

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

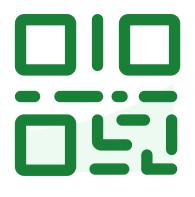




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Webinar Procedures

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







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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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What's your job title?

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Where do you do most of your work?

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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 <u>LightingDesignLab.com</u> and by <u>subscribing to our newsletter</u>.



GoToWebinar Logistics

Questions Pane about contents



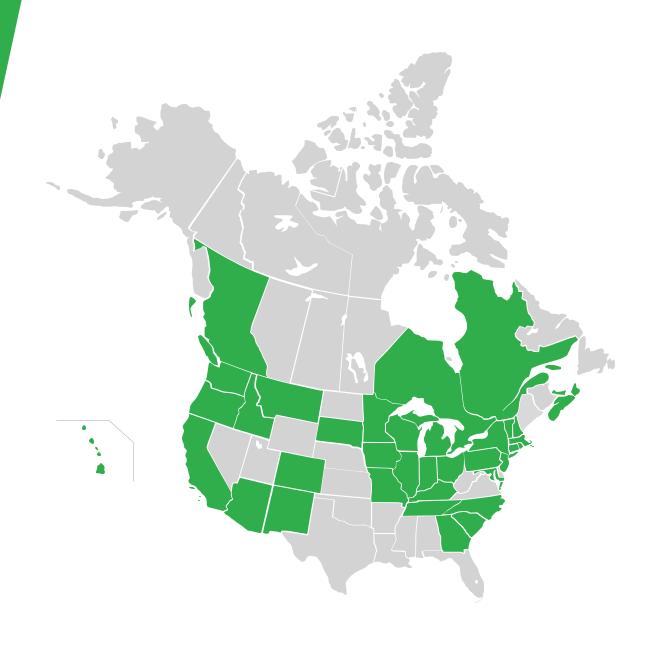
Chat Pane for technical difficulties



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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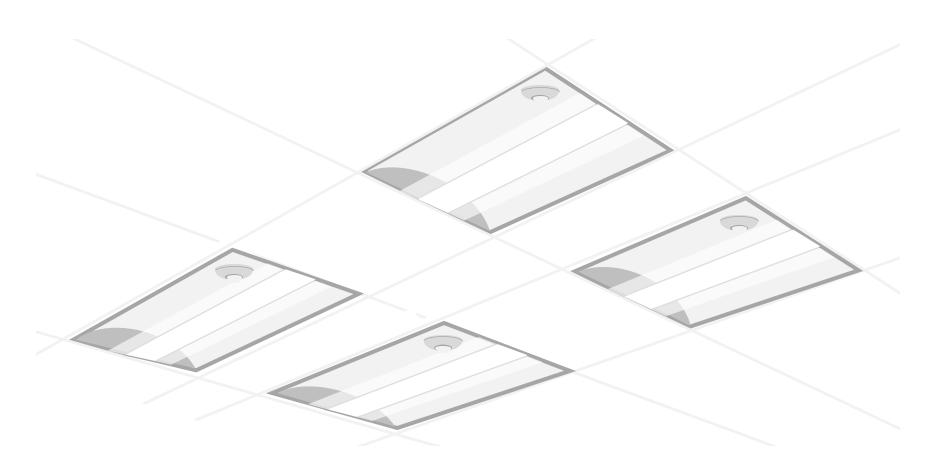
Efficient LED baseline



Slow NLC uptake

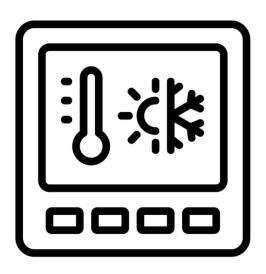


Powered, Networked, Ubiquitous Occupancy Sensors

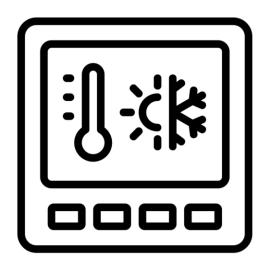




NLC Occupancy Sensors can inform HVAC controls



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

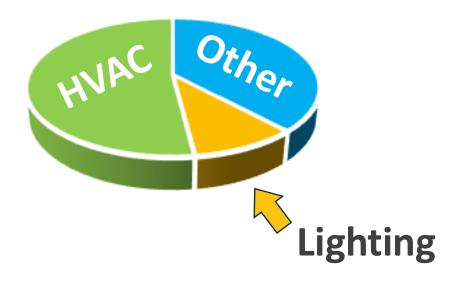


Energy use in commercial buildings in 2018

Lighting 10%

HVAC 52%

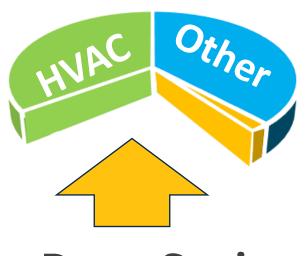
Other 38%



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.







Rebates

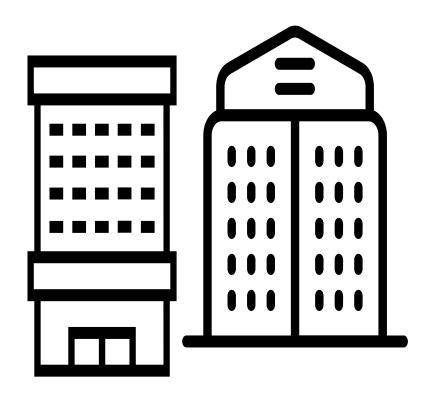
Incentives

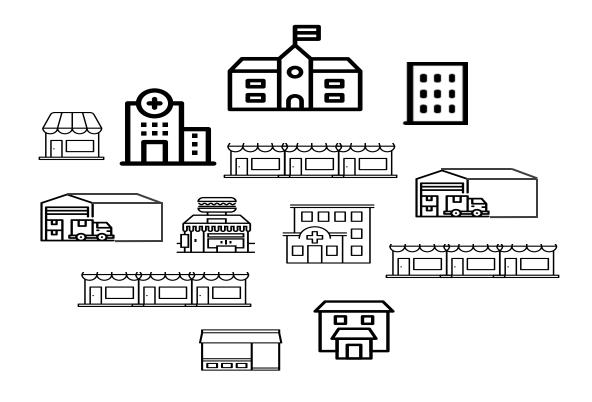
Lower Energy Bills



Large Buildings Digital Now

Smaller Buildings Analog Now, Digital Soon

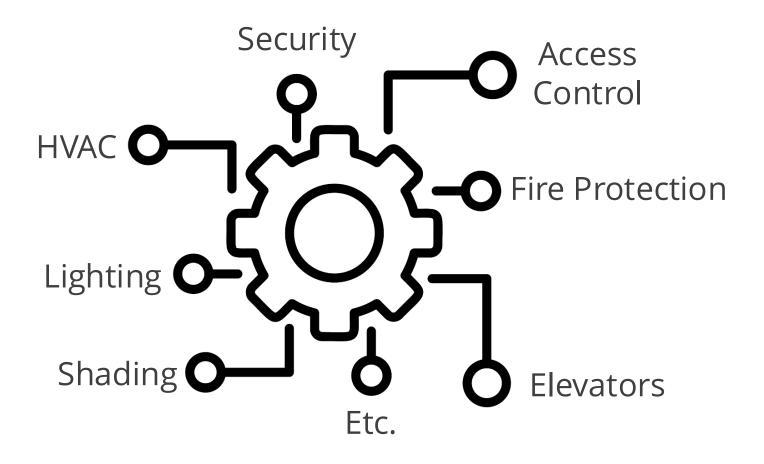




50% of commercial square footage, 6% of buildings

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.



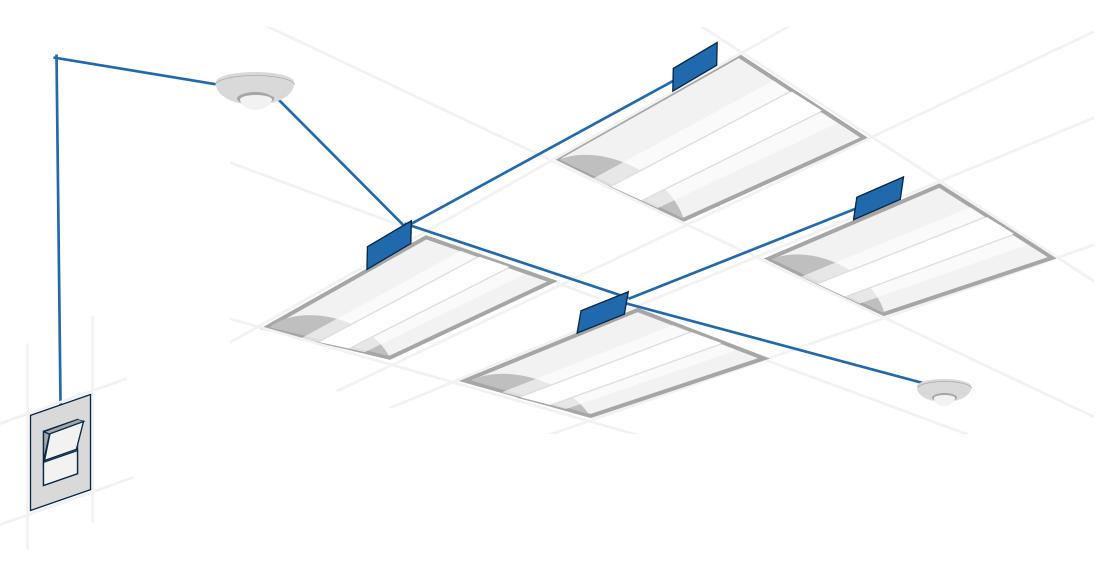


Definitions



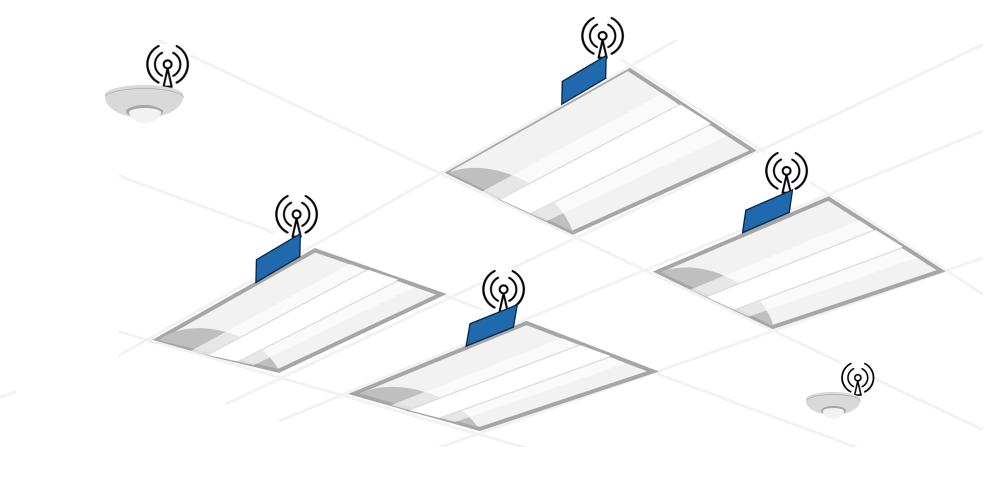


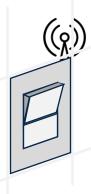
Define "Networked Lighting Control" (NLC)





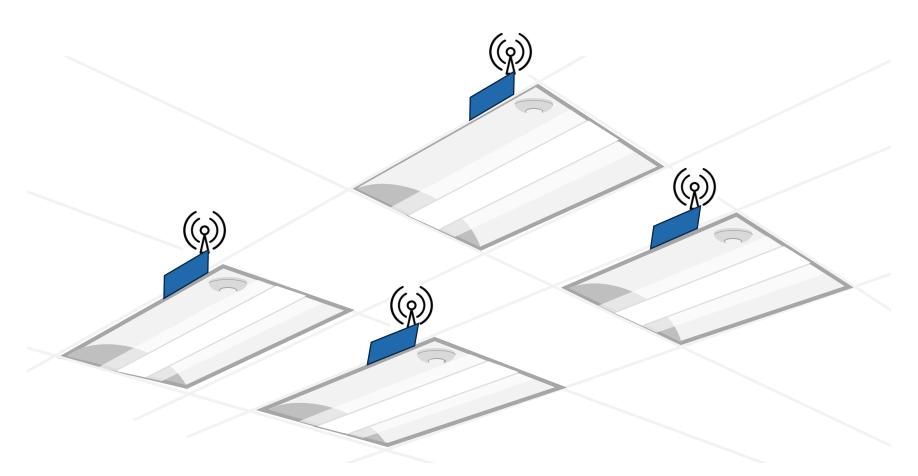
Define "Networked Lighting Control" (NLC)

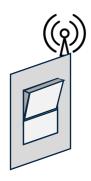






Define "Networked Lighting Control" (NLC)

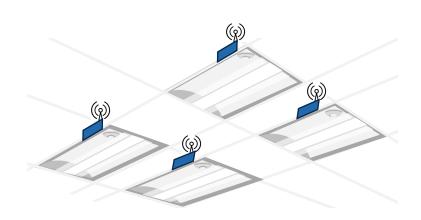


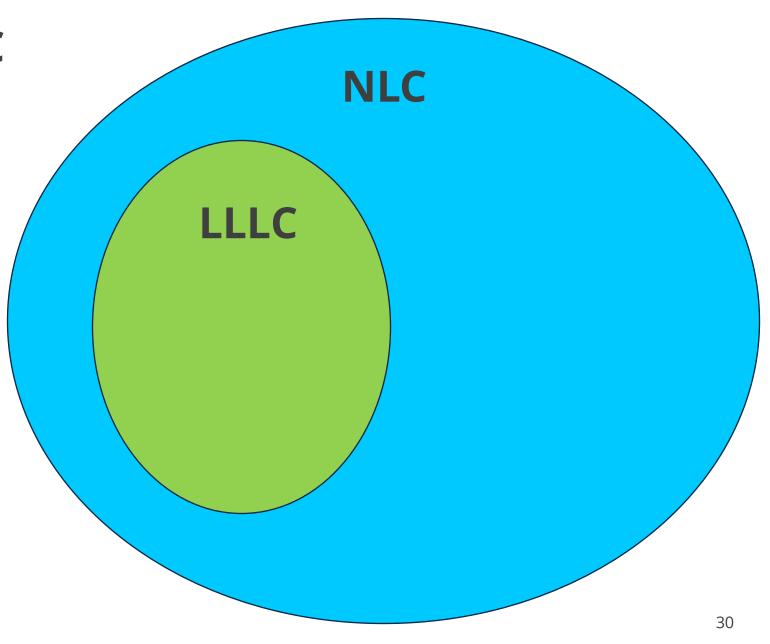


LLLC = sensors on every luminaire (Luminaire Level Lighting Control)



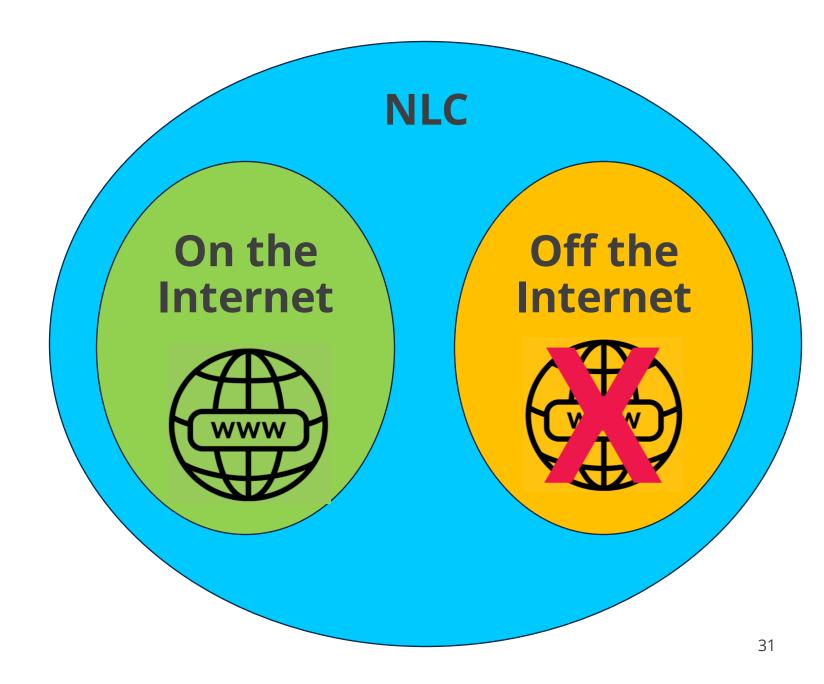
LLLC is a kind of NLC







NLC can be on the Internet or not





Some NLCs access the Internet occasionally through a phone



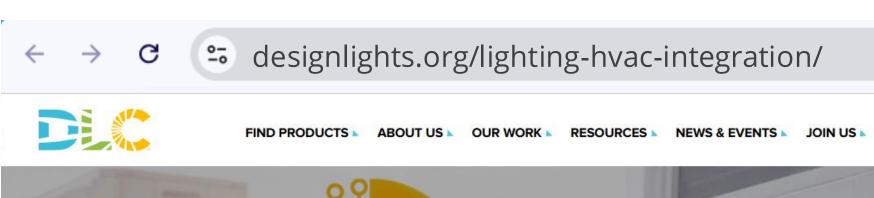


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TOOLKIT

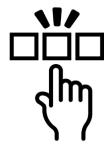




Energy · Quality · Controllabilitys

Toolkit Goals

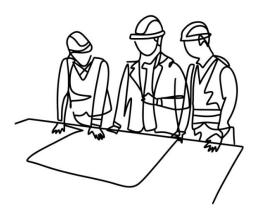
These tools will help you



Choose appropriate projects



Collaborate better





Save energy

Presentation Goals

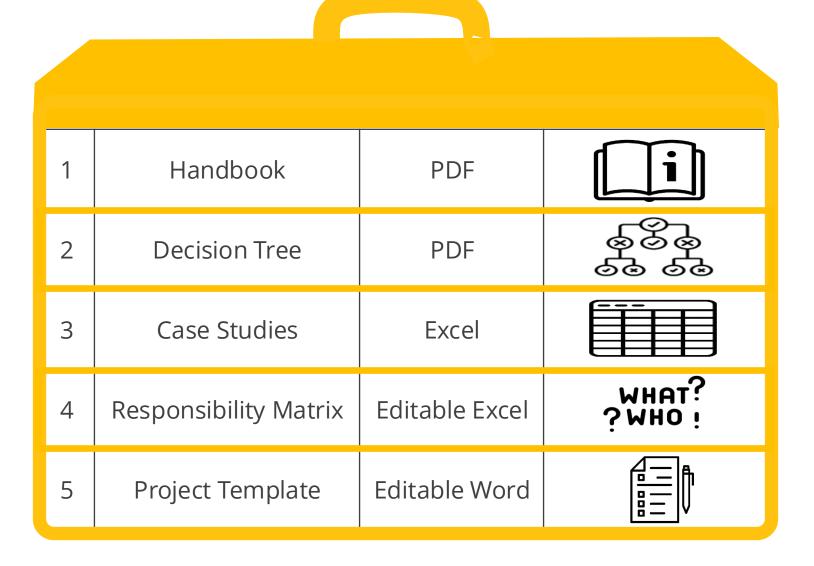


Toolkit Introduction

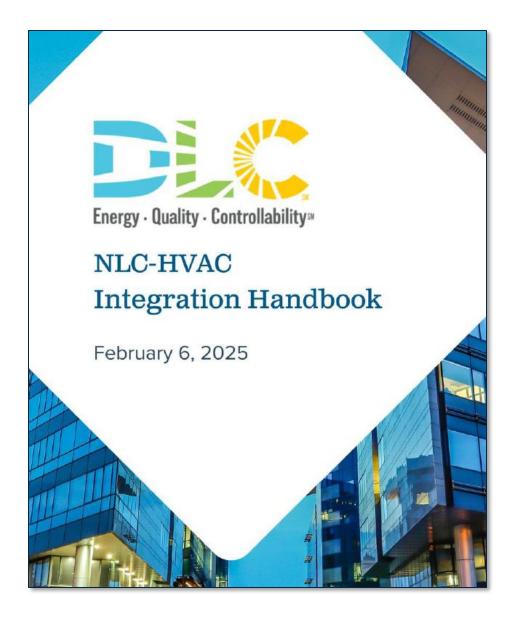


Suggest changes: info@designlights.org

Toolkit Files





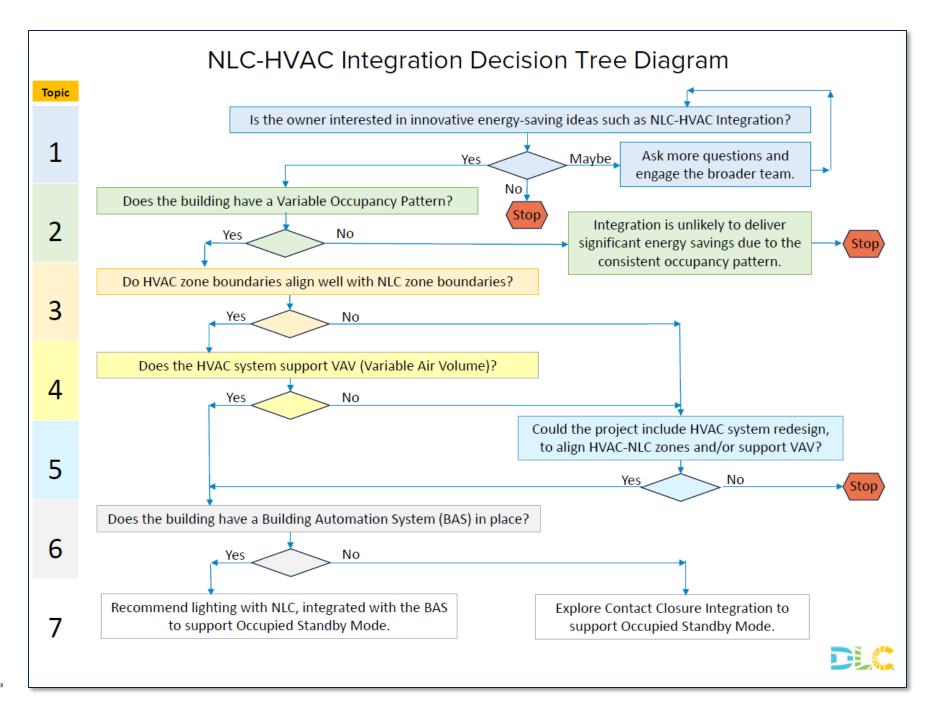


Handbook Contents

Contents
Executive Summary
Background
Benefits of NLC-HVAC Integration
Definitions and Terminology
Introduction to NLC10
Introduction to HVAC Occupied Standby Mode 13
Introduction to BAS/BMS15
Best Practices for Successful Integration 17
References



Decision Tree Diagram





A Detail Page for Each Topic

Does the building have a Variable Occupancy Pattern? Integration is unlikely to deliver significant energy savings due to the consistent occupancy pattern. Do HVAC zone boundaries align well with NLC zone boundaries? Does the HVAC system support VAV (Variable Air Volume)? Topic 1: Is the Owner interested in innovative energy-saving ideas such as NLC-HVAC Integration? Could the project include HVAC system redesign. to align HVAC-NLC zones and/or support VAV? · Issues to Explore: The owner may not know abo Topic 2: Does the building have a Variable Occupancy Pattern? advise. Engage with broader to Building Automation System (BAS) in place? · Clarifying Questions: Is there energy efficier Issues to Explore: The building owner may not tegrated with the BAS Topic 3: Do HVAC Zone boundaries align well with NLC Zone boundaries? Explore Contact Closure Integration to engineering team to ask clarify · Is the building subject thy Mode support Occupied Standby Mode. Clarifying Questions: How predictable is the occur . If the occupancy pattern is pre- Issues to Evalore · How long will this building be · To rely on scheduling instead of . Lighting zones are often smalle Topic 4: Does the HVAC system support VAV (Variable Air Volume)? stop, unless the building is bei schedules as needed over time lighting, to avoid the need for integration more difficult)? changes is unlikely, proceed wit If the building has a Variable Oc overlap with the electrical/light other words, are one or more i-· Issues to explore Clarifying Questions: Topic 5: Could the project include HVAC system redesign, . If the Lighting and HVAC zones of integration project will probably to align HVAC-NLC zones and/or support VAV? . Does the HVAC system have it Background: . If you're wondering how well th · Issues to Explore: depending on how much vent called a VAV box that attaches . For a new HVAC design and ne Topic 6: Does the building have a Building Automation System (BAS) according to the control signal f Occupied Standby Mode well, b system; but the new HVAC sys in place, or already planned? · Multiple case studies of succes increase it when a space is oci DLC N An alternative to a VAV system New HVAC systems such as mir change speed. CAV systems are save a little energy, but not mu · Issues to Explore: . When a new HVAC system and Topic 7: Recommend integration to support Occupied Standby Mode, . For retrofit construction, ask the naming conventions and zoning using BAS or Contact Closure. · For new construction, ask the M · Clarifying Questions: DLC NL Clarifying Questions: What is the projected end-of-lif the value of the energy savings t Issues to Explore: · Does the building already have add a new BAS and connect it to . To proceed with NLC-HVAC integration, see the "DLC NLC-HVAC Controls Integration Toolkit: Handbook" for Best What energy efficiency rebates : BAS; but the new BAS can pote Can the HVAC system be program · What penalty fees, building ma . See also the "DLC NLC-HVAC Controls Integration Toolkit: Case Studies" for Lessons Learned, especially from from the NLC system? integration projects that share their building type and/or other characteristics with your own project. · Does the lighting vendor suppor When NLC-HVAC integration occurs in buildings without a BAS, it is often accomplished by Contact Closure, where a wire delivers an analog signal from an occupancy sensor or NLC system to an HVAC VAV box or thermostat. Each signal uses its own uniquely placed wire. New technology for digital plug-and-play NLC-HVAC integration in small commercial spaces is becoming available, such as wireless thermostats that support WiFi or Bluetooth mesh with commercial-grade cybersecurity · Clarifying Questions: Is an integration contractor available, who can provide the required integration? Integration requires a certain amount of fixed overhead investment, regardless of the project size. Therefore integration to disciss to be more readily feasible in languages somewhere fixed project costs can be seen motived over a large area. For a small space, are deally feasible in languages area. For a small space, are extensing circumstances such as high energy intensity, extremely variable occupancy, technological leadership promotion, or new digital wireless hermostats, that will make integration feasible for your project?



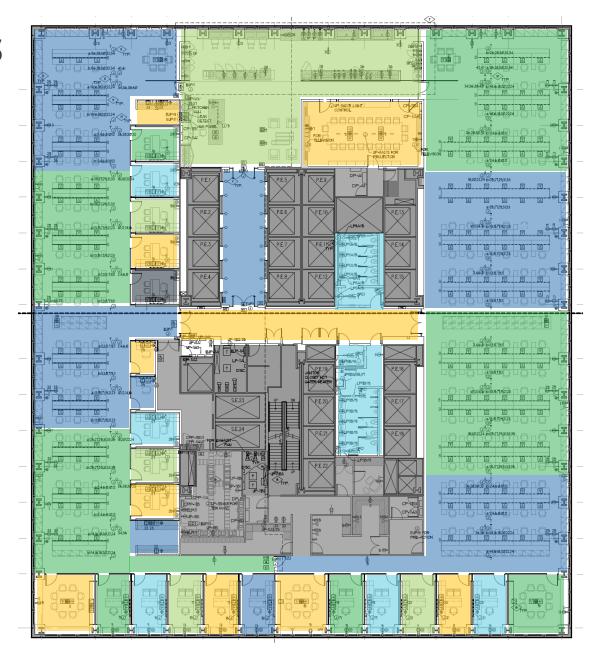
NLC-HVAC Integration Decision Tree Diagram

DLC NLC-HVAC Controls Integration Toolkit: Decision Tree Back to Diagram

Is the owner interested in innovative energy-saving ideas such as NLC-HVAC Integration?

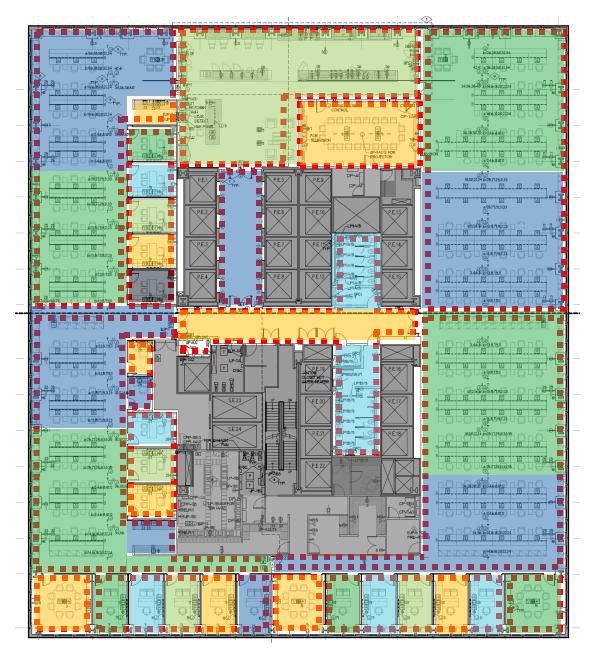
engage the broader team.

Lighting Zones





Lighting Zones



HVAC Zones



Case Studies

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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

	А	В	С	D	Е	F	G	Н	1
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	orth TX USA 164,000 - 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	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



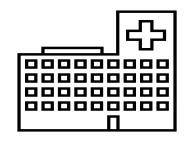
Case Study Columns, Final Section

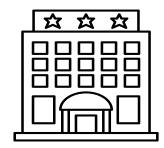
HVAC Type	Occupancy/ HVAC Schedule	Energy Saved ▼	Payback (Years)	Utility Incentive	Project Date		Source Website	Additional Website
- Seven Roof-top Units - Three Exhaust Fans - 1 Gas-fired Unit Heater (warehouse) - Provides 120 tons of cooling		- The control system and lighting redesign reduced energy 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/com mercial/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/u s/solutions/collateral/enterpr ise-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

Task	FACILITIES MANAGER FACILITIES ENGINEERS PROJECT MANAGER / OWNER'S REPRESENTATIVE	Notes Equipment Vendors vary based on task. The NLC-HVAC Integration Handbook has a References section with information about
Lighting System C	FACILITIES MANAGER FACILITIES ENGINEERS PROJECT MANAGER / OWNER'S REPRESENTATIVE	The NLC-HVAC Integration Handbook has a
Luminaire Selection and Fixture Layout		80
6 Luminaire Control Integration C C C R C C A C R I C C A C C I R C A R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C R I C C A C C I R C A C C I R C A C C I R C A C C I R C A C C I R C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C C C R I C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C I R C C A C C R I C C A C C C R I C C C A C C R I C C C A C C R I C C A C C R I C C C A C C R I C C C A C C R I C C C A C C R I C C A C C R I C C A C C R I C C A C C R I C C A C C R I C C A C C R C C C R I C C C A C C R I C C C A C C R C C C C C R I C C C A C C R C C C C C R I C C C C C C R I C C C C		
7 Luminaire Power Requirements	ARI	
Statistic Control System	A C I	
9 CIN and SOO	A R I	
10 Lighting Control Zones C C C R I C C A C R I C C A C R I C C A C R I C C A I C C R I C C A I C C R I C C A I C C R I C C A I C C R I C C A I C R I C C A		
11 Device Layout & Quantities	AIII	Refer to ANSI/IES LP-16-22.
12 HVAC System	AIII	
	ARI	
13 HVAC Selection and VAV/Duct Layout C C R C C C A C I R I C C A I R I C C A I	A R I	
14 HVAC Control Integration C C R C C C A C I R I C C A C I C I R C A R	A C I	
15 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	
16 HVAC Control System		
		Refer to ASHRAE Guideline 36-2021.
18 HVAC Control Zones C C R C C C A C I I C C A C I C R C A C R		
19 HVAC Control Device Layout & Quantities C C R C C C A C I I C C A C I R I C C A I C	A R I	
20 Technology Infrastructure (IT, OT)		
	A R C	
22 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		Refer to DLC NLC5.1 Technical Requirements.
	A C C	
24 Commissioning and Integration Process		
25 Owner's Project Requirements C R R R A		
26 Control System Programming C C C C I R C C		
27 Verification Commissioning C C C C R C		Refer to ANSI/IES LP-8-20.
28 Energy Efficiency Incentives R R C C C A R R A C R		
29 Training C C C I R C I C C		
30 On-site, Commissioning (During Construction)	R C	
31 On-going Testing (During Operations)		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

- 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.
- 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.
- 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.
- 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

- Division 23
- Division 26

1.2 ACRONYMS

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

Page 2 of 8









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

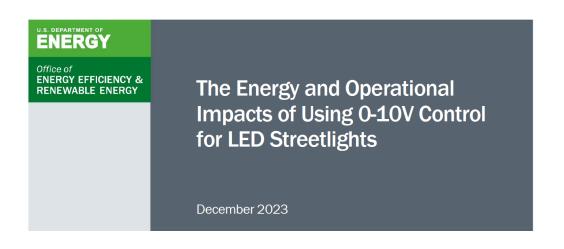


Standardized, Certified Digital Protocols for NLC

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



0-10V Analog Performance is Unreliable



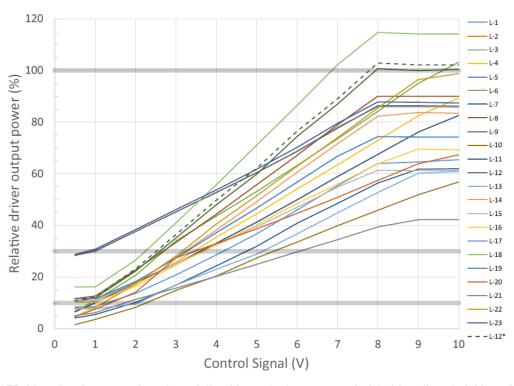


Figure 7. LED driver dimming curves, based on relative driver output power, as calculated from the rated driver efficiency. Horizontal threshold lines are highlighted at 10%, 30%, and 100% of rated maximum input power, and a thick red line shows an "expected" linear dimming curve. Two curves for L-12 (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

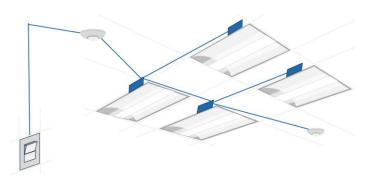


Standardized Digital Data: DALI Alliance





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



2017

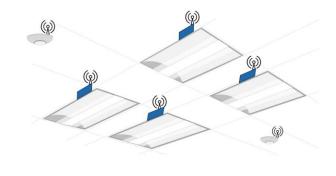


Wired network
WITHIN a luminaire:
drivers, sensors, controllers
(ANSI C137.4)





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

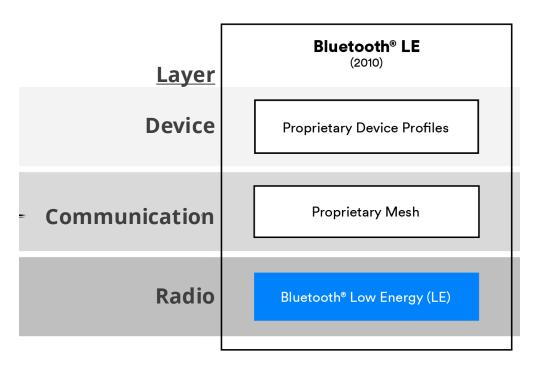




2019

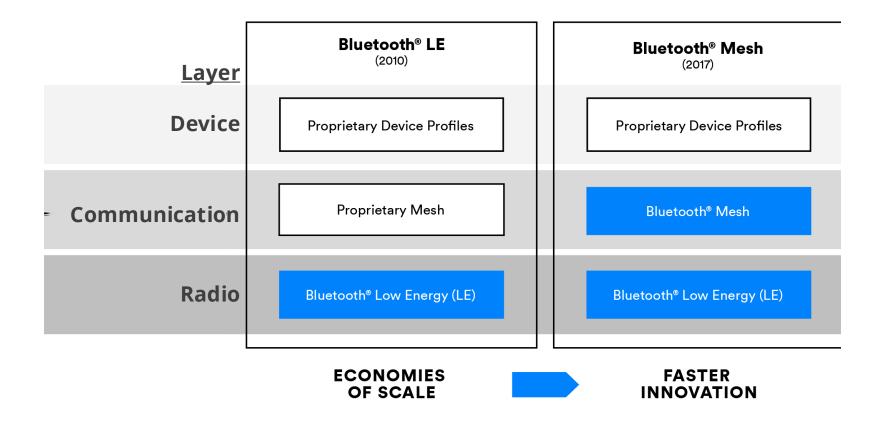
2021

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

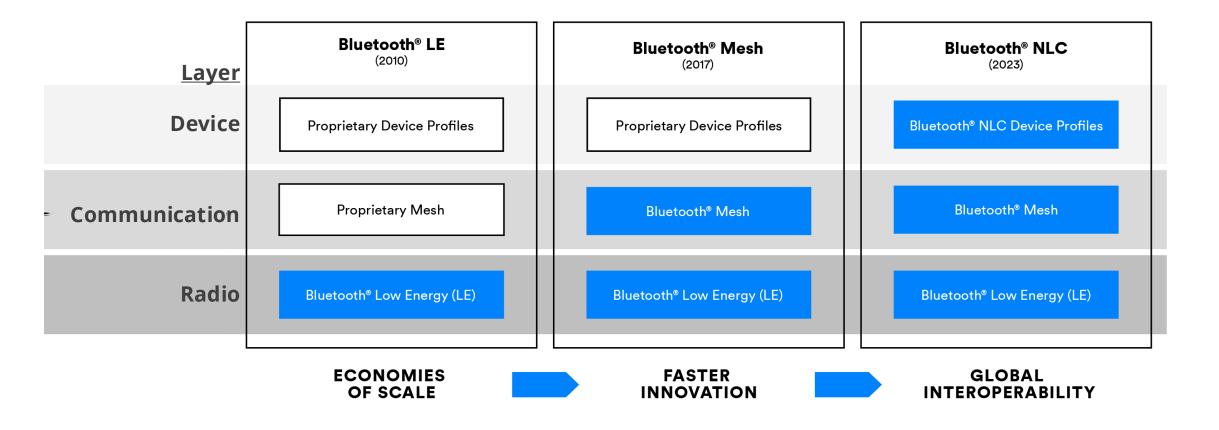


ECONOMIES OF SCALE

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

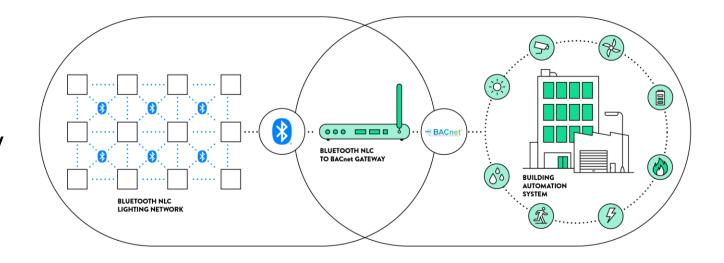


Standardized Digital Data: Bluetooth® Networked Lighting Control (NLC)

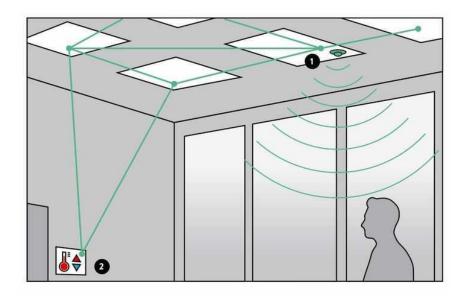


Bluetooth® NLC ↔ HVAC Integration Options

- 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

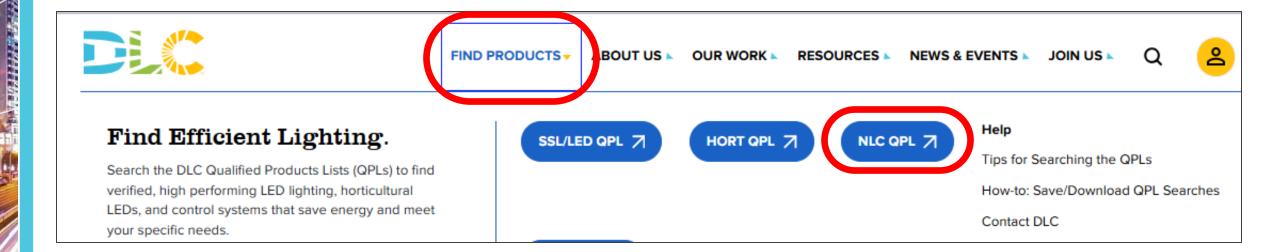


Standardized Data: DLC's list of Networked Lighting Control Systems

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













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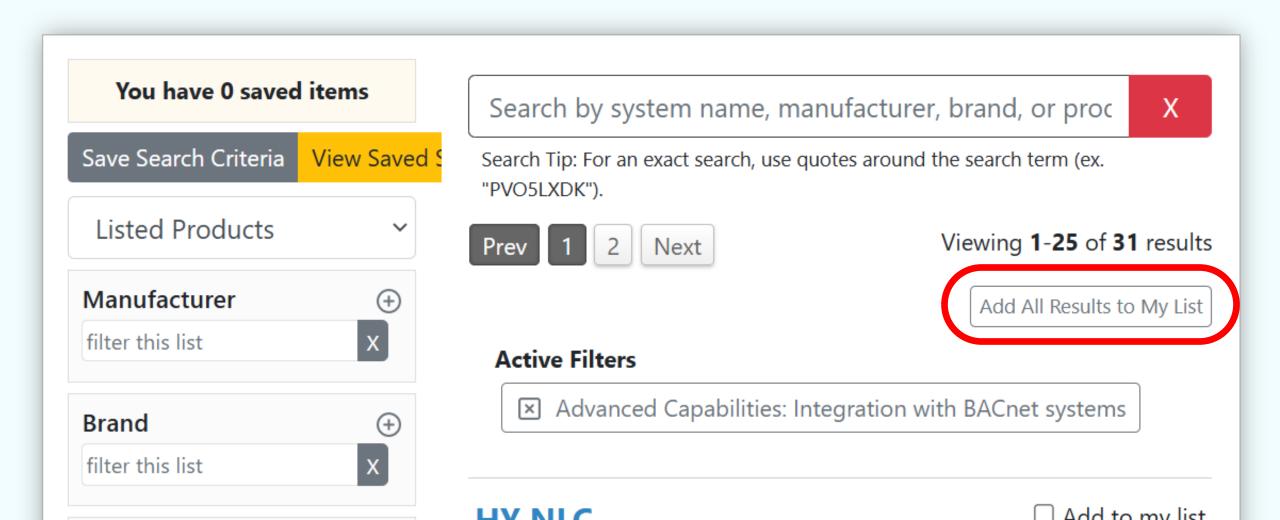


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You have 0 saved ite	ms	Search by system name, manufacturer, brand, or product ID					
Save Search Criteria View	Saved Searches	Search Tip: For an exact search, use quotes around the se	arch term (ex. "PVO5LXDK").				
Listed Products	~	Prev 1 2 3 4 Next	Viewing 1-25 of 90 result				
Manufacturer	⊕		Add All Results to My Lis				
filter this list	X						
		IntrinsiX Xone	☐ Add to my lis				
Brand filter this list	⊕	Manufacturer: IntrinsiX Lighting	Outdoor Scope: Structured Parking, Area/Building				
Tilter this list	X	Brand: IntrinsiX Xone	Exterior/Parking,Streetlight (residential streets)				
Ease of Implementation	(+)		Technical Requirements Version: 5.0				
·		Genio	☐ Add to my lis				
Technical Requirements Version	⊕	Manufacturer: Standard Products Inc.	Outdoor Scope: Structured Parking, Area/Building				
Indoor Scope	(+)	Brand: Stanpro	Exterior/Parking,Streetlight (residential streets)				
·			Technical Requirements Version: 5.0				
Outdoor Scope	(+)	LumaLinx	☐ Add to my lis				
Advanced Capabilities	(+)	Manufacturer: Jaykal LED Solutions,Inc.	Indoor Scope: Portfolio/Enterprise,Whole				
		Brand: LumaLinx	Building,Room or Zone,Structured Parking				
User Interface	(+)	2.4.1.4.	Technical Requirements Version: 5.0				
Integral Controls	(+)	CONTROLLED	☐ Add to my lis				
Wired/Wireless Communication	(+)	Manufacturer: RAB Design Lighting	Outdoor Scope: Structured Parking, Area/Building				

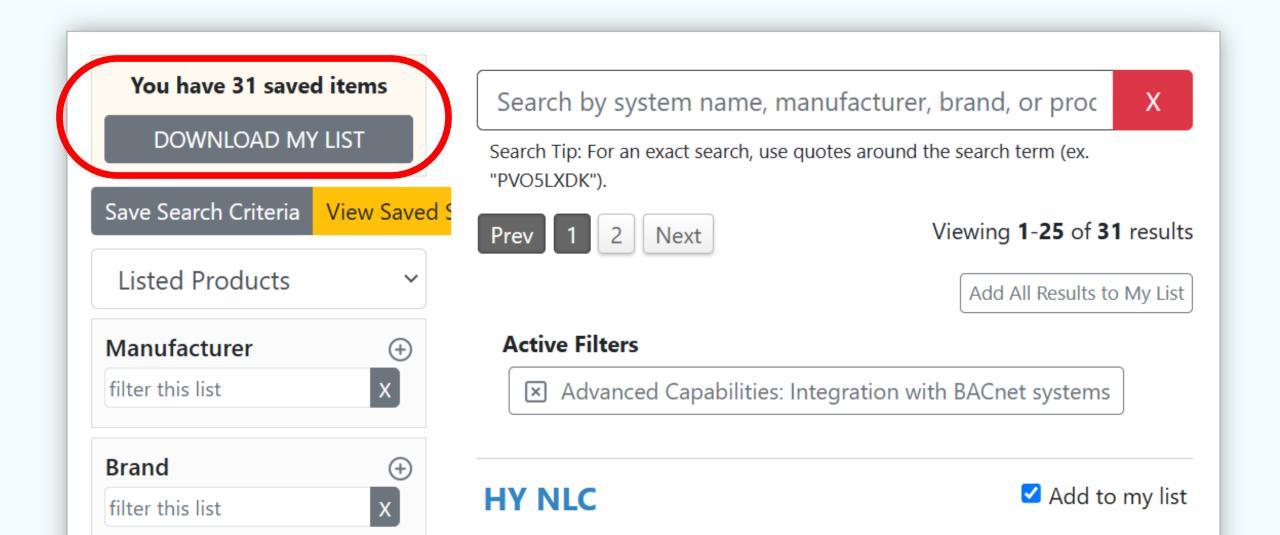












SUMMARY

- 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

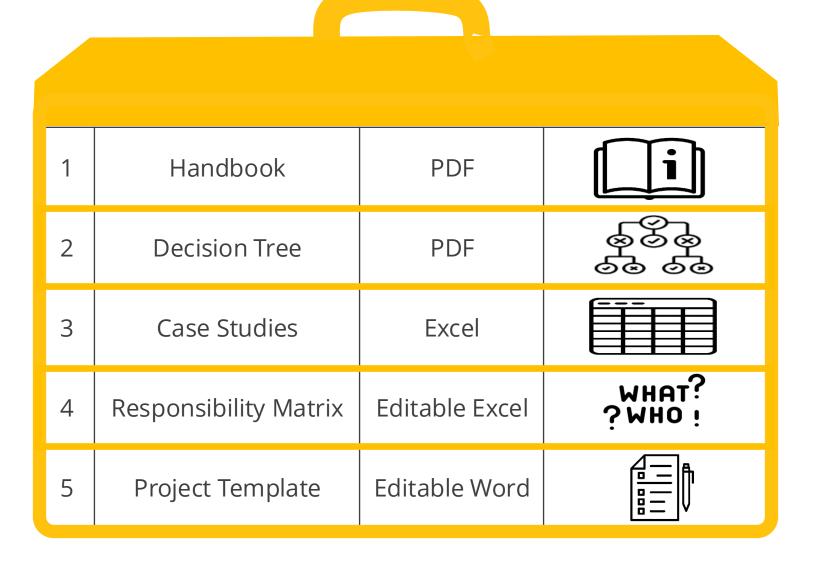
- Occupancy Sensing
- ✓ Daylight Harvesting
- ✓ Zoning
- Continuous Dimming
- ✓ Scheduling
- × Remote Diagnostics
- ✓ Luminaire Level Lighting Control (LLLC)
- X Load Shedding/Demand Response
- External Systems Integration
- Cybersecurity
- ✓ Scene Control

Agenda

- 1. Introduction and Context
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- 5. Questions and Answers



Toolkit Files













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You have 0 saved ite	ms	Search by system name, manufacturer, brand, or product ID					
Save Search Criteria View	Saved Searches	Search Tip: For an exact search, use quotes around the se	arch term (ex. "PVO5LXDK").				
Listed Products	~	Prev 1 2 3 4 Next	Viewing 1-25 of 90 result				
Manufacturer	⊕		Add All Results to My Lis				
filter this list	X						
		IntrinsiX Xone	☐ Add to my lis				
Brand filter this list	⊕	Manufacturer: IntrinsiX Lighting	Outdoor Scope: Structured Parking, Area/Building				
Tilter this list	X	Brand: IntrinsiX Xone	Exterior/Parking,Streetlight (residential streets)				
Ease of Implementation	(+)		Technical Requirements Version: 5.0				
·		Genio	☐ Add to my lis				
Technical Requirements Version	⊕	Manufacturer: Standard Products Inc.	Outdoor Scope: Structured Parking, Area/Building				
Indoor Scope	(+)	Brand: Stanpro	Exterior/Parking,Streetlight (residential streets)				
·			Technical Requirements Version: 5.0				
Outdoor Scope	(+)	LumaLinx	☐ Add to my lis				
Advanced Capabilities	(+)	Manufacturer: Jaykal LED Solutions,Inc.	Indoor Scope: Portfolio/Enterprise,Whole				
		Brand: LumaLinx	Building,Room or Zone,Structured Parking				
User Interface	(+)	2.4.1.4.	Technical Requirements Version: 5.0				
Integral Controls	(+)	CONTROLLED	☐ Add to my lis				
Wired/Wireless Communication	(+)	Manufacturer: RAB Design Lighting	Outdoor Scope: Structured Parking, Area/Building				

Toolkit Goals

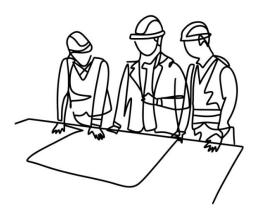
These tools will help you to



Choose appropriate projects



Collaborate better

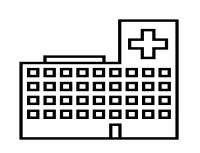


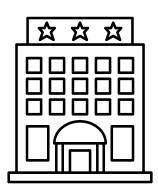


Save energy

Integration Goals

Integration projects will help you



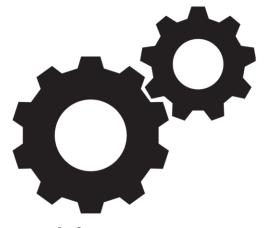




Achieve positive outcomes



Save energy

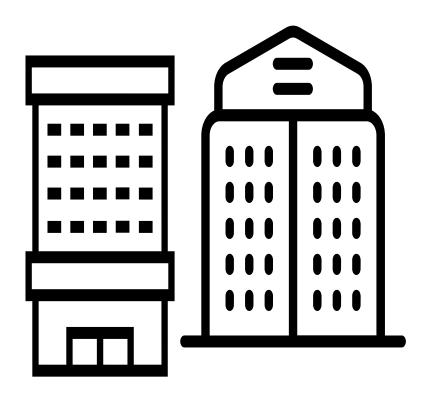


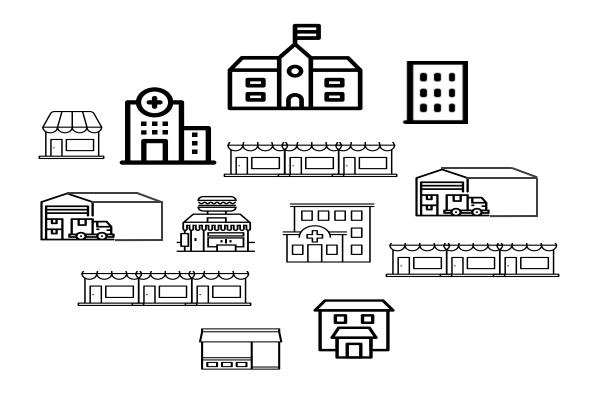
Building systems work together



Large Buildings Digital Now

Smaller Buildings Analog Now, Digital Soon





50% of commercial square footage, 6% of buildings

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





Lighting and Lighting Control Incentives & Partnership

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

> Component Retrofit Kits

• \$0.17/kWh



New / Integrated Retrofit Fixtures

• \$0.25/kWh



Controls-Only Upgrades

• \$0.25/kWh



NLC & LLLC Advanced Controls

- \$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	SAVIN	IGS ESTIM	ATES				6. SCI	L 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 tunding 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*

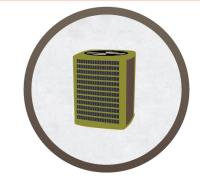
- VRF / VSD
- Comm HPs
- Etc.

Cooling

- Cooling Towers
- Chillers
- CRAC
- Etc.

Ventilation

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









Major HVAC Control System Upgrade



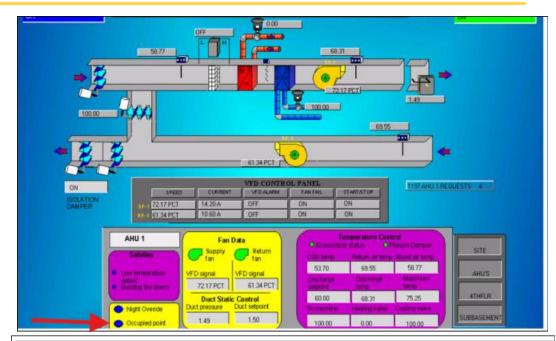
- Major HVAC control upgrades:
 - Installing new control equipment with a web-based interface
 - Implementing at least three major energy-efficiency HVAC control sequences
- Benefits:
 - Improved flexibility and performance
 - (2) Incentive payments: after installation and after 12 months of performance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

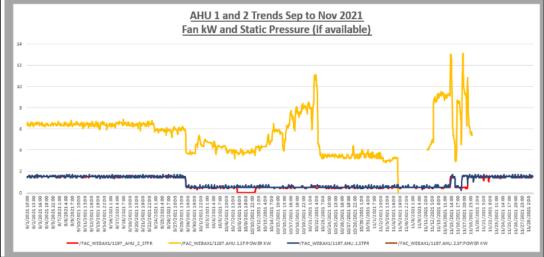
+Incentive: \$0.33 / kWh +\$0.03

	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 <u>SCLEnergyAdvisor@seattle.gov</u>
- An Energy Management Analyst can evaluate options based on your project plans.
- Link to Website



Q & A and Closing

• Questions?

- Levin Nock <u>Inock@designlights.org</u>
- Jim Loewen jim.loewen@seattle.gov
- City Light Energy Advisors
 <u>SCLEnergyAdvisor@seattle.gov</u>, 206-684-3800



Lighting Design Lab <u>lightingdesignlab@seattle.gov</u>

Take the survey!

THANK YOU





 $lighting design lab.com \mid \boxtimes lighting design lab@seattle.gov$