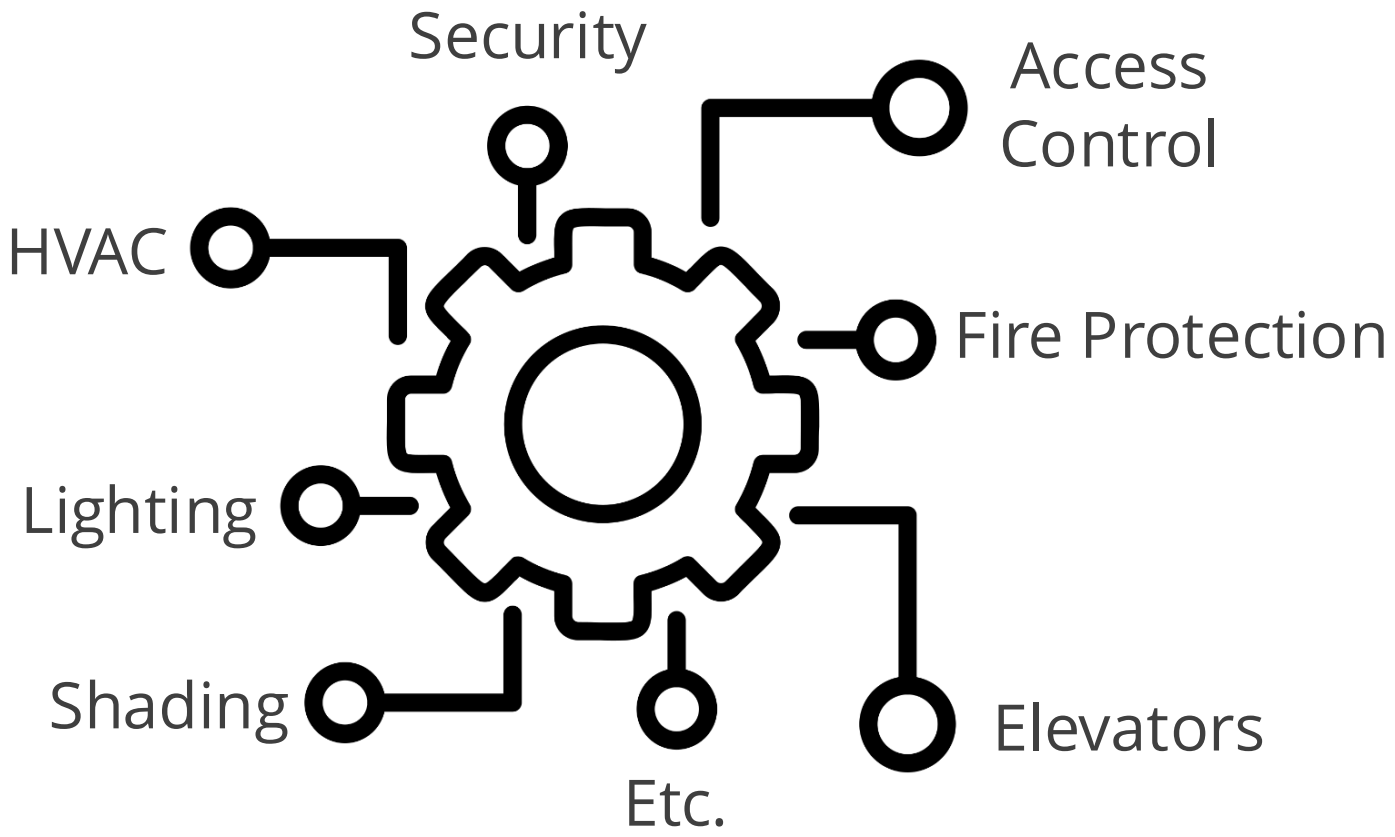
50% of commercial square footage,
6% of buildings

Smaller Buildings
Analog Now, Digital Soon

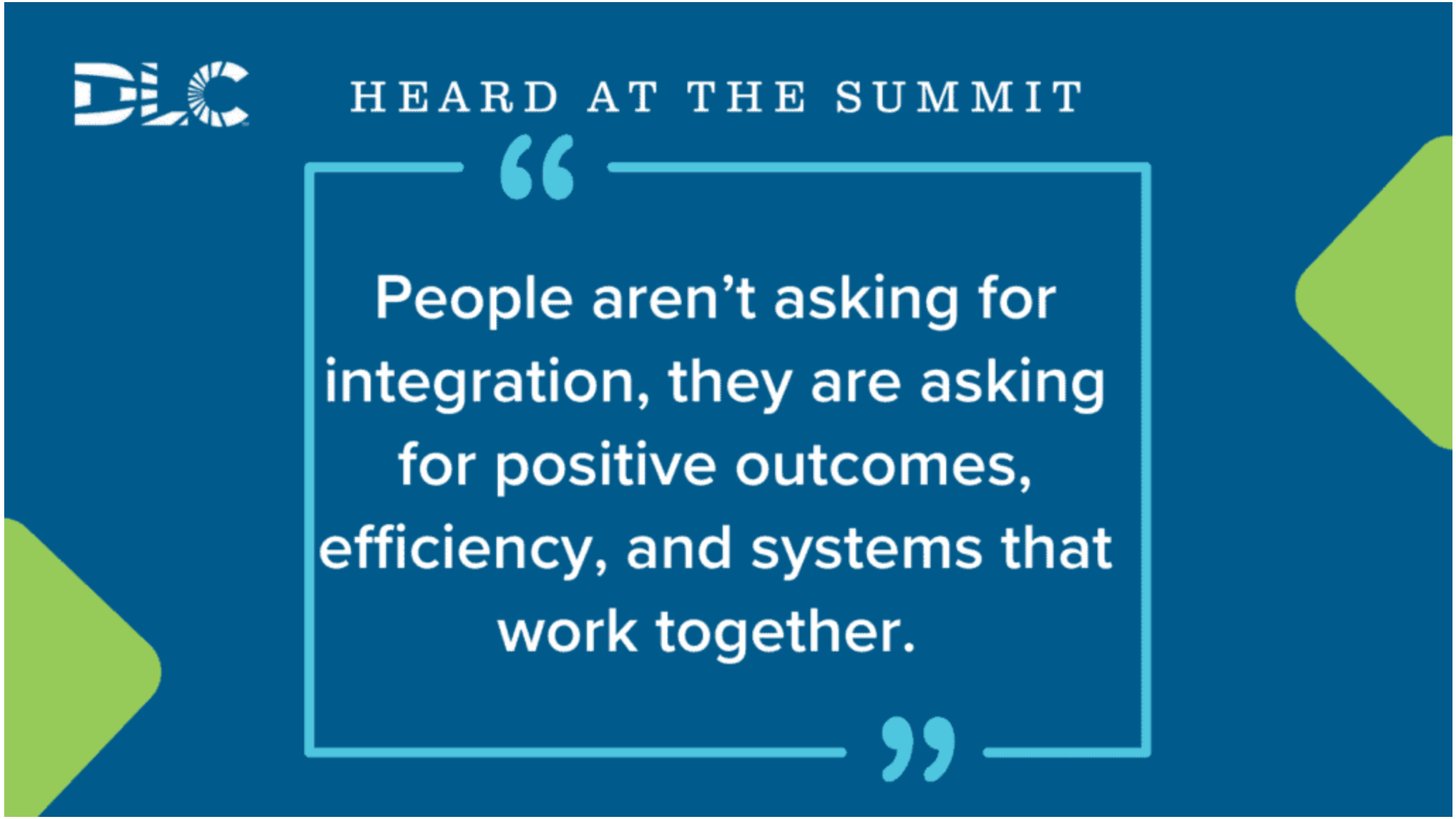


50% of commercial square footage,
94% of buildings

Building Automation

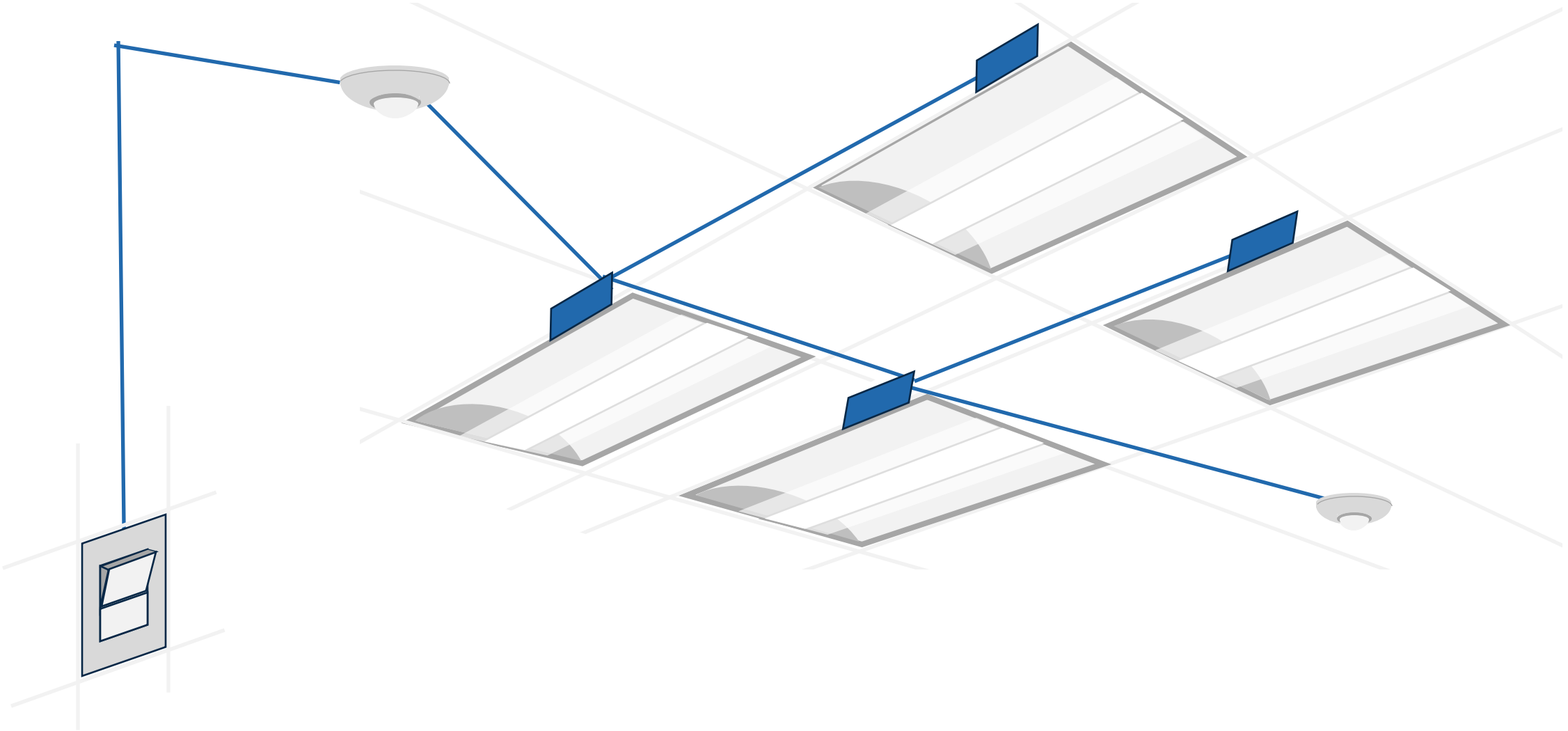


NLC-HVAC integration


HEARD AT THE SUMMIT
People aren't asking for integration, they are asking for positive outcomes, efficiency, and systems that work together.

Definitions

Define “Networked Lighting Control” (NLC)



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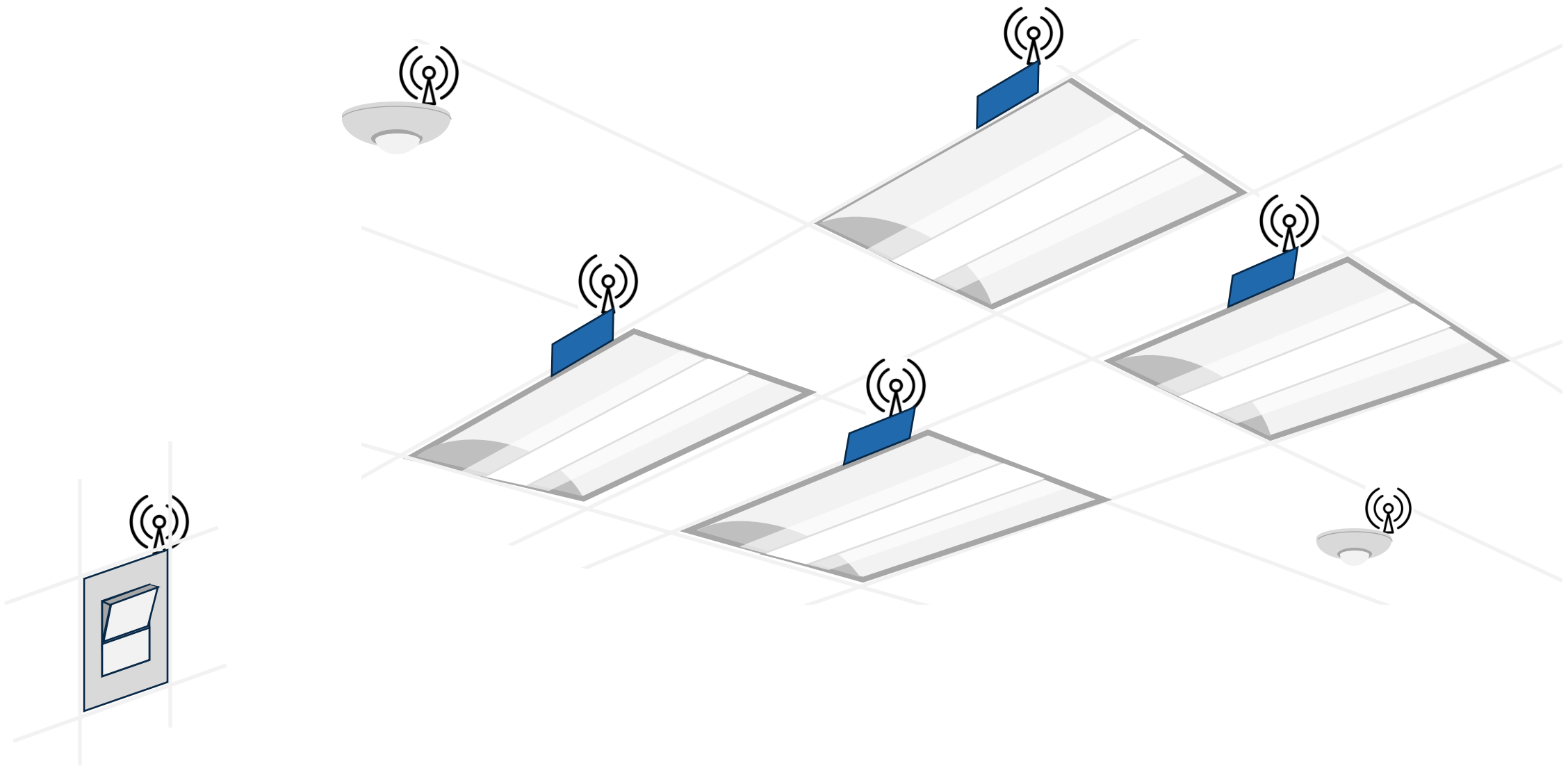

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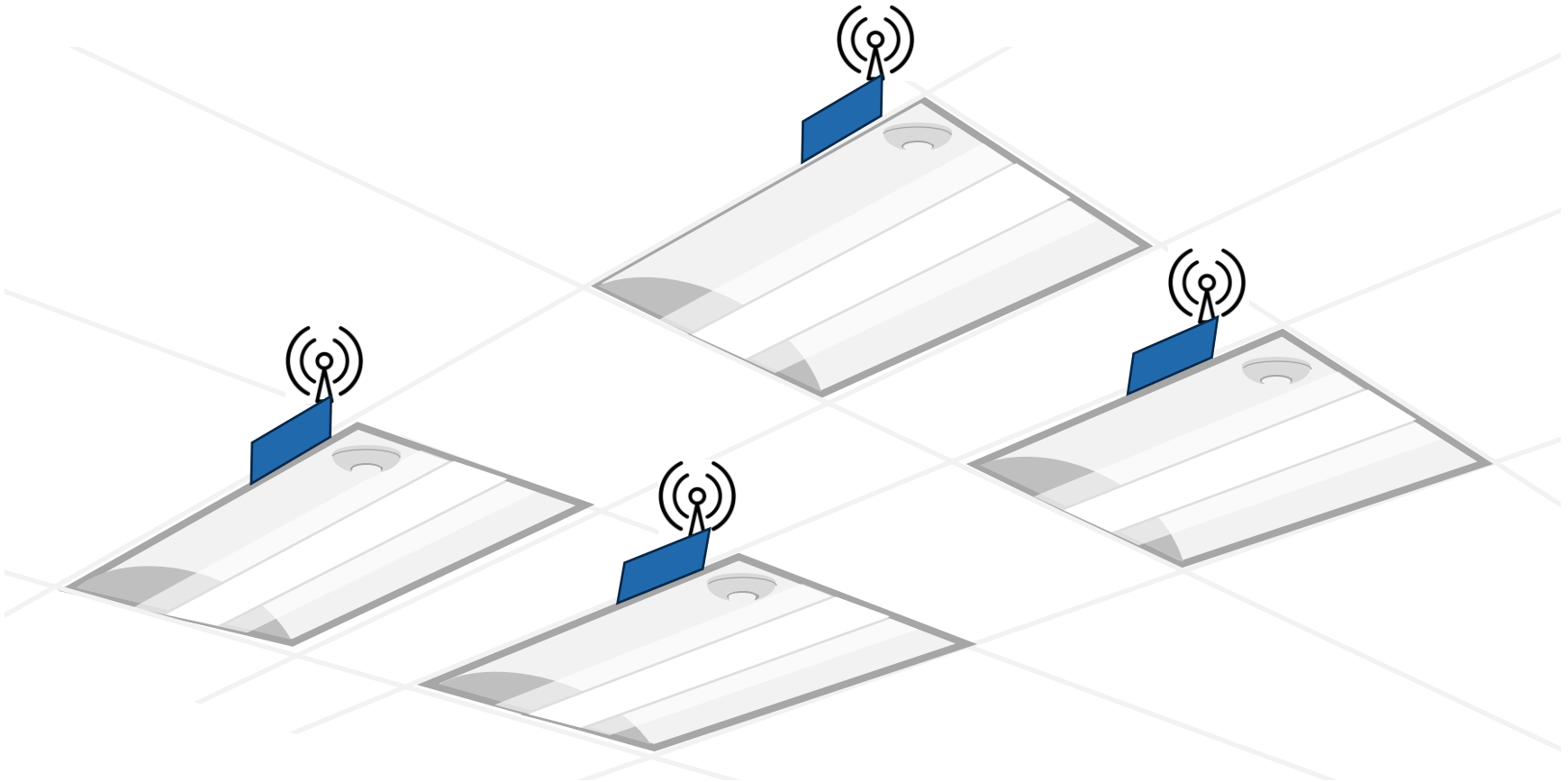
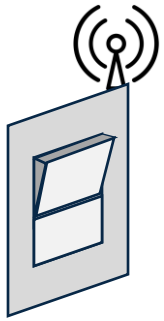
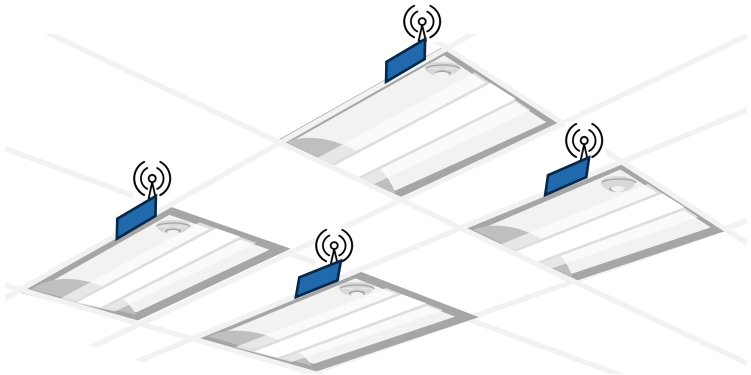
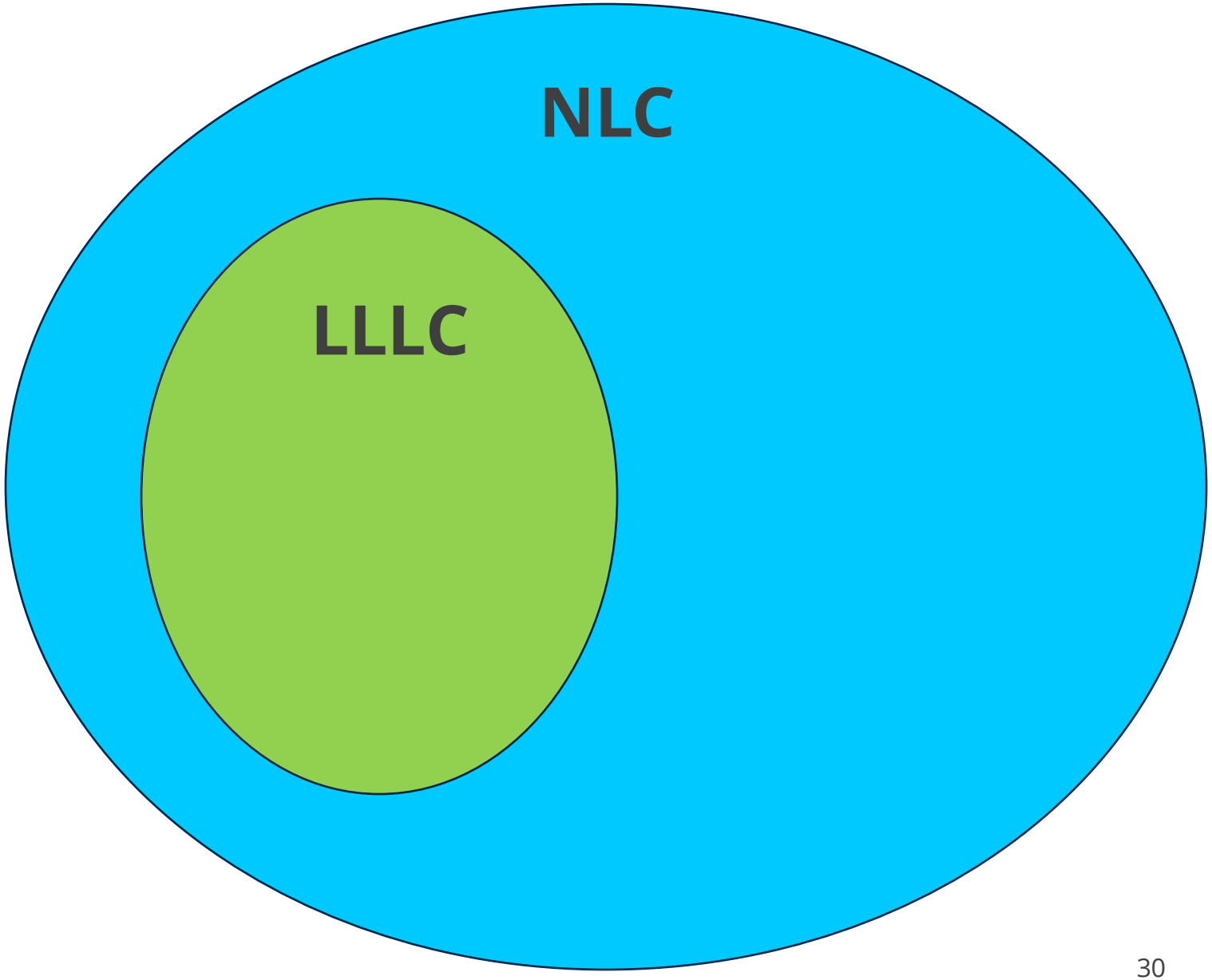




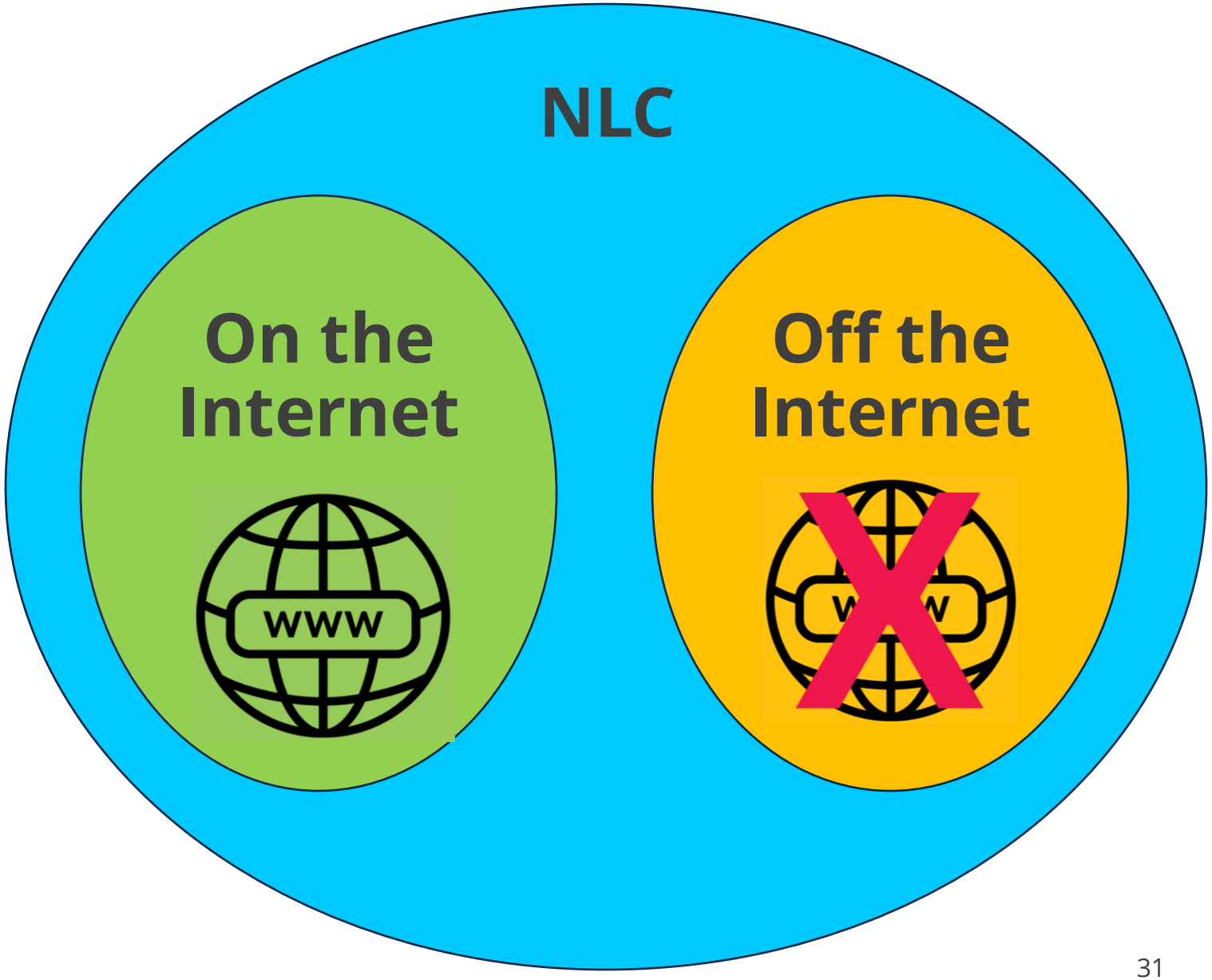
LLLC = sensors on every luminaire (Luminaire Level Lighting Control)

LLLC is a kind of NLC





NLC can be on the Internet or not

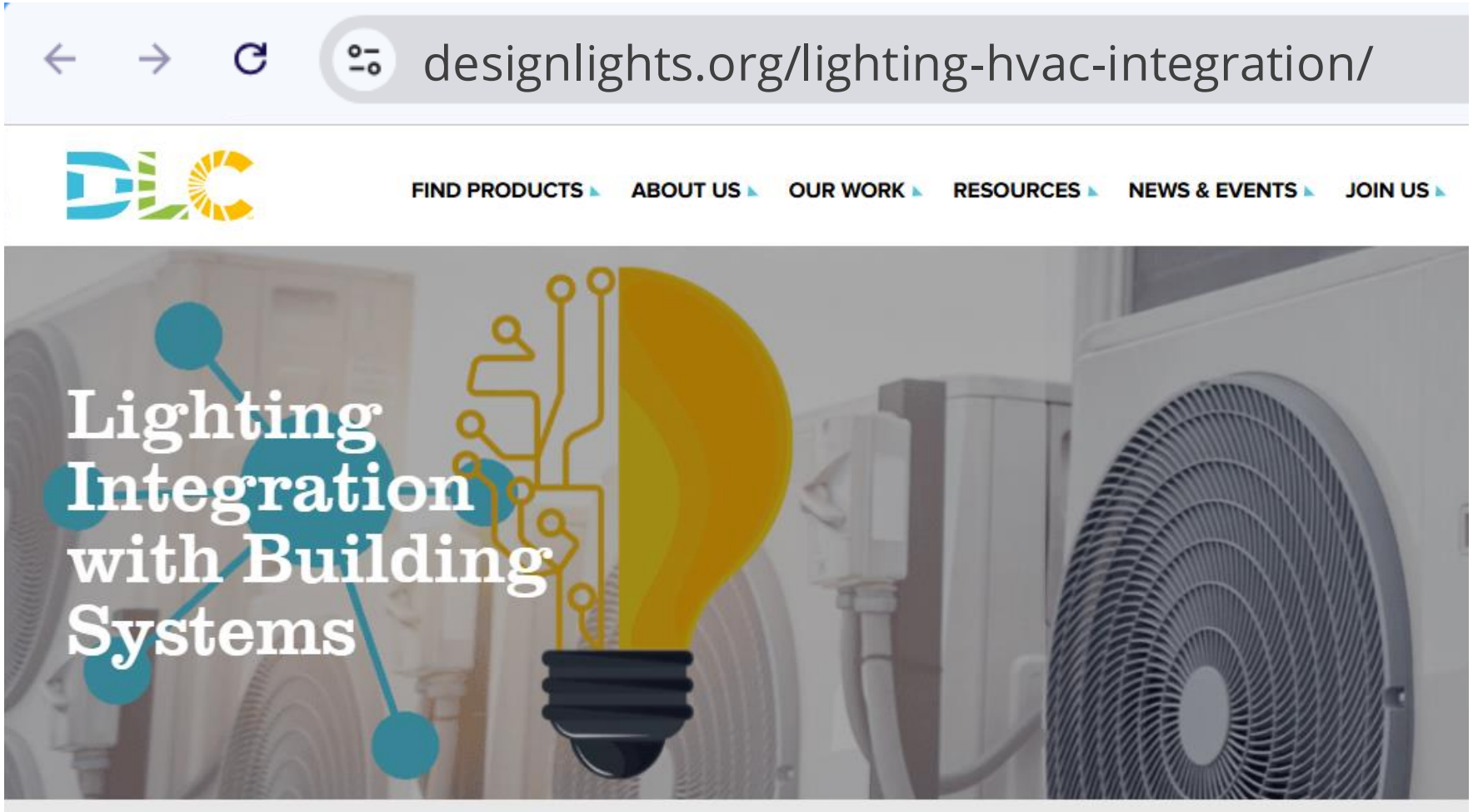


Some NLCs access the Internet occasionally through a phone

Agenda

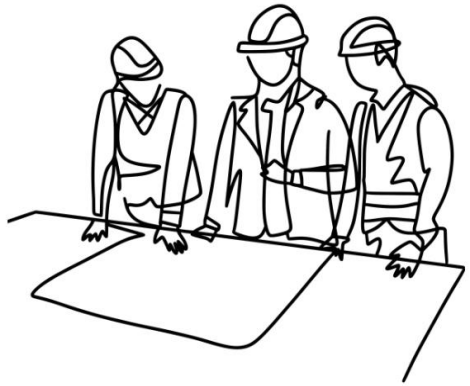
1. Introduction and Context
2. **Explore the DLC Integration Toolkit**
3. Standardized Digital Protocols for NLC
4. Conclusion
5. Questions and Answers

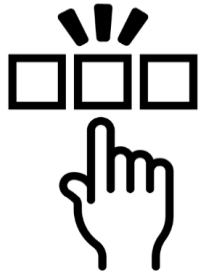
TOOLKIT


designlights.org/lighting-hvac-integration/
FIND PRODUCTS
ABOUT US
OUR WORK
RESOURCES
NEWS & EVENTS
JOIN US
Lighting Integration with Building Systems

Toolkit Goals

These tools will help you





Choose appropriate projects

Collaborate better

Save energy

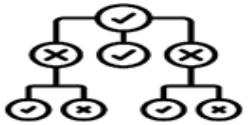
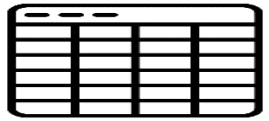
Presentation Goals

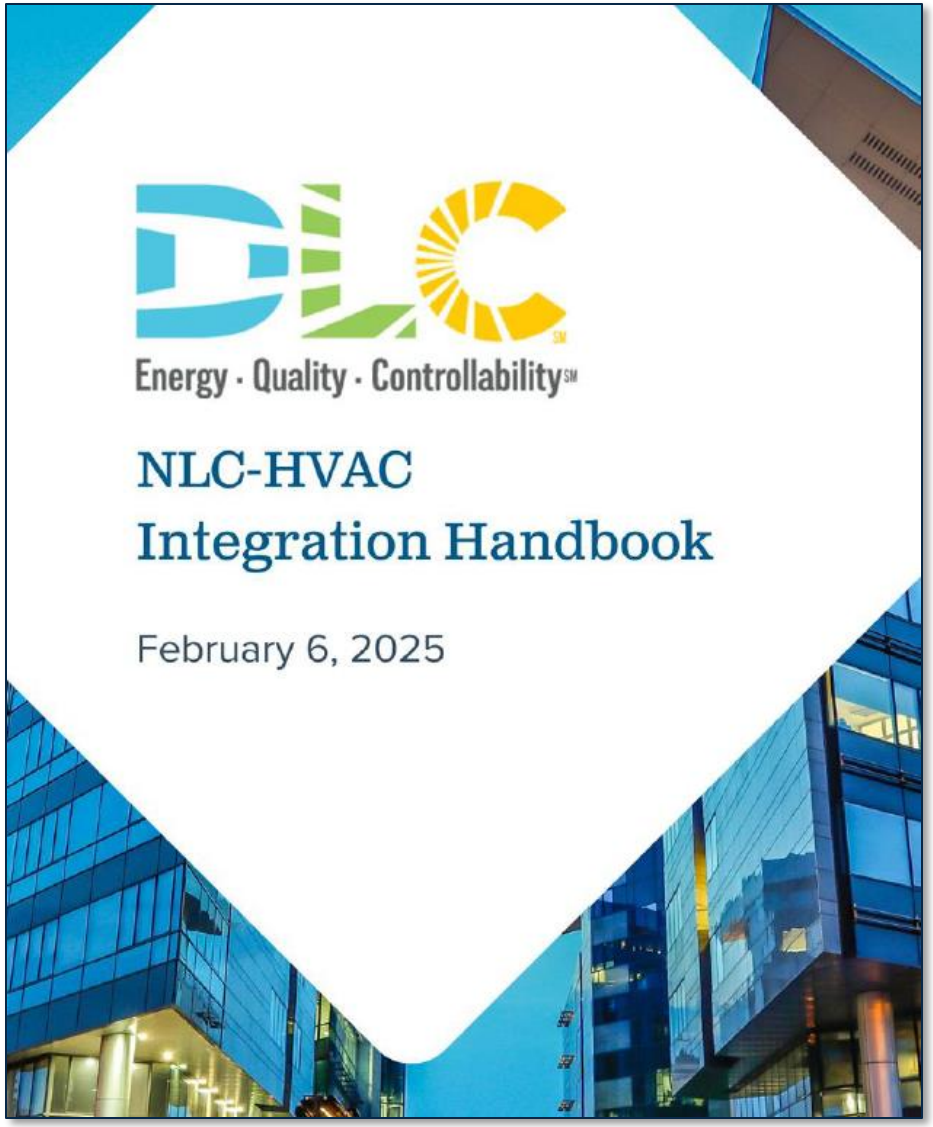
Toolkit Introduction

Suggest changes:

info@designlights.org

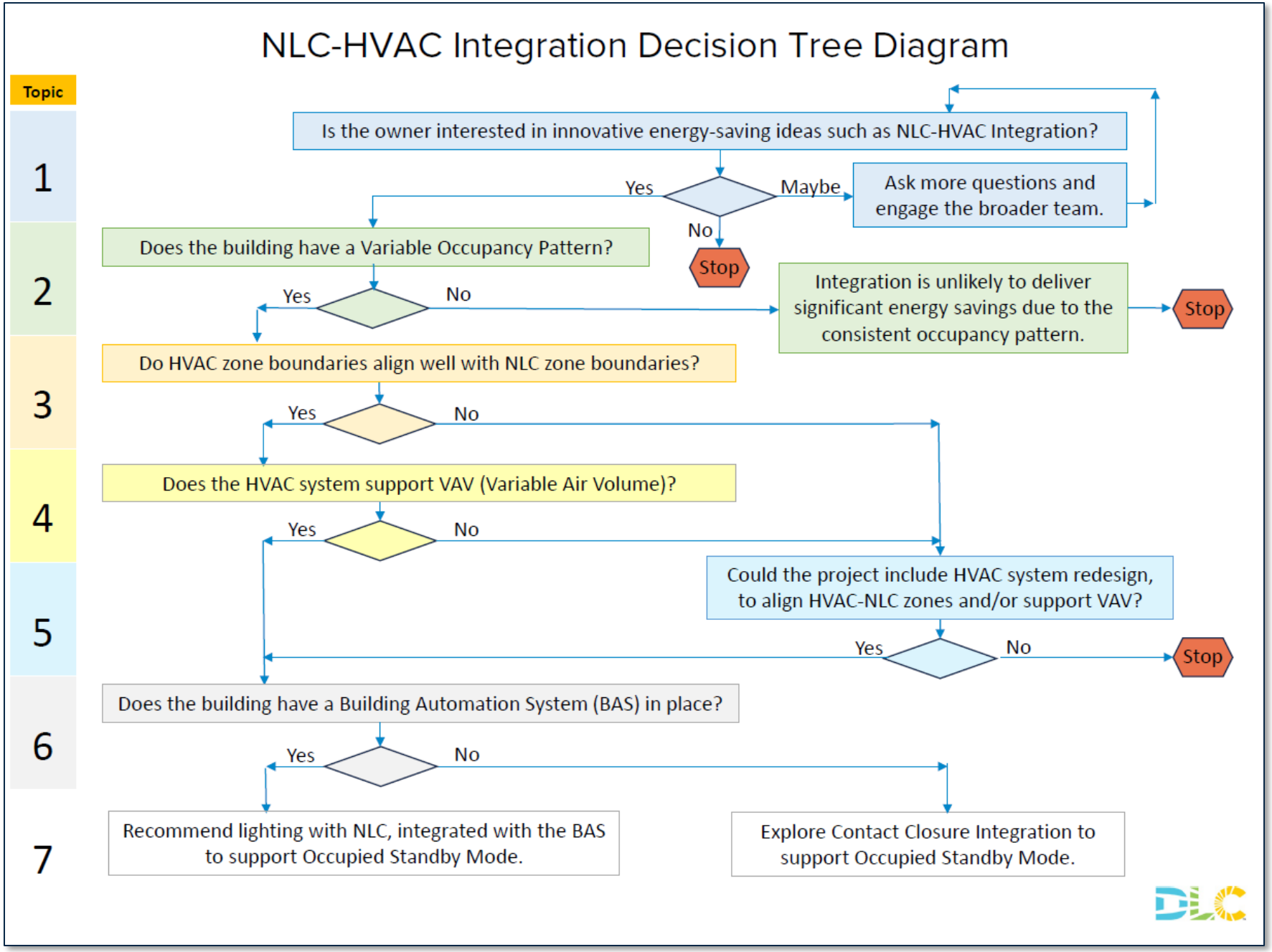
Toolkit Files

1	Handbook	PDF	
2	Decision Tree	PDF	
3	Case Studies	Excel	
4	Responsibility Matrix	Editable Excel	
5	Project Template	Editable Word	

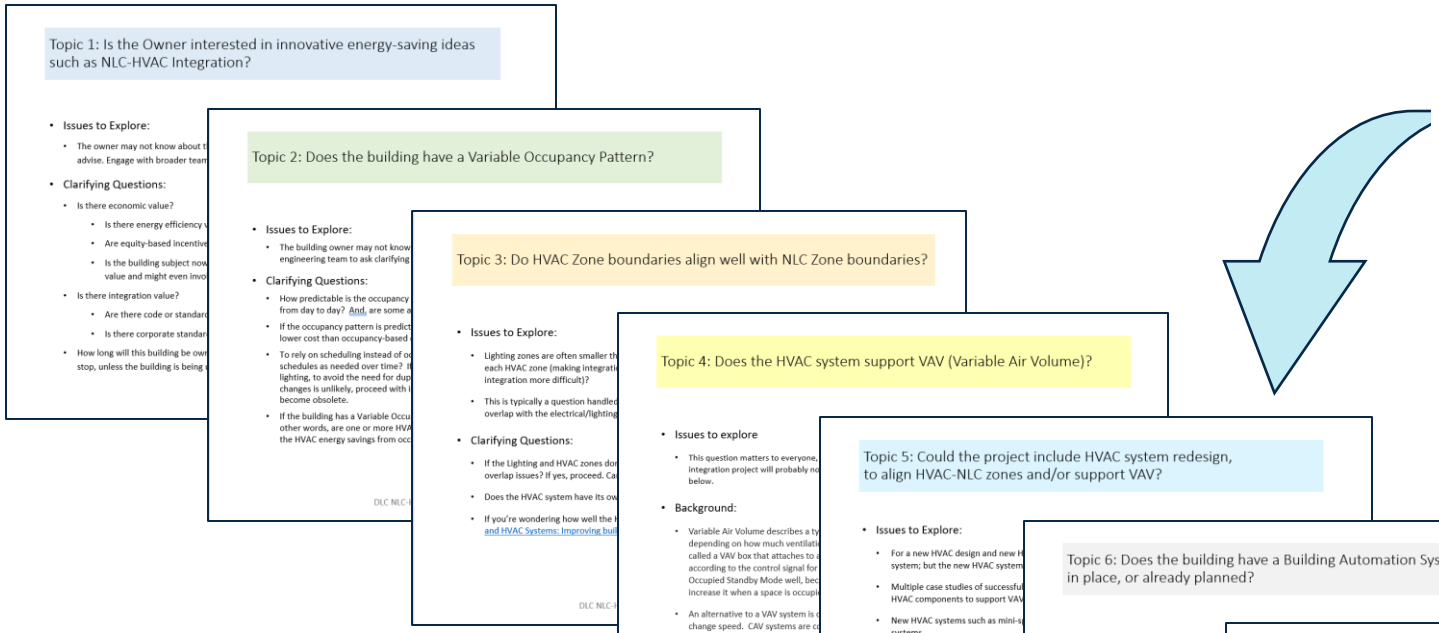


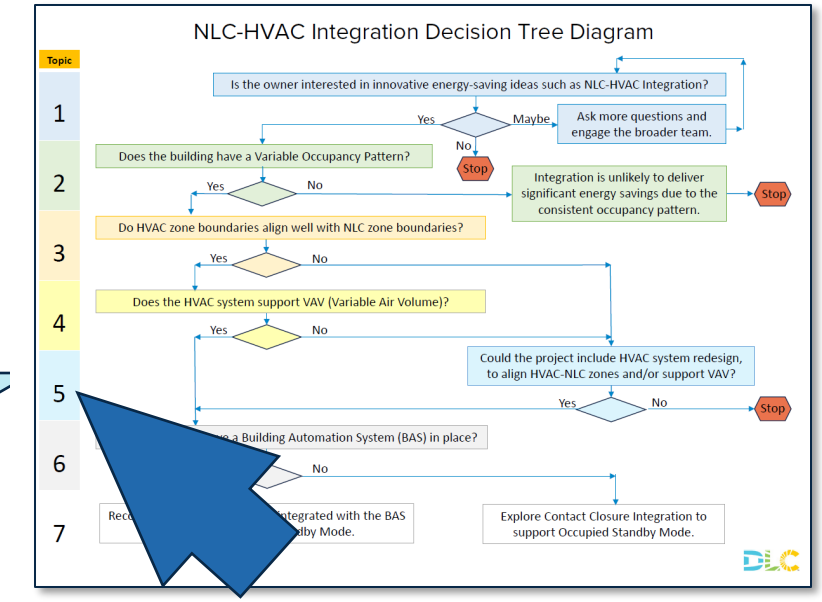
Handbook Contents

Decision Tree Diagram

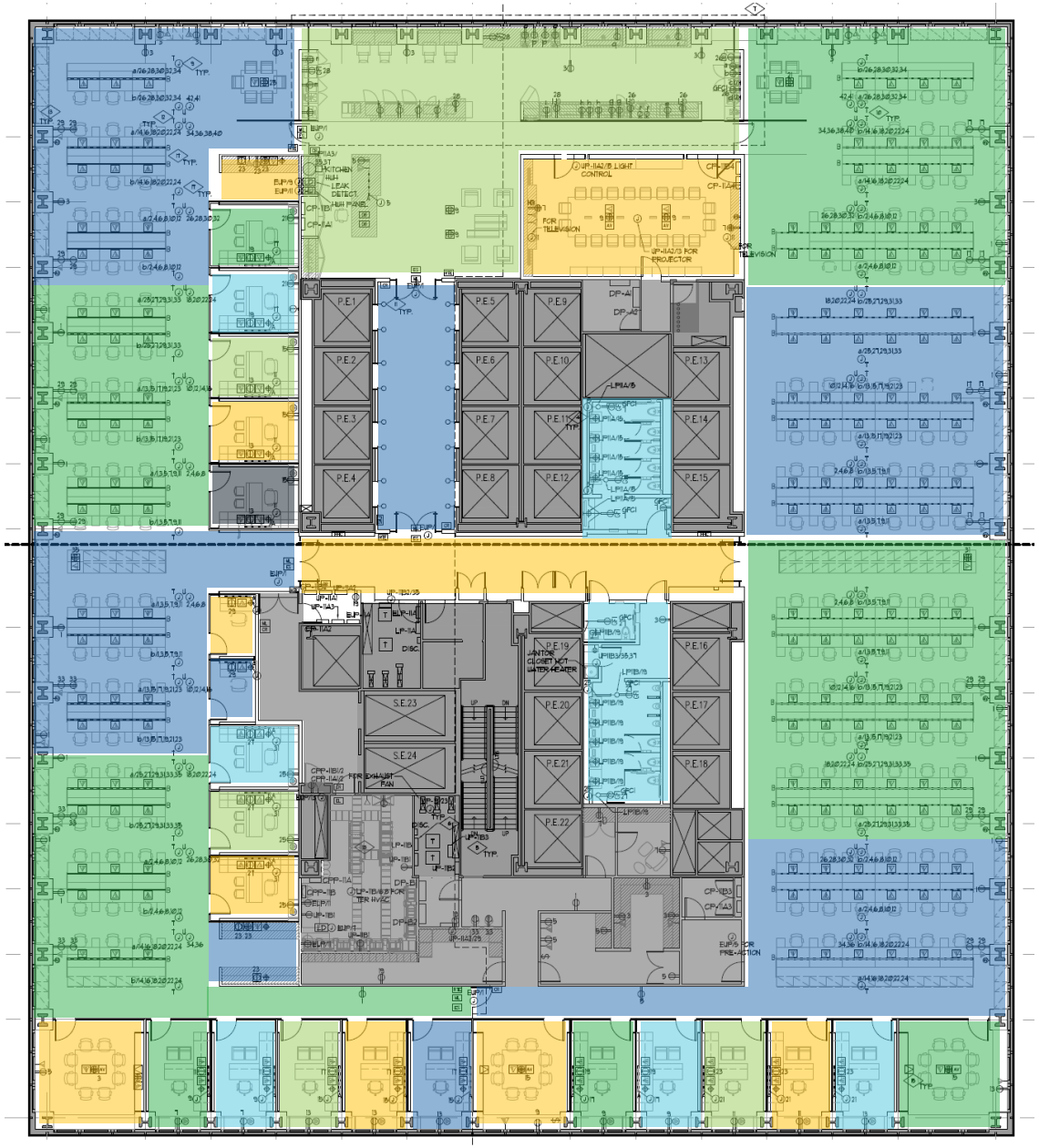


A Detail Page for Each Topic

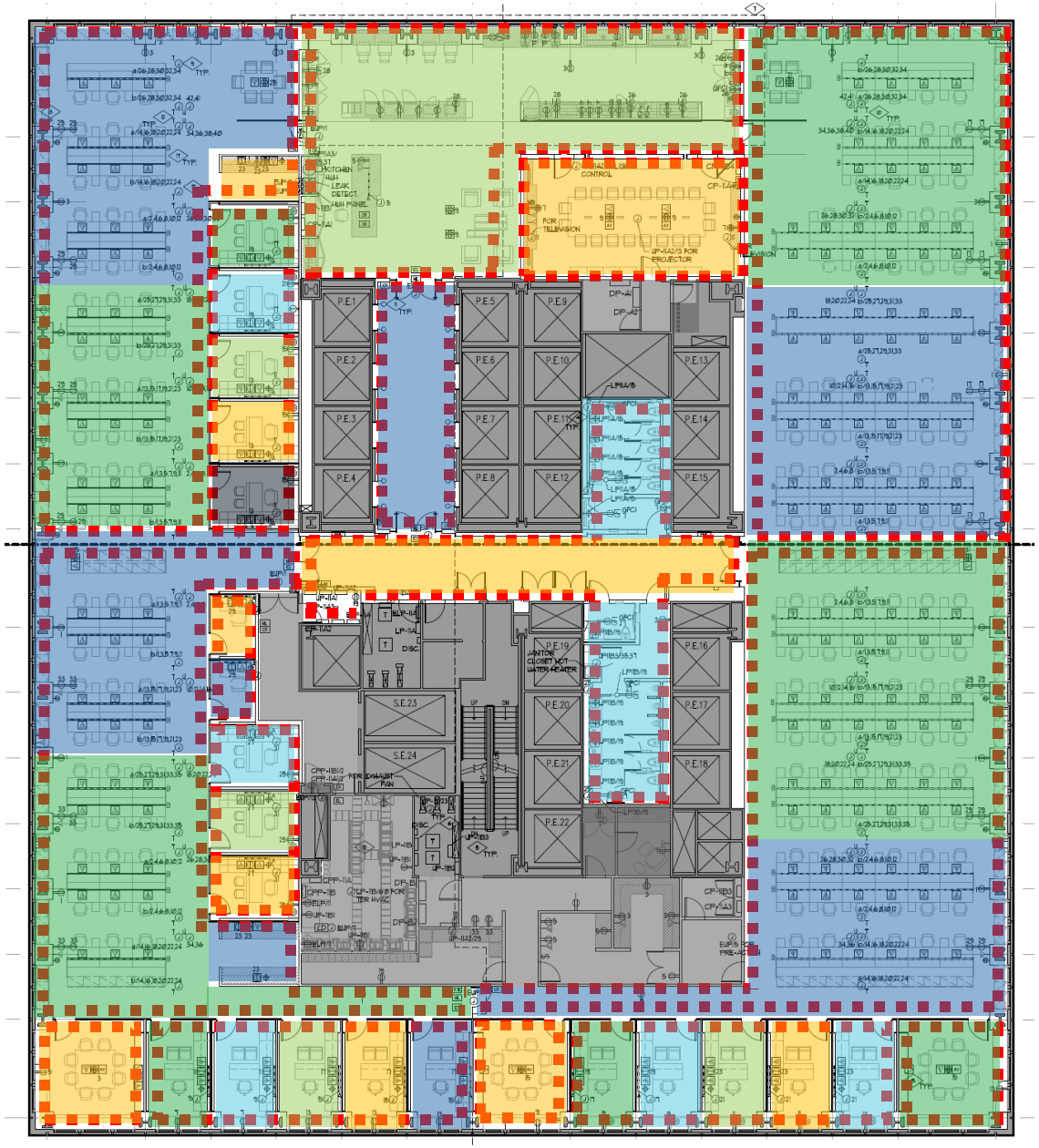




Lighting Zones

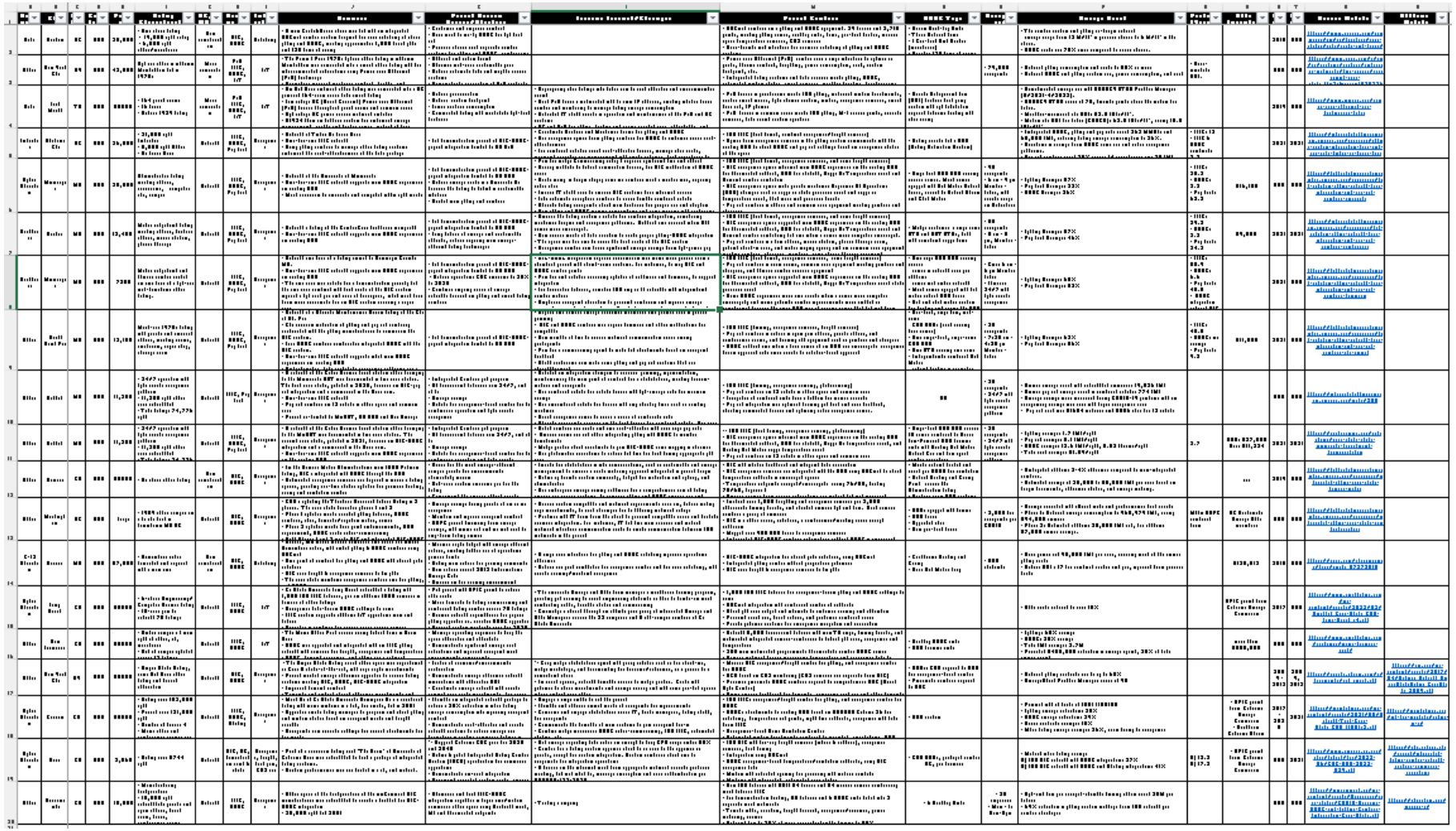


Lighting Zones



HVAC Zones

Case Studies



Case Study Column Headings

Building Type	**Lessons Learned**
City	**Project Controls**
State	HVAC Type
Country	Occupancy/HVAC Schedule
Project Size (sqft)	Energy Saved
Building Characteristics	Payback (Years)
NC, MR, Retrofit (New Construction, Major Renovation, Retrofit)	Utility Incentives
Systems Integrated	Project Date
Integration Purpose	Publish Date
Summary	Source Website
Project Decision Drivers/Objectives	Additional Website

Case Study Columns, First Section

	A	B	C	D	E	F	G	H	I
1	Building Type	City	State	Country	Project Size (sqft)	Building Characteristics	NC, MR, Retrofit	Systems Integrated	Integration Purpose
2	Retail	Durham	NC	USA	25,000	- One story building - 19,000 sqft retail; - 6,000 sqft office/warehouse	New construction	NLC, HVAC	Scheduling
3	Office	New York City	NY	USA	42,000	High rise office in midtown Manhattan built in 1970's	Major renovation	PoE LLLC, HVAC, IoT	IoT
4	Hotel	Fort Worth	TX	USA	164,000	- 164 guest rooms - 16 floors - Historic 1929 building	Major renovation	PoE LLLC, HVAC, IoT	IoT

Case Study Columns, Middle Section

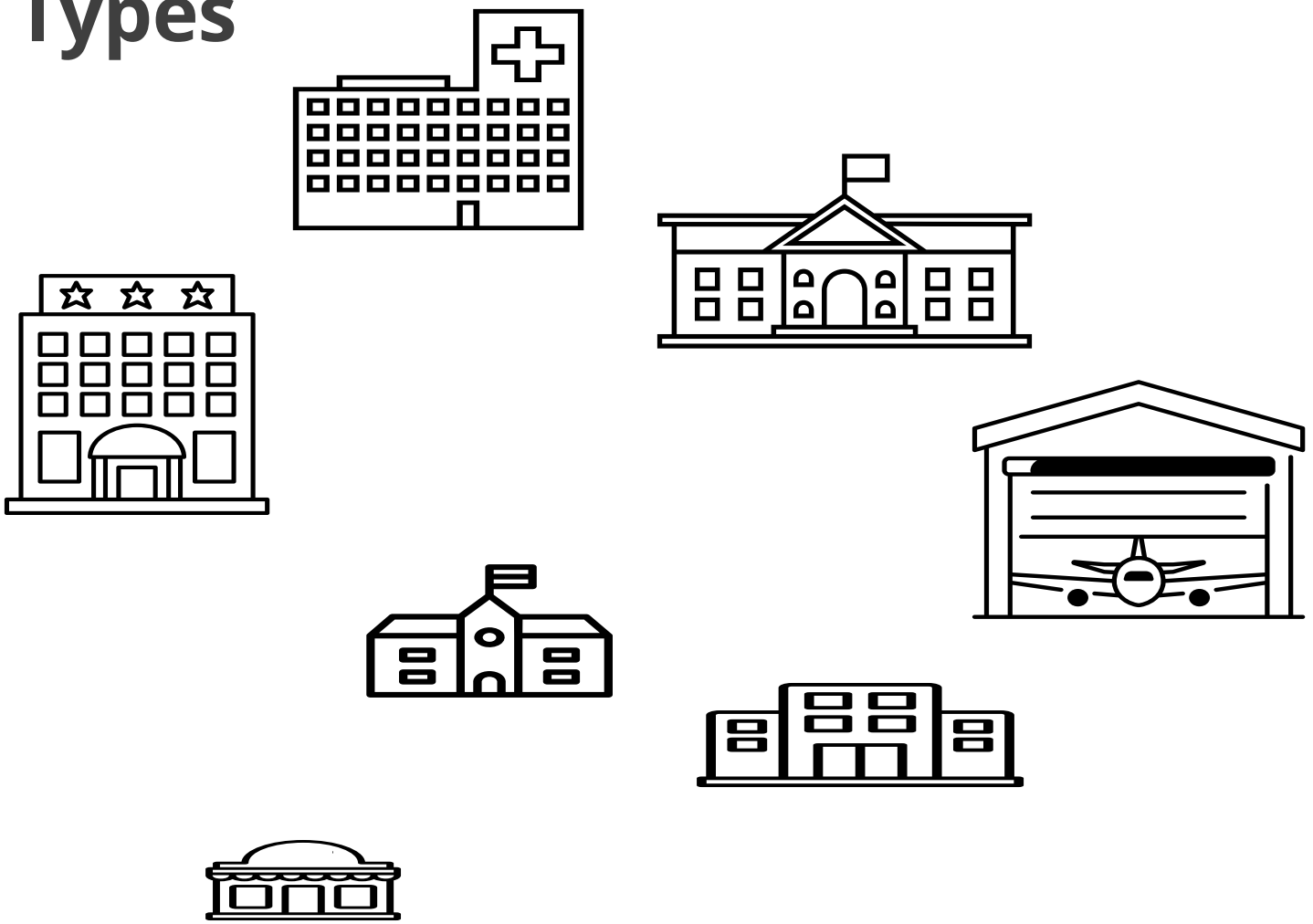
Summary	Project Decision Drivers/Objectives	Lessons Learned/Challenges	Project Controls
- A new Crate&Barrel store was built with an integrated BACnet control system designed for easy scheduling of store lighting and HVAC, including approximately 1,000 track lights and 120 tons of cooling	- Customer and employee comfort - Area must be well-lit; HVAC has high heat load - Previous stores used separate control systems for lighting and HVAC, cumbersome and expensive		- BACnet controls on all lighting and HVAC equipment. 29 devices and 2,715 points, including lighting zones, rooftop units, fans, gas-fired heater, wireless space temperature sensors, CO2 sensors - User-friendly web interface for seamless scheduling of lighting and HVAC systems - BACnet kWh meter
- The Penn 1 Plaza 1970's highrise office building in midtown Manhattan was renovated into a smart office building with fully interconnected subsystems using Power over Ethernet (PoE) technology - Dramatically improved workplace comfort, flexibility, and sustainability	- Attract and retain talent - Advance net-zero sustainability goals - Achieve actionable data and insights across systems - Demonstrate ecosystem of PoE products		- Power over Ethernet (PoE) control uses a single interface to optimize air quality, thermal comfort, daylighting, power consumption, cost, carbon footprint, etc. - Integrated building systems and data sources include lighting, HVAC, automated window shades, smart cameras, weather tracking, touchscreens, voice consoles; air temperature, humidity, quality
- An Art Deco landmark office building was renovated into a DC-powered 164-room luxury hotel smart building - Low voltage DC (Direct Current) Power over Ethernet (PoE) devices throughout guest rooms and common areas - High voltage DC power serves network switches - UL924 lithium ion battery system for enhanced energy management, reliability and backup power, instead of diesel generator	- Historic preservation - Reduce carbon footprint - Lower electrical consumption - Connected building with marketable high-tech features	- Repurposing older buildings into hotels can be cost effective and environmentally sound - Each PoE device is networked with its own IP address, enabling individual device control and monitoring to manage building energy consumption - Dedicated IT staff assists in operation and maintenance of the PoE and DC systems - DC and PoE for lighting, heating and cooling provided ease, affordability, and sustainability	- PoE devices in guestrooms include LED lighting, motorized window treatments, electric smart mirror, digital shower system, minibar, occupancy sensors, smart door lock, IP phones - PoE devices in common areas include LED lighting, Wi-Fi access points, security cameras, hotel sound system speakers

Case Study Columns, Final Section

HVAC Type	Occupancy/ HVAC Schedule	Energy Saved	Payback (Years)	Utility Incentives	Project Date	Publish Date	Source Website	Additional Website
- Seven Roof-top Units - Three Exhaust Fans - 1 Gas-fired Unit Heater (warehouse) - Provides 120 tons of cooling		- The control system and lighting re-design reduced energy usage from 12 W/ft² in previous stores to 6 W/ft² in this store. - HVAC costs are 70% lower compared to earlier stores.			2010	2022	https://www.carrier.com/commercial/en/us/literature/case-studies/retail/crate-and-barrel/	
	- 79,500 occupants	- Reduced lighting consumption and costs by 50% or more - Reduced HVAC and lighting system use, power consumption, and cost	- Near-immediate ROI.		2022	2022	https://www.cisco.com/c/en/us/solutions/collateral/enterprise-networks/dna-spaces/cisco-penn1-case-study.html?oid=csyswt029726	
- Variable Refrigerant Flow (VRF) ductless heat pump system with split distribution replaced hydronic heating with chiller cooling		- Benchmarked energy use with ENERGY STAR Portfolio Manager (5/2021–4/2022). - ENERGY STAR score of 70, twenty points above the median for hotels. - Weather-normalized site EUI: 53.0 kBtu/ft². - Median site EUI for hotels (CBECS): 63.0 kBtu/ft², saving 10.0 kBtu/ft².			2019	2022	https://www.mncee.org/power-over-ethernet-poe-technologies-hotels	

Case Study Building Types

- Healthcare
- Higher Education
- Hotel
- Industrial
- K-12 Education
- Office
- Retail



Project Templates

NLC-HVAC Integration Responsibility Matrix	Design/Specify								Procure								Install								Operations					Notes
Task	ARCHITECT	ELECTRICAL ENGINEER	MECHANICAL ENGINEER	LIGHTING DESIGN	TECHNOLOGY DESIGN	SYSTEMS INTEGRATOR	EQUIPMENT VENDORS	PROJECT MANAGER / OWNER'S REPRESENTATIVE	ARCHITECT	ELECTRICAL CONTRACTOR	MECHANICAL CONTRACTOR	TECHNOLOGY CONTRACTOR	SYSTEMS INTEGRATOR	SYSTEM SPECIFIER	PROJECT MANAGER / OWNER'S REPRESENTATIVE	ARCHITECT	ELECTRICAL CONTRACTOR	MECHANICAL CONTRACTOR	TECHNOLOGY CONTRACTOR	SYSTEMS INTEGRATOR	COMMISSIONING AGENT	PROJECT MANAGER / OWNER'S REPRESENTATIVE	EQUIPMENT VENDORS	SYSTEMS INTEGRATOR	FACILITIES MANAGER	FACILITIES ENGINEERS	PROJECT MANAGER / OWNER'S REPRESENTATIVE	Equipment Vendors vary based on task. The NLC-HVAC Integration Handbook has a References section with information about the documents listed below.
Lighting System																														
Luminaire Selection and Fixture Layout	C	C	C	R	C	C	C	A	C	R		I	C	C	A	C	R		I	C	C	A		I	A	R	I		
Luminaire Control Integration	C	C	C	R	C	C	C	A	C	R		I	C	C	A	C	C		I	R	C	A		R	A	C	I		
Luminaire Power Requirements	C	R	C	C	C	C		A	C	R		I	C	C	A	C	R		I	C	C	A		C	A	R	I		
Lighting Control System																														
CIN and SOO	C	C	C	R	I	C		A	C	R		I	C	C	A	C	C		I	R	C	A	C	R	A	I	I	Refer to ANSI/IES LP-16-22.	
Lighting Control Zones	C	C	C	R	I	C		A	C	R		I	C	C	A	C	C		I	R	C	A	C	R	A	I	I		
Device Layout & Quantities	C	C	C	R	I	C	C	A	C	R		I	C	C	A	C	R		I	C	C	A	I	C	A	R	I		
HVAC System																														
HVAC Selection and VAV/Duct Layout	C	C	R	C	C	C	C	A	C	I	R	I	C	C	A	C	I	R	I	C	C	A		I	A	R	I		
HVAC Control Integration	C	C	R	C	C	C	C	A	C	I	R	I	C	C	A	C	I	C	I	R	C	A		R	A	C	I		
HVAC System Power Requirements	C	C	R	C	C	C		A	C	I	R	I	C	C	A	C	I	R	I	C	C	A		C	A	R	I		
HVAC Control System																														
CIN and SOO	C	C	R	C	C	C		A	C		I	I	C	C	A	C	I	C	I	R	C	A	C	R	A	C	I	Refer to ASHRAE Guideline 36-2021.	
HVAC Control Zones	C	C	R	C	C	C		A	C		I	I	C	C	A	C	I	C	I	R	C	A	C	R	A	C	I		
HVAC Control Device Layout & Quantities	C	C	R	C	C	C	C	A	C		I	I	C	C	A	C	I	R	I	C	C	A	I	C	A	R	I		
Technology Infrastructure (IT, OT)																														
Infrastructure & Connectivity for Connected Control Systems	C	C	C	C	R	C		A	C	I	I	R	C	C	A	C	C	C	R	C	C	A		I	A	R	C		
Cyber Security Coordination	C	I	I	I	I	R		A	C	I	I	I	R	C	A	C	I	I	C	R	C	A	I	R	A	C	C	Refer to DLC NLC5.1 Technical Requirements.	
Control System Network Requirements	C	I	I	I	I	R	C	A	C	I	I	I	R	C	A	C	I	I	C	R	C	A	I	R	A	C	C		
Commissioning and Integration Process																														
Owner's Project Requirements	C	R	R	R				A													I									
Control System Programming							C									C	C	C	I	R	C	C							
Verification Commissioning																C	C	C	C	C	R	C						Refer to ANSI/IES LP-8-20.	
Energy Efficiency Incentives		R	R	C		C	C	A		R	R				A						C	R							
Training																C	C	C	I	R	C	I	C	C		R	C		
On-site, Commissioning (During Construction)																C	C	C	I	R	C	C	I	R		C	C	Refer to ANSI/IES LP-8-20.	
On-going Testing (During Operations)																							C	R		C	C	Refer to ANSI/IES LP-8-20.	

The project team shall list all the performance outcomes for the individual project under procurement.

The contractor described in this section shall perform the role of the Master Systems Integrator (MSI). During the procurement process, the project team shall identify the sub-contractor to perform this specification and ensure the Division 25 responsibilities are achieved. The MSI is contracted to provide the DIV 25 specification requirements and manage all cross-domain coordination.

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes

General and technical requirements for Networked Lighting Control integration with Building Automation System.

B. Scope

1. Procurement and installation of integrated systems shall follow Related Sections specifications including labor and materials. Include all components not specifically indicated or specified, but necessary to make the system function within the intent of the specification.

2. Communication network type may vary, based on the system design. MSI shall coordinate communication protocol requirements for integration. In this scope, integration refers to the NLC and the HVAC system and may include direct controller to controller, controller to supervisory controller and vise versa, and controller to BMS front end user interface software all using a standard open communications protocol such as BACnet.

3. MSI shall lead the effort to integrate the Lighting, HVAC and BMS Systems. Effort includes developing the integration plan, facilitating communication protocol meetings, tracking and follow through with requests for vendor-specific information.

4. MSI shall coordinate with Owner's IT department for software on-boarding, network infrastructure requirements, network deployment and management, cybersecurity policies and requirements, and related OT/IT coordination requirements to accommodate project schedule.

C. Related Sections

1. Division 23

2. Division 26

1.2 ACRONYMS

A. ANSI American National Standards Institute
B. API Application Programmable Interface

Toolkit Tour

Suggest changes to

info@designlights.org

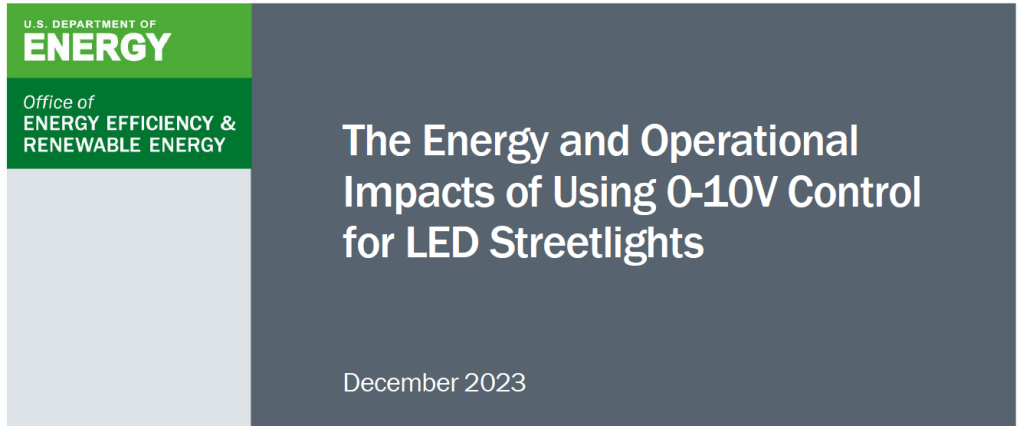
Agenda

1. Introduction and Context
2. Explore the DLC Integration Toolkit
3. **Standardized Digital Protocols for NLC**
4. Conclusion
5. Questions and Answers

Standardized, Certified Digital Protocols for NLC

1. DALI Alliance
2. Bluetooth® NLC
3. DLC's list of NLC Systems

0-10V Analog Performance is Unreliable



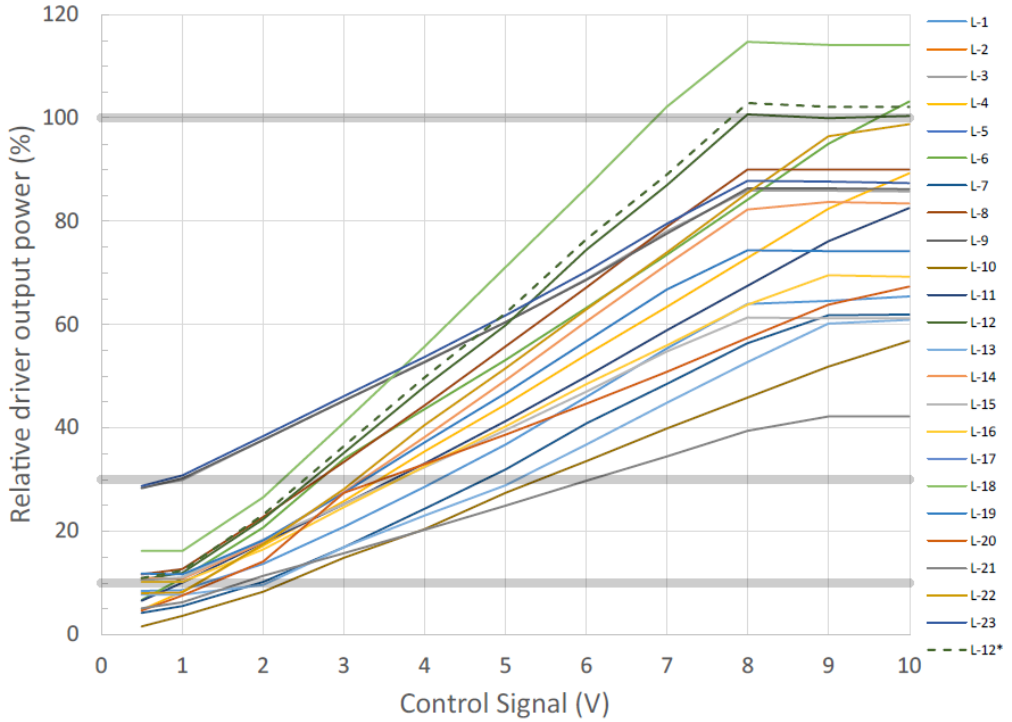


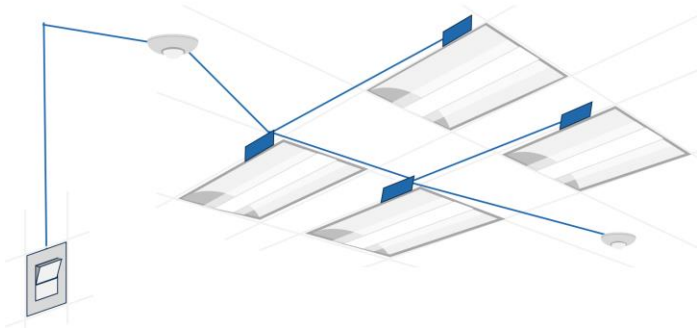
Figure 7. LED driver dimming curves, based on relative driver output power, as calculated from the rated driver efficiency. Horizontal threshold lines are highlighted at 10%, 30%, and 100% of rated maximum input power, and a thick red line shows an "expected" linear dimming curve. Two curves for L-12 (dark green, solid and dashed) show the response based on rated efficiency data found in two different manufacturer documents.

PNNL-32949

https://www.pnnl.gov/publications/energy-and-operational-impacts-using-0-10v-control-led-streetlights

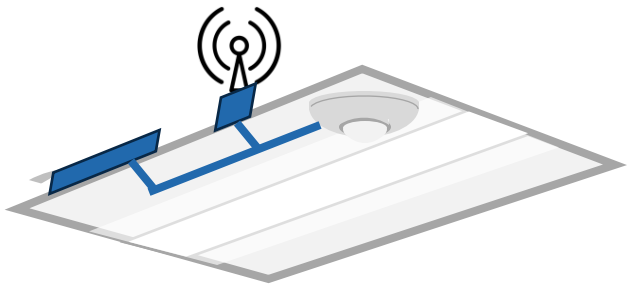
Standardized Digital Data: DALI Alliance

Wired network
BETWEEN luminaires,
sensors, wall-stations,
gateways…



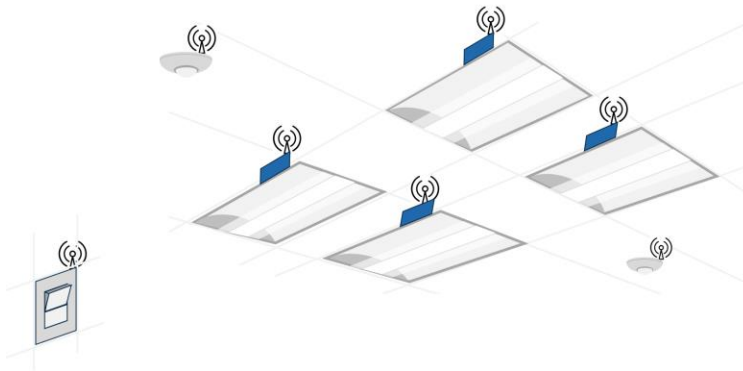
2017

Wired network
WITHIN a luminaire:
drivers, sensors, controllers
(ANSI C137.4)



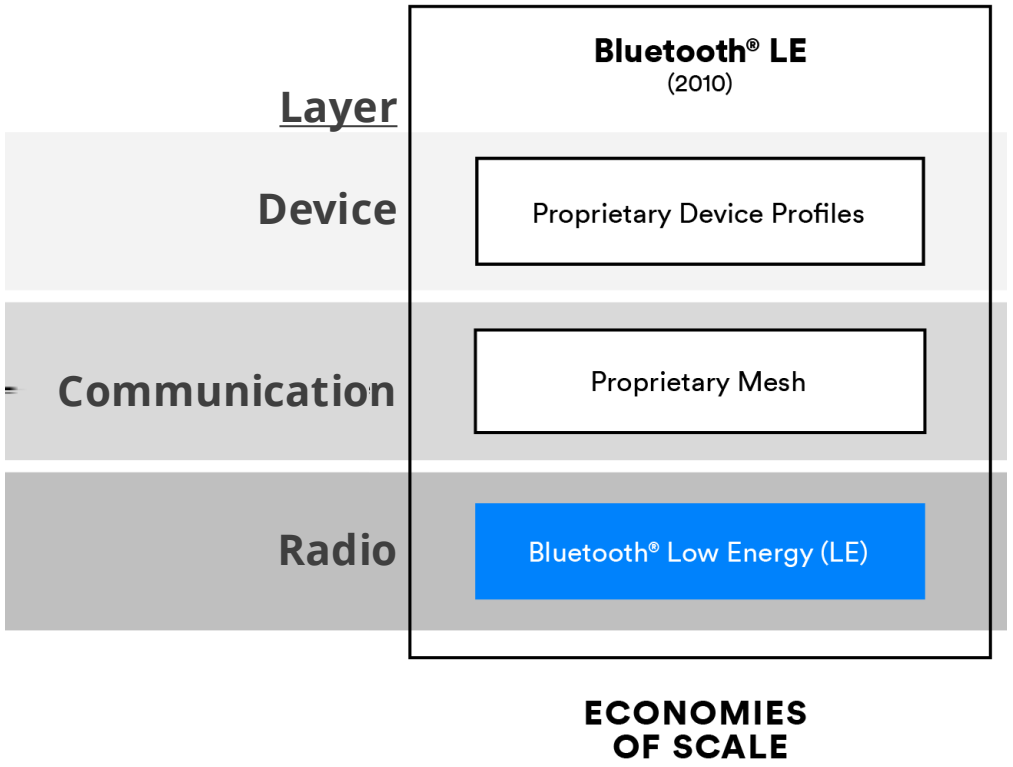
2019

Wireless network
BETWEEN luminaires,
sensors, wall-stations,
gateways…

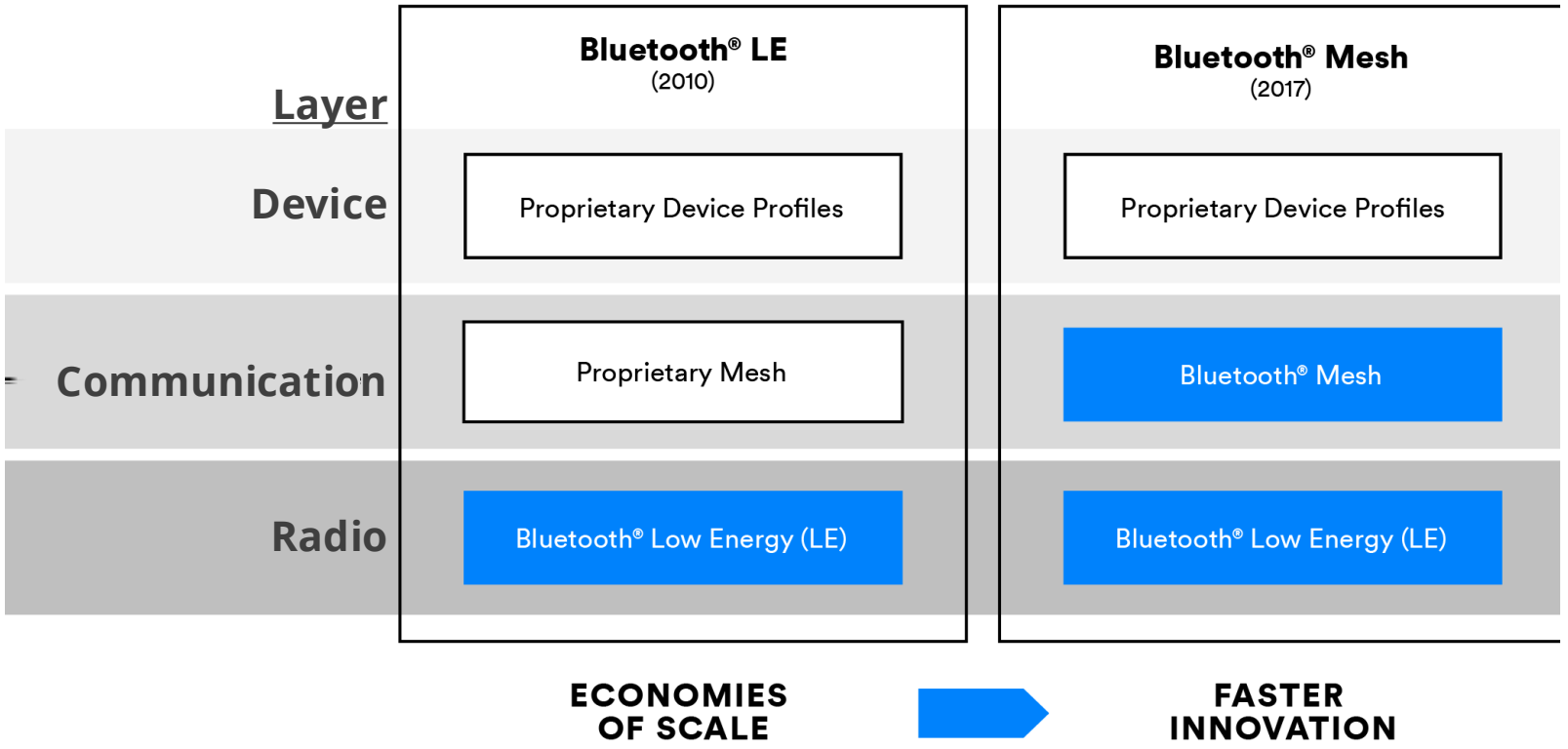


2021

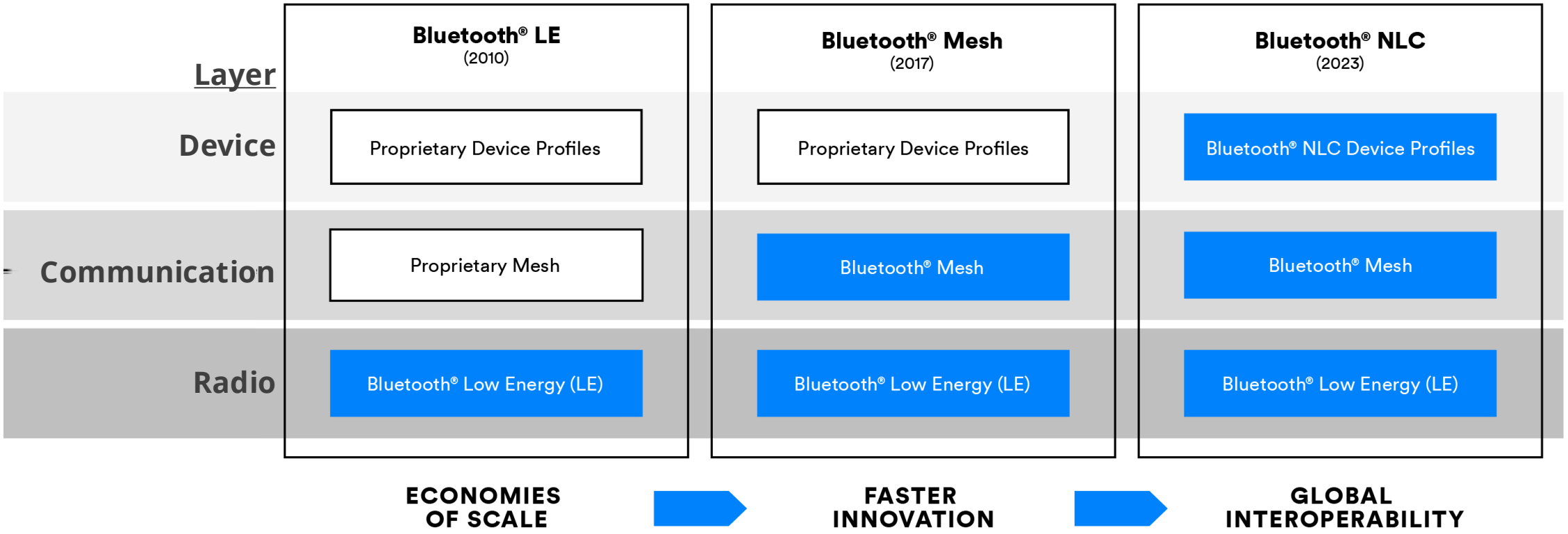
Standardized Digital Data:
Bluetooth® Networked Lighting Control (NLC)



Standardized Digital Data:
Bluetooth® Networked Lighting Control (NLC)

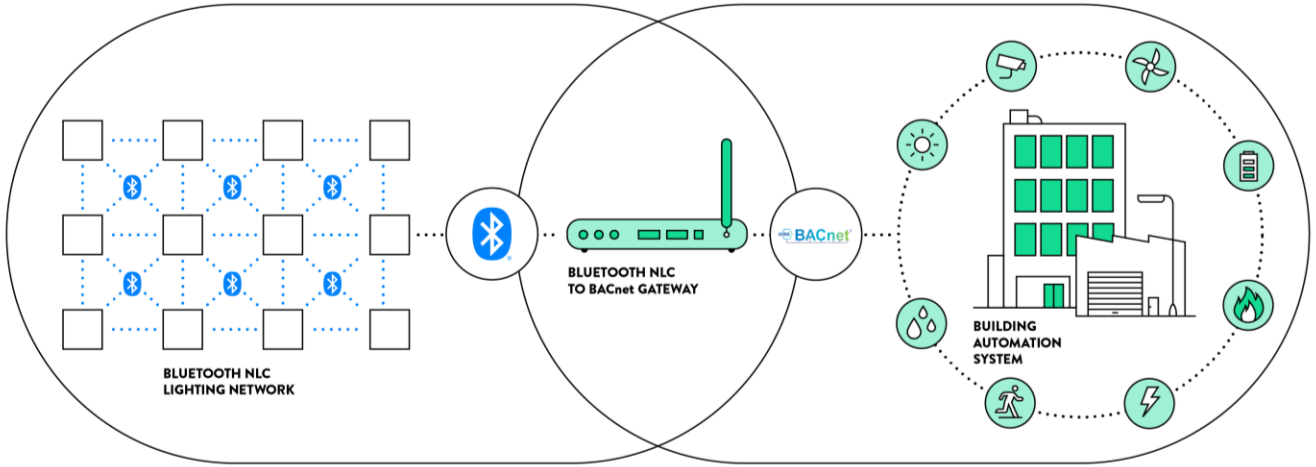


Standardized Digital Data:
Bluetooth® Networked Lighting Control (NLC)

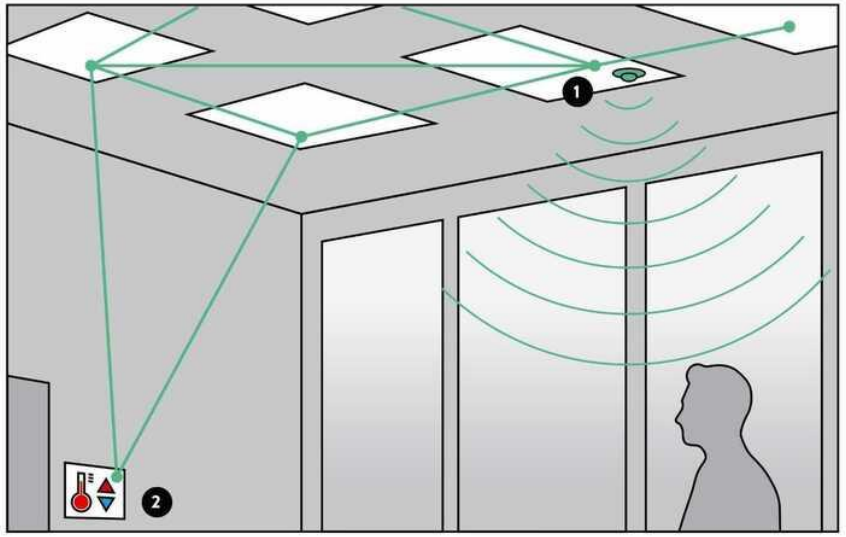


Bluetooth® NLC ↔ HVAC Integration Options

- Large buildings / buildings with BAS
  - Bluetooth NLC to BACnet gateway



- Small buildings / buildings without BAS
  - Bluetooth – enabled thermostats
  - Direct communication between NLC sensors and thermostats

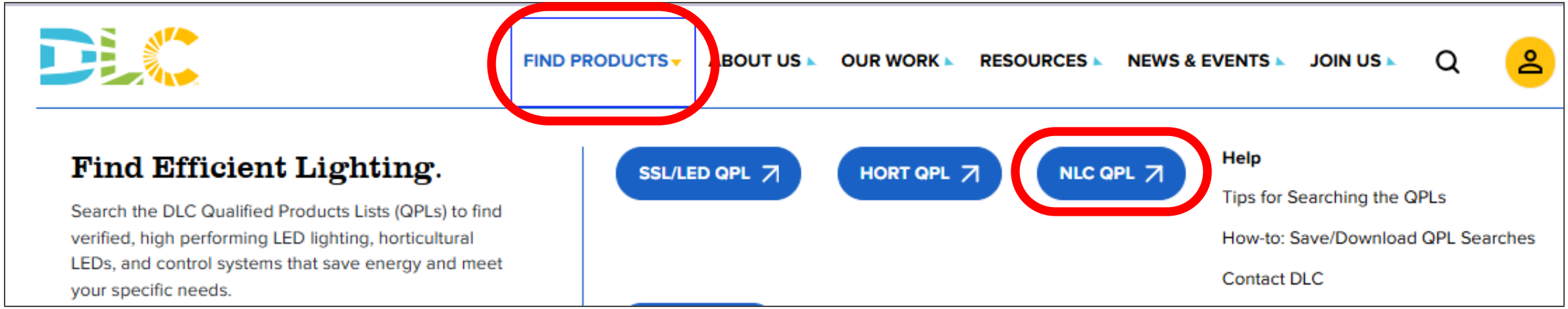


Standardized Data:
DLC's list of Networked Lighting Control Systems

NLC system capabilities relevant to integration

- Networking of Luminaires and Devices
- Occupancy Sensing
- Cybersecurity
- Remote Diagnostics
- External Systems Integration

Standardized Data:
DLC's list of Networked Lighting Control Systems



You have 0 saved items

Save Search Criteria | View Saved Searches

Listed Products

Manufacturer
filter this list X

Brand
filter this list X

Ease of Implementation

Technical Requirements Version

Indoor Scope

Outdoor Scope

Advanced Capabilities

User Interface

Integral Controls

Wired/Wireless Communication

Search by system name, manufacturer, brand, or product ID X

Search Tip: For an exact search, use quotes around the search term (ex. "PVO5LXDK").

Prev 1 2 3 4 Next

Viewing **1**-**25** of **90** results

Add All Results to My List

IntrinsiX Xone

Add to my list

Manufacturer: IntrinsiX Lighting
Brand: IntrinsiX Xone

Outdoor Scope: Structured Parking,Area/Building Exterior/Parking,Streetlight (residential streets)
Technical Requirements Version: 5.0

Genio

Add to my list

Manufacturer: Standard Products Inc.
Brand: Stanpro

Outdoor Scope: Structured Parking,Area/Building Exterior/Parking,Streetlight (residential streets)
Technical Requirements Version: 5.0

LumaLinx

Add to my list

Manufacturer: Jaykal LED Solutions,Inc.
Brand: LumaLinx

Indoor Scope: Portfolio/Enterprise,Whole Building,Room or Zone,Structured Parking
Technical Requirements Version: 5.0

CONTROLLED

Add to my list

Manufacturer: RAB Design Lighting

Outdoor Scope: Structured Parking,Area/Building

You have 0 saved items

Save Search Criteria | View Saved S

Listed Products

Manufacturer

filter this list X

Brand

filter this list X

Search by system name, manufacturer, brand, or proc X

Search Tip: For an exact search, use quotes around the search term (ex. "PVO5LXDK").

Prev 1 2 Next

Viewing **1**-**25** of **31** results

Add All Results to My List

Active Filters

Advanced Capabilities: Integration with BACnet systems

Add to my list

Levin Nock
Log Out

Home / DLC Qualified Product Lists / Networked Lighting Controls

You have 31 saved items

DOWNLOAD MY LIST

Save Search Criteria | View Saved S

Listed Products

Manufacturer

filter this list X

Brand

filter this list X

Search by system name, manufacturer, brand, or proc X

Search Tip: For an exact search, use quotes around the search term (ex. "PVO5LXDK").

Prev 1 2 Next

Viewing **1-25** of **31** results

Add All Results to My List

Active Filters

Advanced Capabilities: Integration with BACnet systems

HY NLC

Add to my list

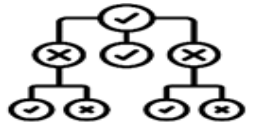
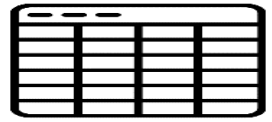
SUMMARY

- ✓ Networking
- ✗ Traffic Sensing
- ✓ High-End Trim
- ✓ Individual Luminaire Addressability
- ✓ Control Persistence
- ✓ Energy Monitoring
- ✓ User Interface
- ✓ Personal Control
- ✓ Plug Load Control
- ✓ Emergency Lighting
- ✓ Color Changing/Tuning
- ✓ Occupancy Sensing
- ✓ Daylight Harvesting
- ✓ Zoning
- ✓ Continuous Dimming
- ✓ Scheduling
- ✗ Remote Diagnostics
- ✓ Luminaire Level Lighting Control (LLLC)
- ✗ Load Shedding/Demand Response
- ✓ External Systems Integration
- ✓ Cybersecurity
- ✓ Scene Control

Agenda

1. Introduction and Context
2. Explore the DLC Integration Toolkit
3. Standardized Digital Protocols for NLC
4. **Conclusion**
5. Questions and Answers

Toolkit Files

1	Handbook	PDF	
2	Decision Tree	PDF	
3	Case Studies	Excel	
4	Responsibility Matrix	Editable Excel	
5	Project Template	Editable Word	

You have 0 saved items

Save Search Criteria | View Saved Searches

Listed Products

Manufacturer
filter this list X

Brand
filter this list X

Ease of Implementation

Technical Requirements Version

Indoor Scope

Outdoor Scope

Advanced Capabilities

User Interface

Integral Controls

Wired/Wireless Communication

Search by system name, manufacturer, brand, or product ID X

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Outdoor Scope: Structured Parking,Area/Building Exterior/Parking,Streetlight (residential streets)
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LumaLinx

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Brand: LumaLinx

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Technical Requirements Version: 5.0

CONTROLLED

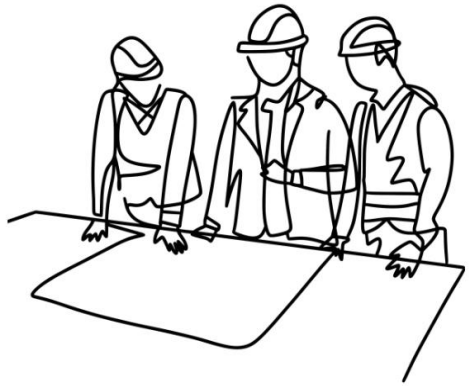
Add to my list

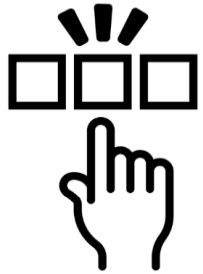
Manufacturer: RAB Design Lighting

Outdoor Scope: Structured Parking,Area/Building

Toolkit Goals

These tools will help you to





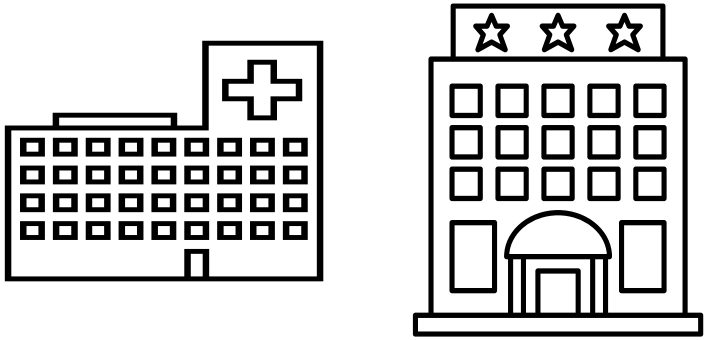
Choose appropriate projects

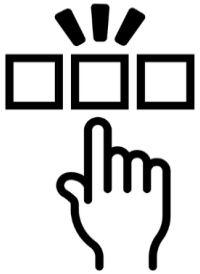
Collaborate better

Save energy

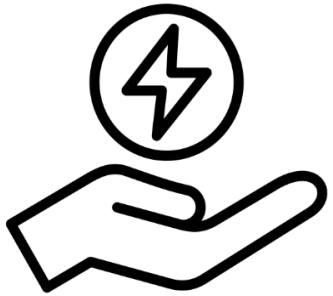
Integration Goals

Integration projects will help you

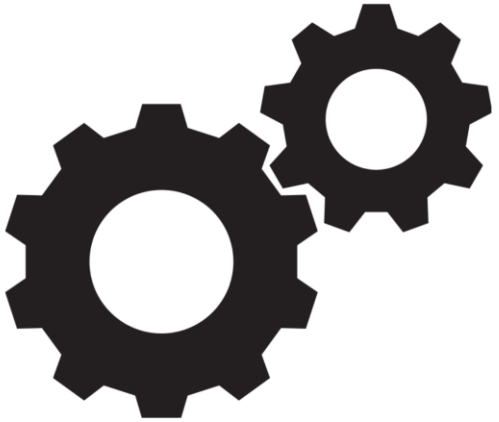




Achieve positive outcomes

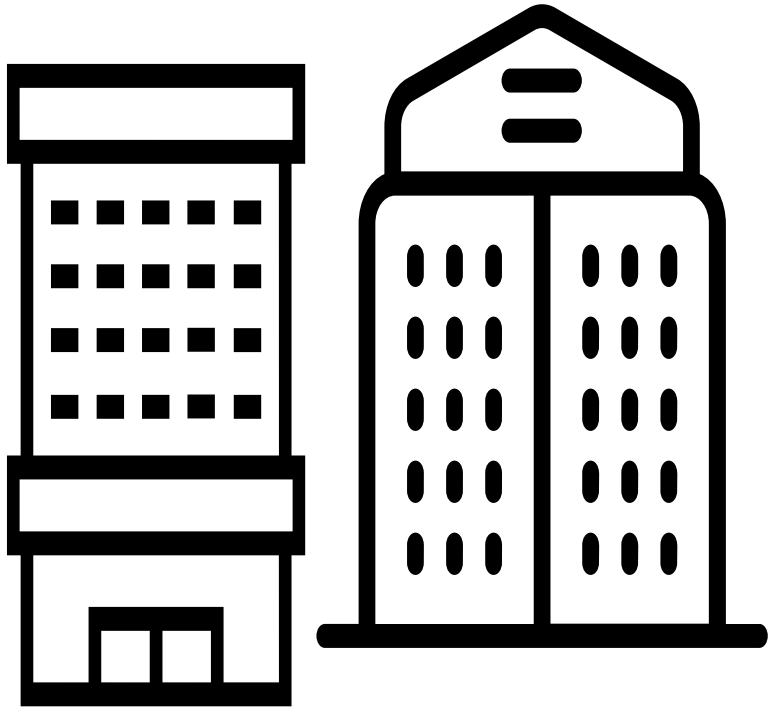


Save energy



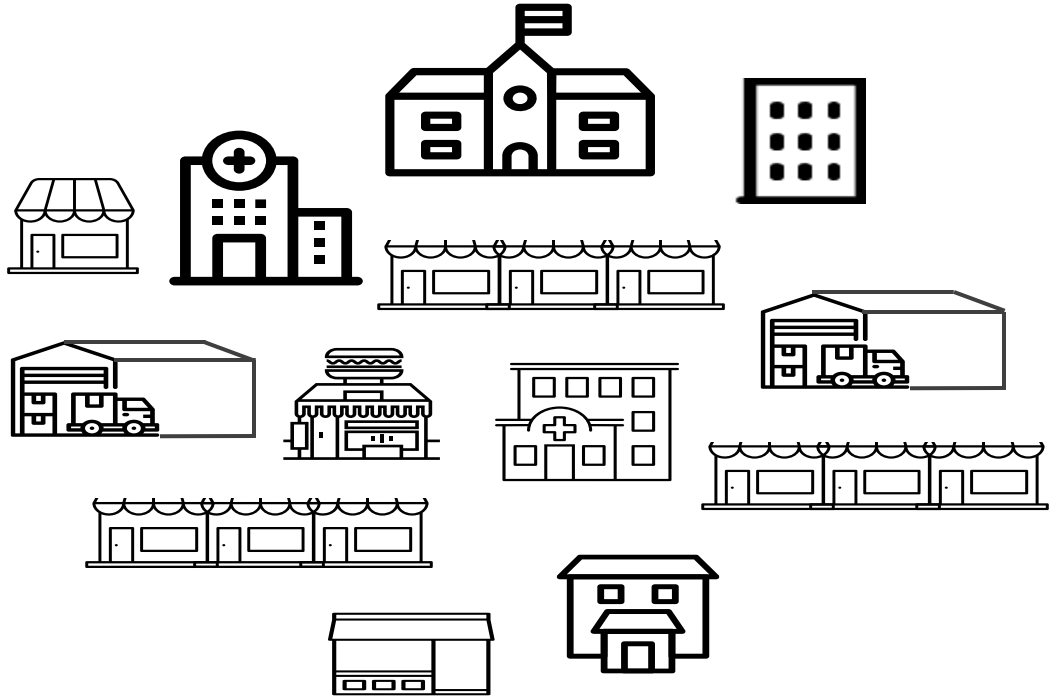
Building systems work together

Large Buildings
Digital Now



50% of commercial square footage,
6% of buildings

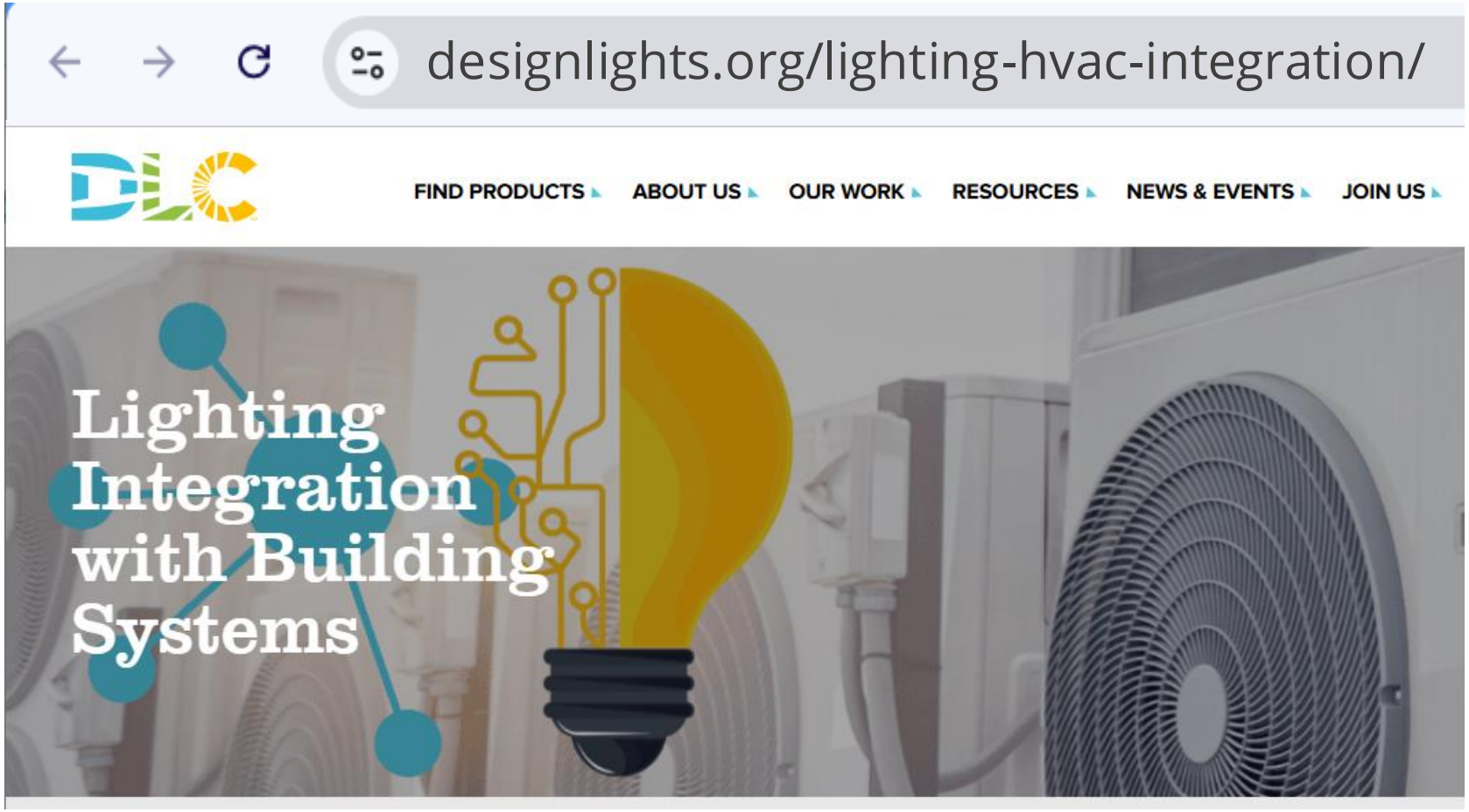
Smaller Buildings
Analog Now, Digital Soon



50% of commercial square footage,
94% of buildings

Questions?

TOOLKIT



- info@designlights.org
- Levin Nock

Incentive Updates from City Light

Combining Lighting and HVAC Incentive Projects

Lighting and HVAC Performance Incentives Increasing

Seattle City Light

Lighting and Lighting Control Incentives & Partnership

- **Commercial Retrofit Program:** Incentives based on kWh savings for energy-efficient fixture and/or controls upgrades. *Soon to increase by $0.03/kWh saved (5/15/2025).*

Component Retrofit Kits	New / Integrated Retrofit Fixtures	Controls-Only Upgrades	NLC & LLLC Advanced Controls
• $0.17/kWh	• $0.25/kWh	• $0.25/kWh	• $0.25/kWh Fixture Savings • $0.25/kWh Controls Savings • $75/$50 per fixture

Case Study: Theatre Lighting Replacement with LLLC

- We worked with a theatre organization downtown to replace their back of house lighting:
  - Replaced **238 T8 fixtures with LED** troffer retrofit kits with LLLC sensors
  - **Total Incentive $27,598**, covers 47% of the **$59,094.00** total cost

5. ENERGY SAVINGS ESTIMATES						6. SCL FUNDING ESTIMATES					
Existing kW	Existing kWh/ year	Prop-osed kW	kWh Savings (Fixture Efficiency)	kWh Savings (Controls)	kWh Savings	Incentive Rate $/kWh (Fixture)	Incentive Rate $/kWh (Controls)	Incentive (Fixture Efficiency)	Incentive (Controls)	Bonus Incentive (NLC)	Incentive prior to funding caps
14	47,106	6.0	25,239	13,754	38,993			$6,309.75	$3,438.50	$17,850.00	$27,598.25

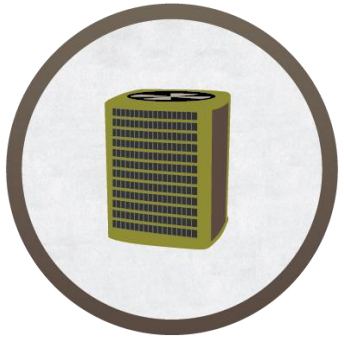
HVAC Incentives – Most Measures Pay $0.33/kWh +**$0.03**

Controls upgrades

- Occ Sensors
- Pneumatic to digital (DDC)
- Adv Rooftop Ctrl
- Scheduling
- Etc.

Heat Pumps*

- VRF / VSD
- Comm HPs
- Etc.



Cooling

- Cooling Towers
- Chillers
- CRAC
- Etc.

Ventilation

- DOAS
- Economizers
- Fan drive upgrades
- Demand Ctrl Ventilation
- Etc.

Major HVAC Control System Upgrade

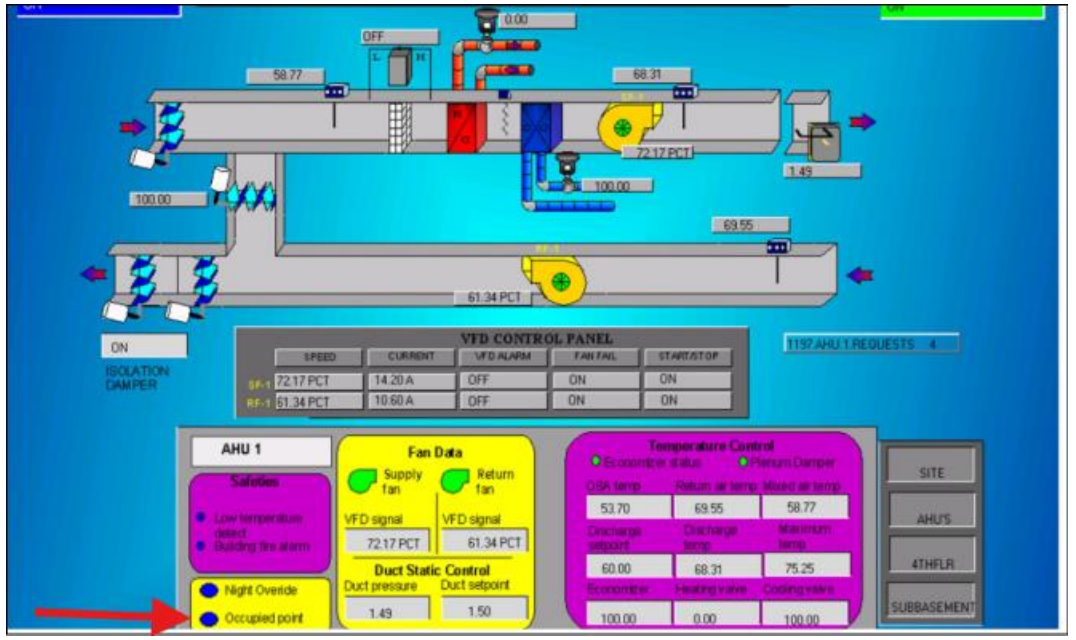
- Major HVAC control upgrades:
  - Installing new control equipment with a web-based interface
  - Implementing at least three major energy-efficiency HVAC control sequences
- Benefits:
  - Improved flexibility and performance
  - (2) Incentive payments: after installation and after 12 months of performance
  - Lower energy usage; typically 10-15%

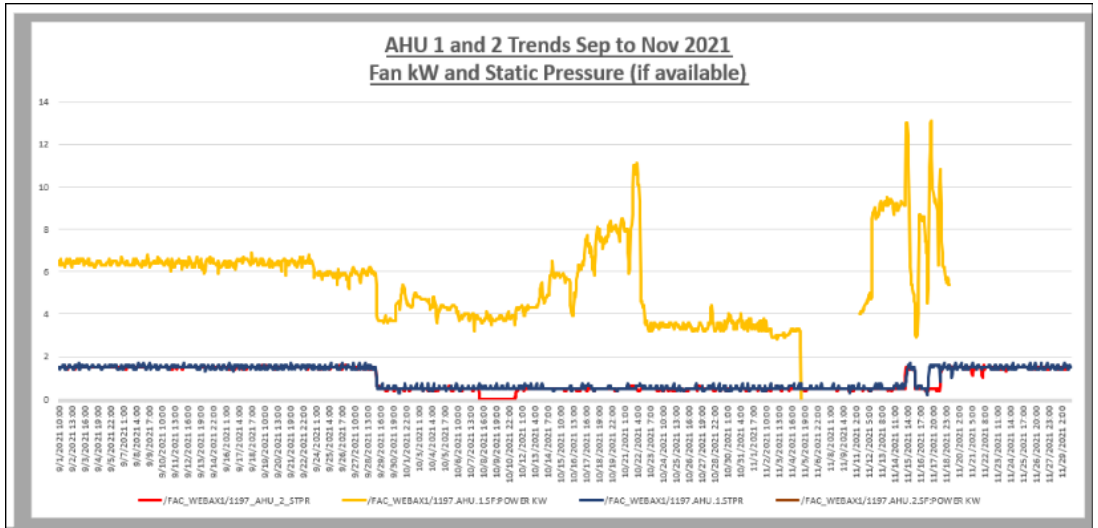
+Incentive: $0.33 / kWh **+$0.03**

	Completed Project
Property Details	>100,000 ft² mixed use with residential in 15-year-old building
Project Details	**New control system (none existed prior) installed to:** • Enable alarms • Utilize trending • Schedule set-backs • Monitor through a graphical interface
Total Project Cost	$119k
Base Incentive Payment 1	$11k upon verification of installation
Performance Incentive Payment 2	$25k^ upon one-year calculated savings
Est. Annual kWh Savings	160,000 kWh/yr
Est. Annual Avoided Costs	>$12.8k/yr

University Hall HVAC Controls, Fan + Lighting Project

- HVAC Project Scope
  - 183,435 sqft higher ed building
  - Replaced motors with ECM on 134 terminal units
  - Reduce Fan Air Use by 15%-50%
- Results
  - Project cost: $793,000
  - Energy Savings: 832,500
  - Incentive @ **$0.36**: $299,700
- Lighting Motion Sensor Tie-in
  - Reduced ECM Fan Speed
  - Increased Temperature Setpoint Deadband

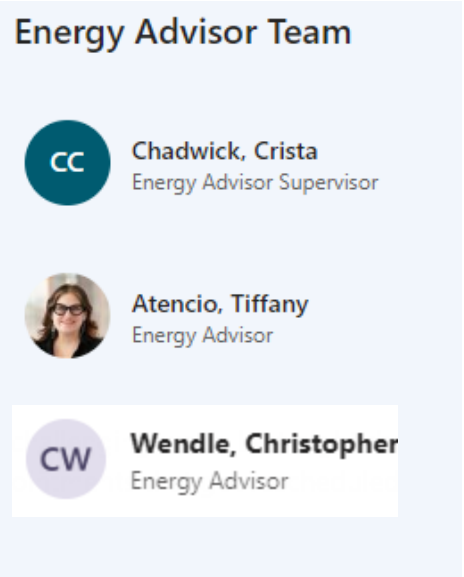




Interested in working with us on your Energy Projects?

Our Energy Advisors & Energy Management Analysts are ready to help!

- Call an Energy Advisor (206) 684-3800 or email SCLEnergyAdvisor@seattle.gov
- An Energy Management Analyst can evaluate options based on your project plans.
- Link to Website



Q & A and Closing

- **Questions?**
  - Levin Nock lnock@designlights.org
  - Jim Loewen jim.loewen@seattle.gov
  - City Light Energy Advisors SCLEnergyAdvisor@seattle.gov, 206-684-3800
  - Lighting Design Lab lightingdesignlab@seattle.gov
- **Take the survey!**

THANK YOU

lighting design lab

Seattle City Light

lightingdesignlab.com | ✉ lightingdesignlab@seattle.gov