CONTROLS SUMMIT '24

Integration for the Future

Oct. 15-16 · Milwaukee, WI

HVAC Integration

Panelists

Dan Mellinger

Energy Futures Group

Ron Bernstein

RBCG Consulting

Michael Doucette

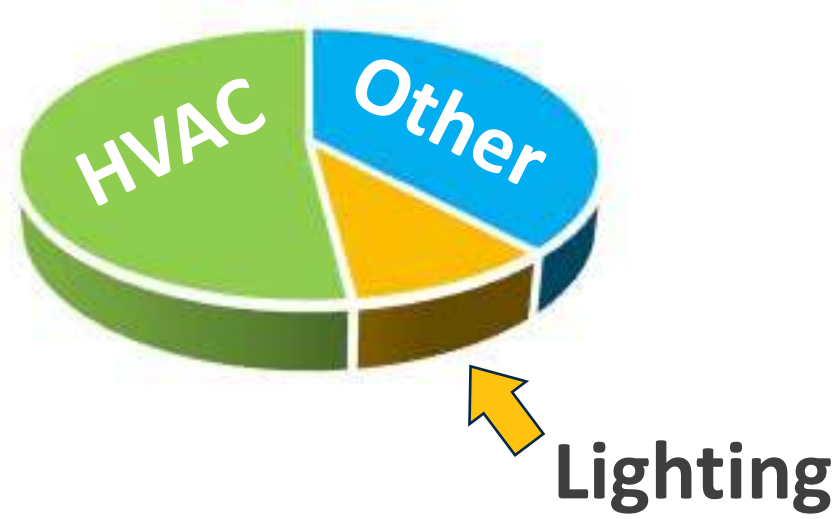
United Illuminating

Levin Nock

DLC

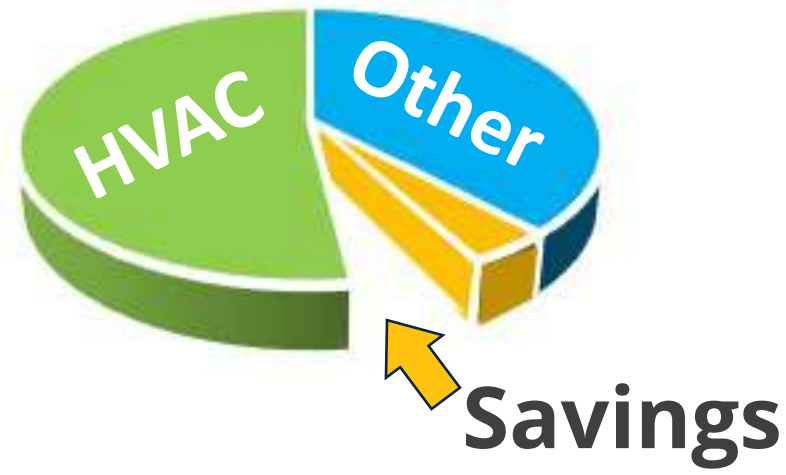
Energy use in commercial buildings in 2018

Lighting	10%
HVAC	52%
Other	38%



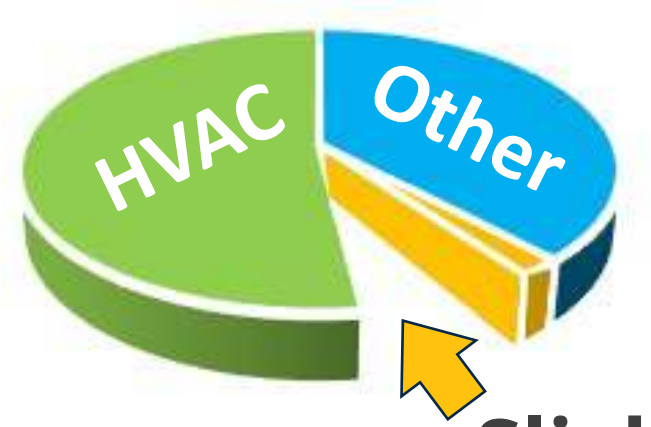
CBECS (Commercial Buildings Energy Consumption Survey), US EIA, 2022

Uncontrolled LED retrofits save 50% to 60% of the old lighting load.*



* Less when replacing LED

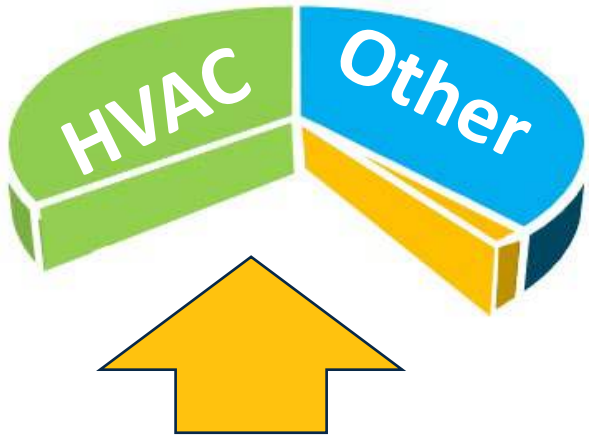
LED retrofits with NLC can save 80% of lighting load:
LED conversion saves 50% to 60%,
NLC saves 50% of the remaining load.*



Slightly Deeper Savings

* Portfolio average. Results in individual buildings will vary.

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



Seriously Deeper Savings

Serve more customers with NLC-HVAC integration

NLC-HVAC integration

The Role of a Building Systems Integrator

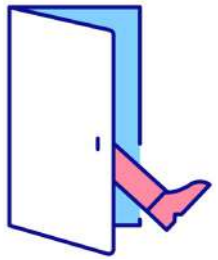
Ron Bernstein, RBCG Consulting

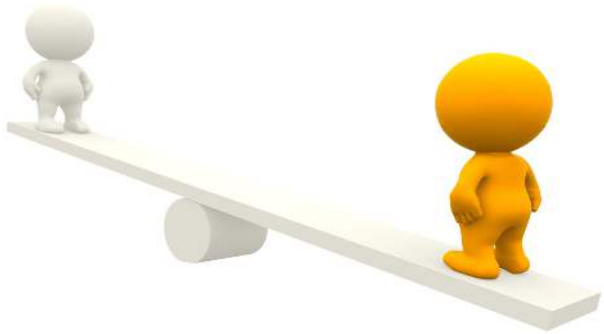
Comprehensive Retrofit Incentives and NLC-HVAC Integration

Michael Doucette, United Illuminating

Why a Comprehensive Program?

- Leverage a foot in the door, with contact by one trade to support others
- Leverage the easy measures to accomplish more extensive measures
- Leverage a single audience with a decision maker
- Desired outcome: deep, comprehensive energy savings across multiple building systems





2024 EXISTING BUILDINGS CAP SHEET

COMPREHENSIVE TIERED PROJECT INCENTIVE (ALL MEASURES)

Incentives are calculated as the greater of the annual savings or the summer peak kW savings multiplied by the incentive rate, plus fuel savings, with a maximum incentive based on a percent of project cost.

	GREATER OF		PLUS	PLUS	PLUS	Not to exceed	
	per annual kWh saved	per summer peak kW saved	per annual Natural Gas CCF saved	per annual Oil Gallon^ saved	per annual Propane Gallon^ saved	PROJECT CAP	PROJECT QUALIFICATION
TIER 2 COMPREHENSIVE							
Three or more systems*	$0.65	$1,000	$6.00	$8.00	$6.00	65% of Installed Cost	• For lighting to qualify for this tier the lighting must be at least Enhanced Performance • To include standard lighting, project must qualify for this tier independent of the lighting
TIER 1 COMPREHENSIVE							
Minimum two systems*	$0.50	$1,000	$5.00	$7.00	$5.00	50% of Installed Cost	• A control device/system that only sets the space temperature or only controls lighting is not an EMS • Retro-commissioning & energy management system control points automatically qualify for this tier

A system is defined as an energy consuming piece of equipment or process. Qualifying systems include: LED lighting or controls; weatherization; compressed air equipment or distribution; domestic hot water equipment, controls or distribution; heat recovery; HVAC equipment, controls, or distribution; motors or controls; PRIME engagements; Process Equipment; custom equipment; refrigeration equipment or controls.

*No one system can contribute more than 90% of the project's BTU energy savings & each qualifying system must contribute at least 3% based on total annual BTU energy savings.

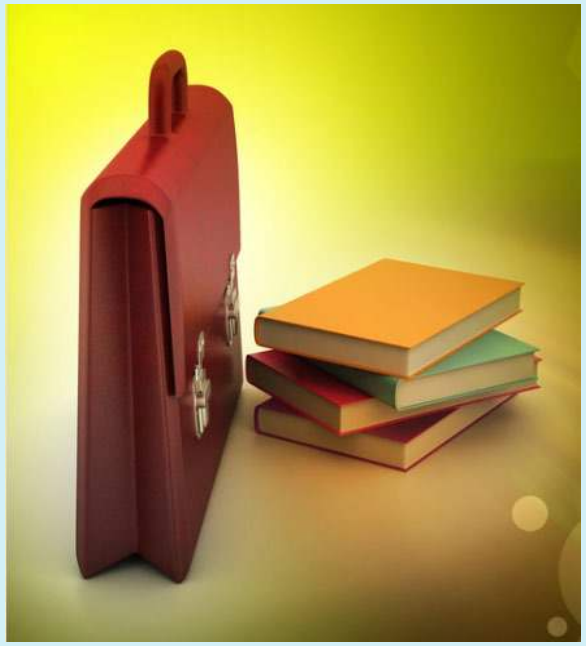
Incentives are not available for the replacement of an existing condensing heating system. Pre-inspections are required of all non-condensing existing equipment.

^per gallon incentives apply only to oil or propane, alternative fuel sources do not qualify.

Comprehensive Program Details

- BTU savings balance:
  Largest item saves 90% or less; smallest item saves at least 3%
- Savings accepted from natural gas, propane, oil
- Example "systems" other than LED lighting
  - ✓ Compressed Air System
  - ✓ Domestic Hot Water System
  - ✓ HVAC System
  - ✓ Refrigeration System
  - ✓ Process System – (e.g. waste heat recovery in industry)
  - ✓ Motors (non-HVAC) – (e.g. water or wastewater pumping)

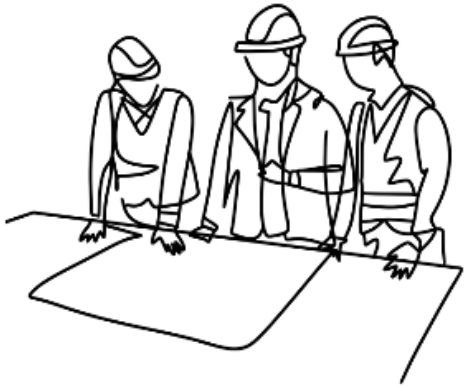
The New DLC Toolkit for NLC-HVAC Controls Integration

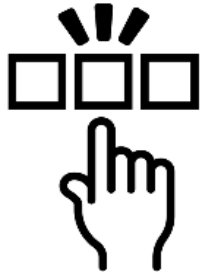


Levin Nock, DLC

Toolkit Goals

This Integration Toolkit will help you to





Choose appropriate projects

Communicate better

Save energy


COMING
SOON

Toolkit Contents

Document	Description	File Type
Integration Handbook	A concise reference manual	PDF
Responsibility matrix	Who is responsible for what.	Editable Excel
Project Template	Construction integration specification aligned with CSI Division 25.	Editable Word
Incentive Template	A form to help stakeholders find incentives for NLC-HVAC control integration	Excel form with blanks
Decision Tree	Choose appropriate projects for NLC-HVAC integration	Flowchart & Excel form
Case Study Spreadsheet	List of relevant published case studies	Excel

Handbook Contents

NLC-HVAC Integration Responsibility Matrix	Design/Specify							Procure							Install							Operations				Notes
Task	ARCHITECT	ELECTRICAL ENGINEER	MECHANICAL ENGINEER	LIGHTING DESIGN	TECHNOLOGY DESIGN	SYSTEMS INTEGRATOR	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	VENDOR	SYSTEMS INTEGRATOR	FACILITIES MANAGEMENT (OT/IT)	PROJECT MANAGER / OWNER'S REPRESENTATIVE	Vendor under Operations is based on task.
Lighting System																										
Luminaire Selection and Fixture Layout	C	C	C	R	C	C	C	C	R		I	C	C	C	C	R		I	C	C	C		I	R	I	
Luminaire Control Integration	C	C	C	R	C	C	C	C	R		I	C	C	C	C	C		I	R	C	C		R	C	I	
Luminaire Power Requirements	C	R	C	C	C	C	C	C	R		I	C	C	C	C	R		I	C	C	C		C	R	I	
Lighting Control System																										
CIN and SOO	C	C	C	R	I	C	C	C	R		I	C	C	C	C	C		I	R	C	C	C	R	I	I	Refer to ANSI/IES LP-16-22.
Lighting Control Zones	C	C	C	R	I	C	C	C	R		I	C	C	C	C	C		I	R	C	C	C	R	I	I	
Device Layout & Quantities	C	C	C	R	I	C	C	C	R		I	C	C	C	C	R		I	C	C	C	I	C	R	I	
HVAC System																										
HVAC Selection and VAV/Duct Layout	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	R	I	C	C	C		I	R	I	
HVAC Control Integration	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	C	I	R	C	C		R	C	I	
HVAC System Power Requirements	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	R	I	C	C	C		C	R	I	
HVAC Control System																										
CIN and SOO	C	C	R	C	C	C	I	C		I	I	C	C	C	C	I	C	I	R	C	C	C	R	C	I	Refer to ASHRAE Guideline 36-2021.
HVAC Control Zones	C	C	R	C	C	C	I	C		I	I	C	C	C	C	I	C	I	R	C	C	C	R	C	I	
HVAC Control Device Layout & Quantities	C	C	R	C	C	C	I	C		I	I	C	C	C	C	I	R	I	C	C	C	I	C	R	I	
Technology Infrastructure (IT, OT)																										
Infrastructure & Connectivity for Connected Control Systems	C	C	C	C	R	C	I	C	I	I	R	C	C	C	C	C	C	R	C	C	C		I	R	C	
Cyber Security Coordination	C	I	I	I	I	R	C	C	I	I	I	R	C	C	C	I	I	C	R	C	C	I	R	C	C	Refer to DLC NLC5.1 Technical Requirements.
Control System Network Requirements	C	I	I	I	I	R	C	C	I	I	I	R	C	C	C	I	I	C	R	C	C	I	R	C	C	
Commissioning and Integration Process																										
Owner's Project Requirements	C	R	R	R			C													I						
Control System Programming															C	C	C	I	R	C	C					
Verification Commissioning															C	C	C	C	C	R	C					Refer to ANSI/IES LP-8-20.
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.

Tasks

Lighting System

Lighting Control System

HVAC System

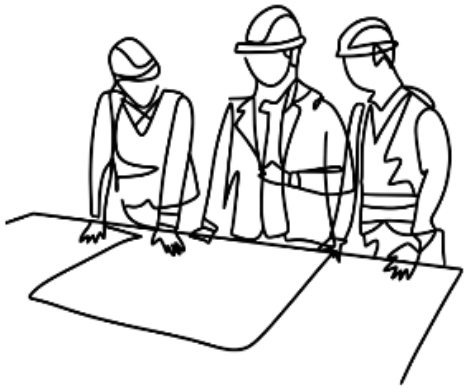
HVAC Control System

Technology Infrastructure (IT, OT)

Commissioning and Integration Process

Lighting System
Luminaire Selection and Fixture Layout
Luminaire Control Integration
Luminaire Power Requirements
Lighting Control System
CIN and SOO
Lighting Control Zones
Device Layout & Quantities
HVAC System
HVAC Selection and VAV/Duct Layout
HVAC Control Integration
HVAC System Power Requirements
HVAC Control System
CIN and SOO
HVAC Control Zones
HVAC Control Device Layout & Quantities
Technology Infrastructure (IT, OT)
Infrastructure & Connectivity for Connected Control Systems
Cyber Security Coordination
Control System Network Requirements
Commissioning and Integration Process
Owner's Project Requirements
Control System Programming
Verification Commissioning
Training
On-site, Commissioning (During Construction)
On-going Testing (During Operations)

People



Design/Specify
ARCHITECT
ELECTRICAL ENGINEER
MECHANICAL ENGINEER
LIGHTING DESIGN
TECHNOLOGY DESIGN
SYSTEMS INTEGRATOR
PROJECT MANAGER / OWNER'S REPRESENTATIVE

Procure
ARCHITECT
ELECTRICAL CONTRACTOR
MECHANICAL CONTRACTOR
TECHNOLOGY CONTRACTOR
SYSTEMS INTEGRATOR
SYSTEM SPECIFIER
PROJECT MANAGER / OWNER'S REPRESENTATIVE

Install
ARCHITECT
ELECTRICAL CONTRACTOR
MECHANICAL CONTRACTOR
TECHNOLOGY CONTRACTOR
SYSTEMS INTEGRATOR
COMMISSIONING AGENT
PROJECT MANAGER / OWNER'S REPRESENTATIVE

Operations
VENDOR
SYSTEMS INTEGRATOR
FACILITIES MANAGEMENT (OT/IT)
PROJECT MANAGER / OWNER'S REPRESENTATIVE

Key and Notes

General Assumptions and Notes	
R: RESPONSIBLE	The party that executes the work and ensures strategic objectives are met.
A: ACCOUNTABLE	Establishes strategic objectives. This role may be included within R.
C: COORDINATION	Provides input to meet objective.
I: INFORMED	Informed on the work being completed to meet objective.
CIN	Control Intent Narrative (high level overview of what the controls do, in layman's terms)
SOO	Sequence of Operations (detailed technical specification of control parameter settings)
	This Responsibility Matrix describes the specific workflow and responsibilities for integration of Networked Lighting Controls (NLC) and Heating, Ventilation, and Cooling (HVAC) control systems.
	Responsibility and workflows may vary based on organizational composition and objectives.

NLC-HVAC Integration Responsibility Matrix	Design/Specify							Procure							Install							Operations				Notes
Task	ARCHITECT	ELECTRICAL ENGINEER	MECHANICAL ENGINEER	LIGHTING DESIGN	TECHNOLOGY DESIGN	SYSTEMS INTEGRATOR	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	VENDOR	SYSTEMS INTEGRATOR	FACILITIES MANAGEMENT (OT/IT)	PROJECT MANAGER / OWNER'S REPRESENTATIVE	Vendor under Operations is based on task.
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Luminaire Control Integration	C	C	C	R	C	C	C	C	R		I	C	C	C	C	C		I	R	C	C		R	C	I	
Luminaire Power Requirements	C	R	C	C	C	C	C	C	R		I	C	C	C	C	R		I	C	C	C		C	R	I	
Lighting Control System																										
CIN and SOO	C	C	C	R	I	C	C	C	R		I	C	C	C	C	C		I	R	C	C	C	R	I	I	Refer to ANSI/IES LP-16-22.
Lighting Control Zones	C	C	C	R	I	C	C	C	R		I	C	C	C	C	C		I	R	C	C	C	R	I	I	
Device Layout & Quantities	C	C	C	R	I	C	C	C	R		I	C	C	C	C	R		I	C	C	C	I	C	R	I	
HVAC System																										
HVAC Selection and VAV/Duct Layout	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	R	I	C	C	C		I	R	I	
HVAC Control Integration	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	C	I	R	C	C		R	C	I	
HVAC System Power Requirements	C	C	R	C	C	C	I	C	I	R	I	C	C	C	C	I	R	I	C	C	C		C	R	I	
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CIN and SOO	C	C	R	C	C	C	I	C		I	I	C	C	C	C	I	C	I	R	C	C	C	R	C	I	Refer to ASHRAE Guideline 36-2021.
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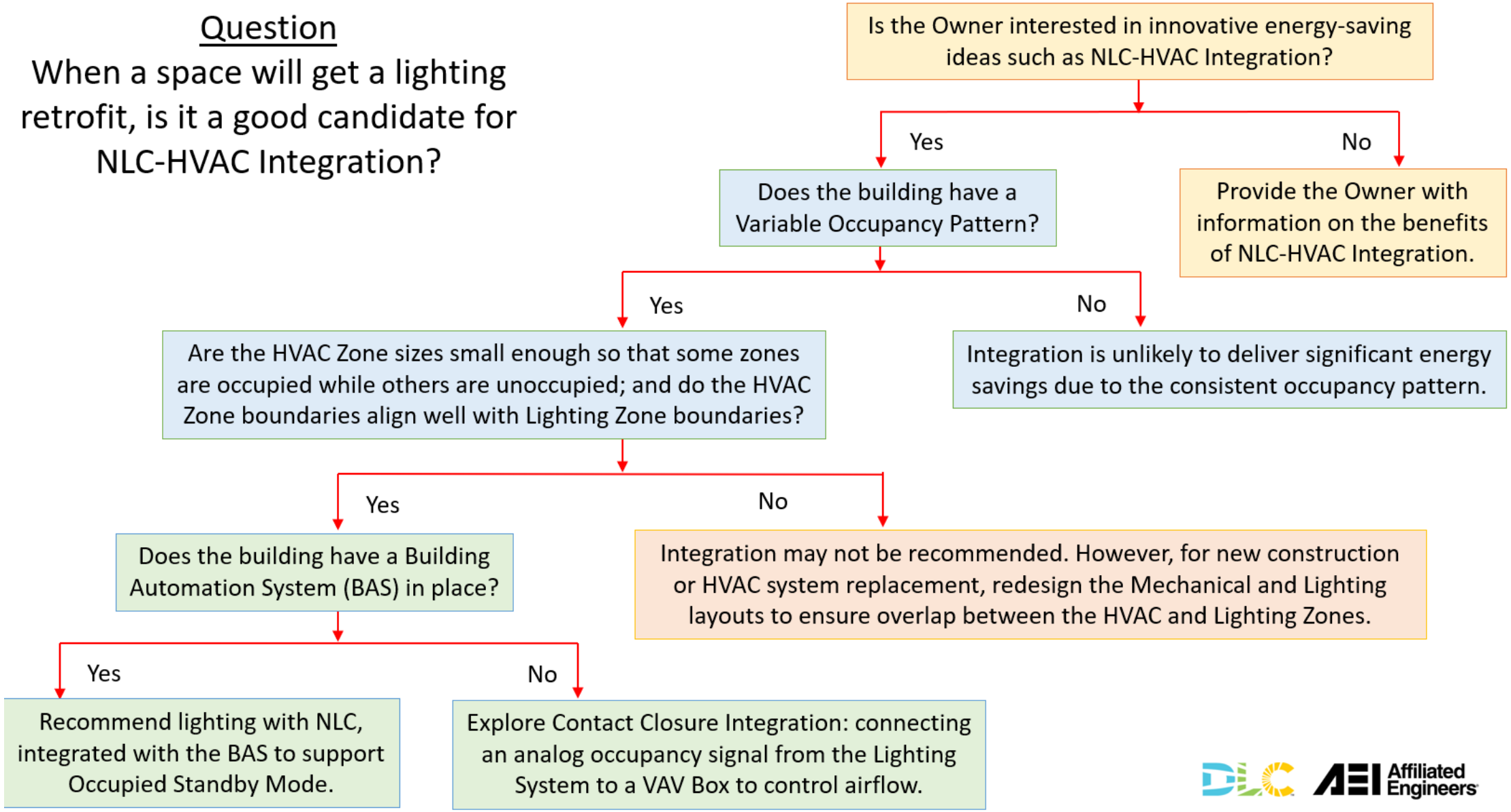
HVAC Control Device Layout & Quantities	C	C	R	C	C	C	I	C		I	I	C	C	C	C	I	R	I	C	C	C	I	C	R	I	
Technology Infrastructure (IT, OT)																										
Infrastructure & Connectivity for Connected Control Systems	C	C	C	C	R	C	I	C	I	I	R	C	C	C	C	C	C	R	C	C	C		I	R	C	
Cyber Security Coordination	C	I	I	I	I	R	C	C	I	I	I	R	C	C	C	I	I	C	R	C	C	I	R	C	C	Refer to DLC NLC5.1 Technical Requirements.
Control System Network Requirements	C	I	I	I	I	R	C	C	I	I	I	R	C	C	C	I	I	C	R	C	C	I	R	C	C	
Commissioning and Integration Process																										
Owner's Project Requirements	C	R	R	R			C													I						
Control System Programming															C	C	C	I	R	C	C					
Verification Commissioning															C	C	C	C	C	R	C					Refer to ANSI/IES LP-8-20.
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.

NLC-HVAC Controls Integration Decision Tree

Question

When a space will get a lighting retrofit, is it a good candidate for NLC-HVAC Integration?



Discussion Session

Example Buildings will all get a lighting retrofit soon.

- Run them through the Decision Tree and pick one you like

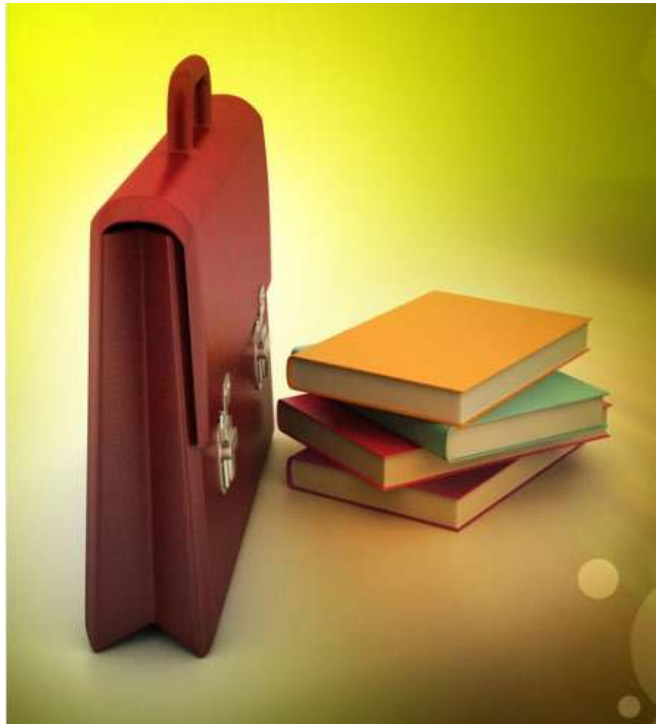
Read and discuss the Best Practices for Successful Integration.

- Do you have any suggested additions or modifications?

Do you see your role in this draft of the Responsibility Matrix?

- If yes, is the role assignment(s) accurate?
- If not, where would you like to be engaged?

Goals



Familiarity with Toolkit

Suggest changes

Q&A

Dan Mellinger
Energy Futures Group

Ron Bernstein
RBCG Consulting

Michael Doucette
United Illuminating

Levin Nock
DLC

Discussion Session

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