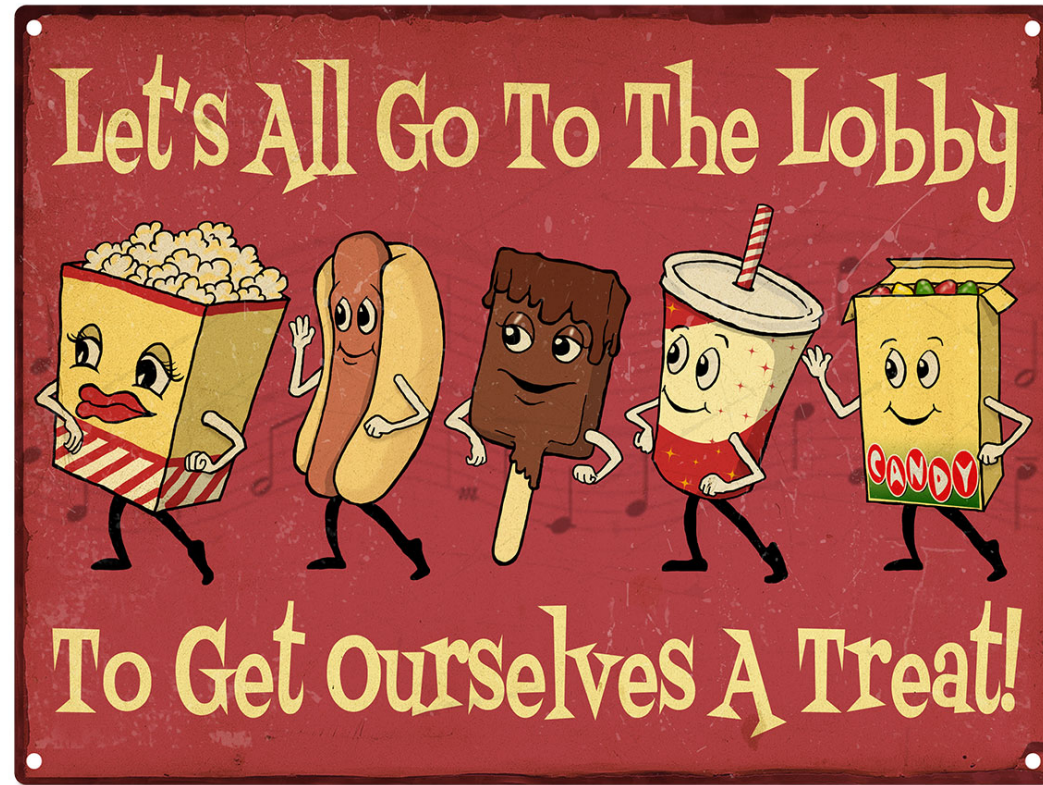


WELCOME TO THE WEBINAR!

Networked Lighting Controls for Utilities

June 2, 2020
11:00 to Noon

[illegible]

Networked Lighting Controls for Utilities

Presented by: John Arthur Wilson
June 2, 2020



l i g h t i n g d e s i g n l a b

Before we begin...

During the Webinar

- Attendees will be muted
- Please use the chat feature in the control panel to submit questions to LDL staff
- The presenter will pause to address questions every ~10 minutes
- Please participate in the online polls.

Following the Webinar

- Please take the short survey
- A recording and the slide deck will be posted on LDL's webpage
- Reach out to LightingDesignLab@seattle.gov with comments or questions.



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***Click the logo to
check them out!***

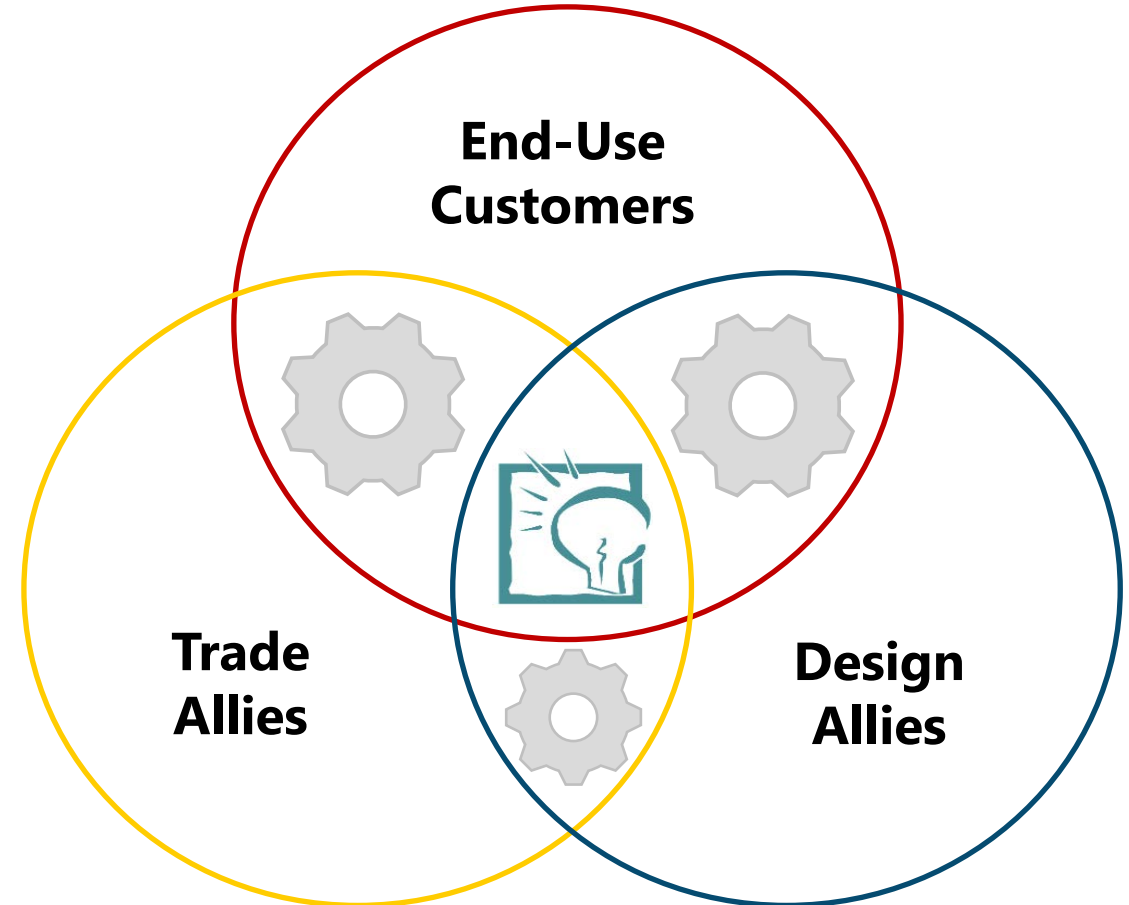


We'd like to thank today's event sponsor

Who We Work With



It takes a village...

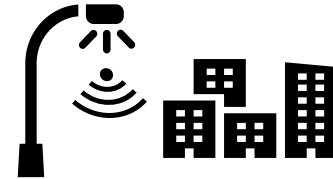


LDL's Four Core Service Areas

EDUCATION & TRAINING



TECHNOLOGY EVALUATION



TOOLS & RESOURCES



INFORMATION AGGREGATION



Meet Today's Speaker

Stakeholder Solutions Manager



13 years working for utilities

Tribune of the Stakeholders

Friend of Industry

Regionalist



*Mr. Wilson, posing outside the entrance of
LDL on his way to the 2019 open house gala*

-Puget Bugler

TIME FOR A POLL

LET ME KNOW



Enough about me...

Let's talk about you...

WHAT ARE WE TALKING ABOUT...

Understanding Key Concepts

Technology <i>Basics</i>
Control Strategies <i>Basics</i>
Market Trends & Dynamics



Program Implementation

Technology / Performance Requirements
Savings & Incentives
Project Oversight
Market Engagement & Tools n' Resources

UNDERSTANDING KEY CONCEPTS

~ crash course ~

NLC Tech Terms & Basic Concepts: ***It's on my network?!?***

So it's on my network?!?

Many NLC systems operate on their own network

Many
communicate via
router – or from
device to device



Most enterprise
systems can
integrate with
existing networks

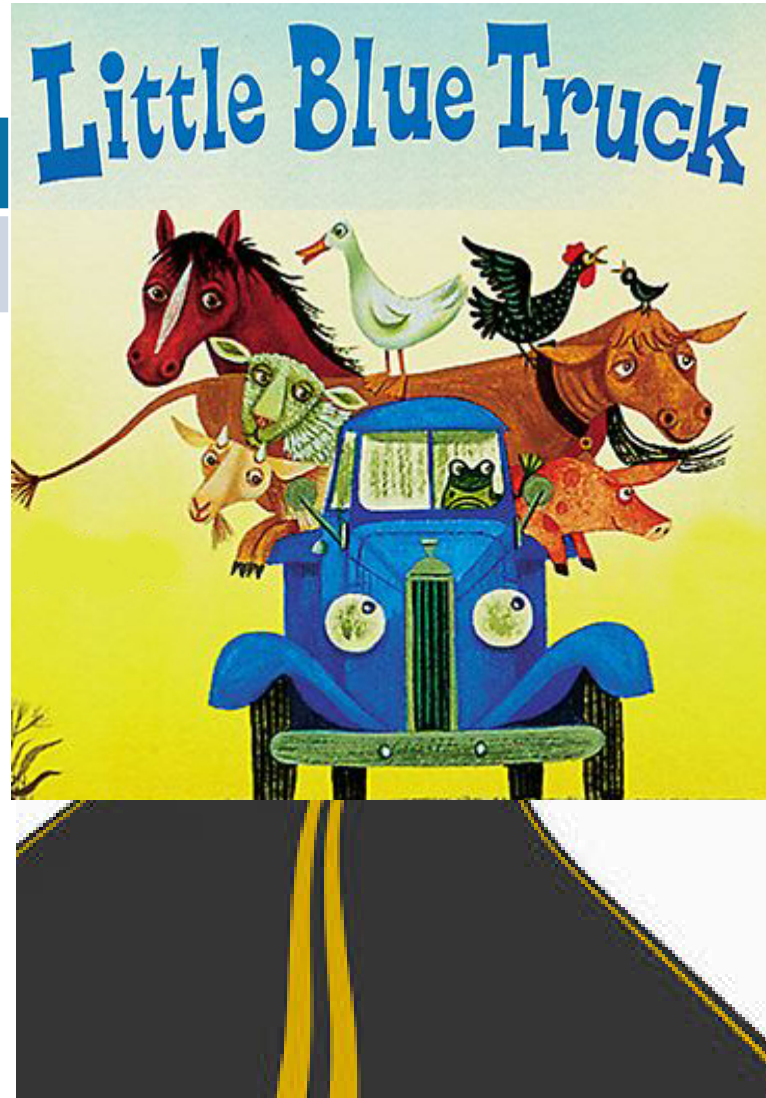
NLC Tech Terms & Basic Concepts: **Protocols**

Communication Protocols

The How

A **communication protocol** allows two or more devices to transmit information

Wireless examples include: WiFi, Bluetooth, Zigbee, or cellular networks.



Load Control Protocols

The What

A **load control protocol** is the content in the message being communicated

Examples include: DALI, DMX512, proprietary digital protocols or 0-10 volts (analog)

NLC Tech Terms & Basic Concepts: **LLLC vs. NLC?**

Luminaire Level Lighting Controls are Networked Lighting Controls



LLLC means every fixture includes

- Motion & Daylight Sensor
- Load Controller
- Individually Addressable (connected)

1 : Many

BASIC NLC CONFIGURATION



*1-8 zones possible with
additional sensors*

LLLC CONFIGURATION



*1-8 zone capable
out of the box*

1 : 1

NLC Tech Terms & Basic Concepts: **Wall Stations**

Now introducing... the artist formally known as... ***THE WALL SWITCH***



- How users interact with the luminaires
- Often programmable
- May or may not include scenes



Simple

Interface

Complex

Limited

Capabilities

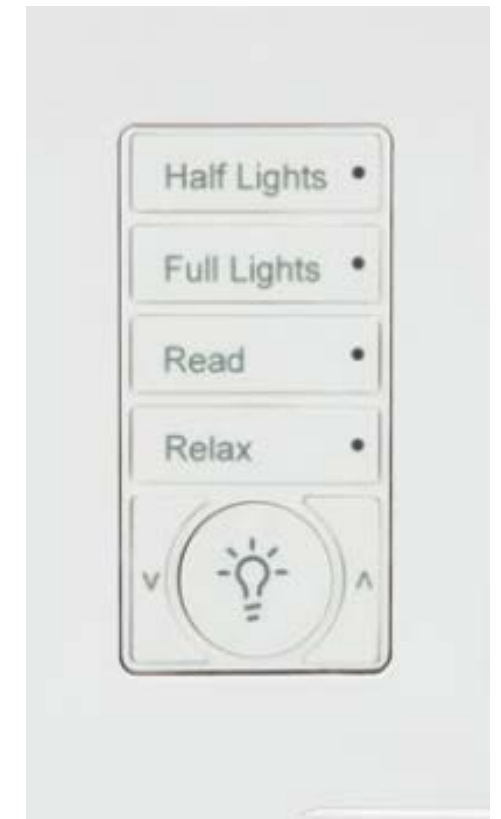
Flexible

NLC Tech Terms & Basic Concepts: **Scenes**

In lighting, a *scene* refers to a collection of control zones – with programmable preset's



Office Scenes:	Description
Half Lights	50%
Full Lights	100%
Read	30%
Relax	3%
Off / On	0% - 50%



NLC Tech Terms & Basic Concepts: **Sequence of Operations**

The Sequence of Operations is how the system designer communicates intent

Area	Typical open office		
	Lights	Zones (a) - (d)	Fully dimmable lights controlled in this area
	Daylight Zones	Zones (a) - (b)	Daylight rows 1 and 2 will dim independently. Lights will automatically adjust to daylight maintaining recommended 30FC on task surfaces
	Manual Wall Control	Zones (a), (b), (c), (d)	For each independent zone, the user can select scenes on/off, 50%, and can raise/lower the zone

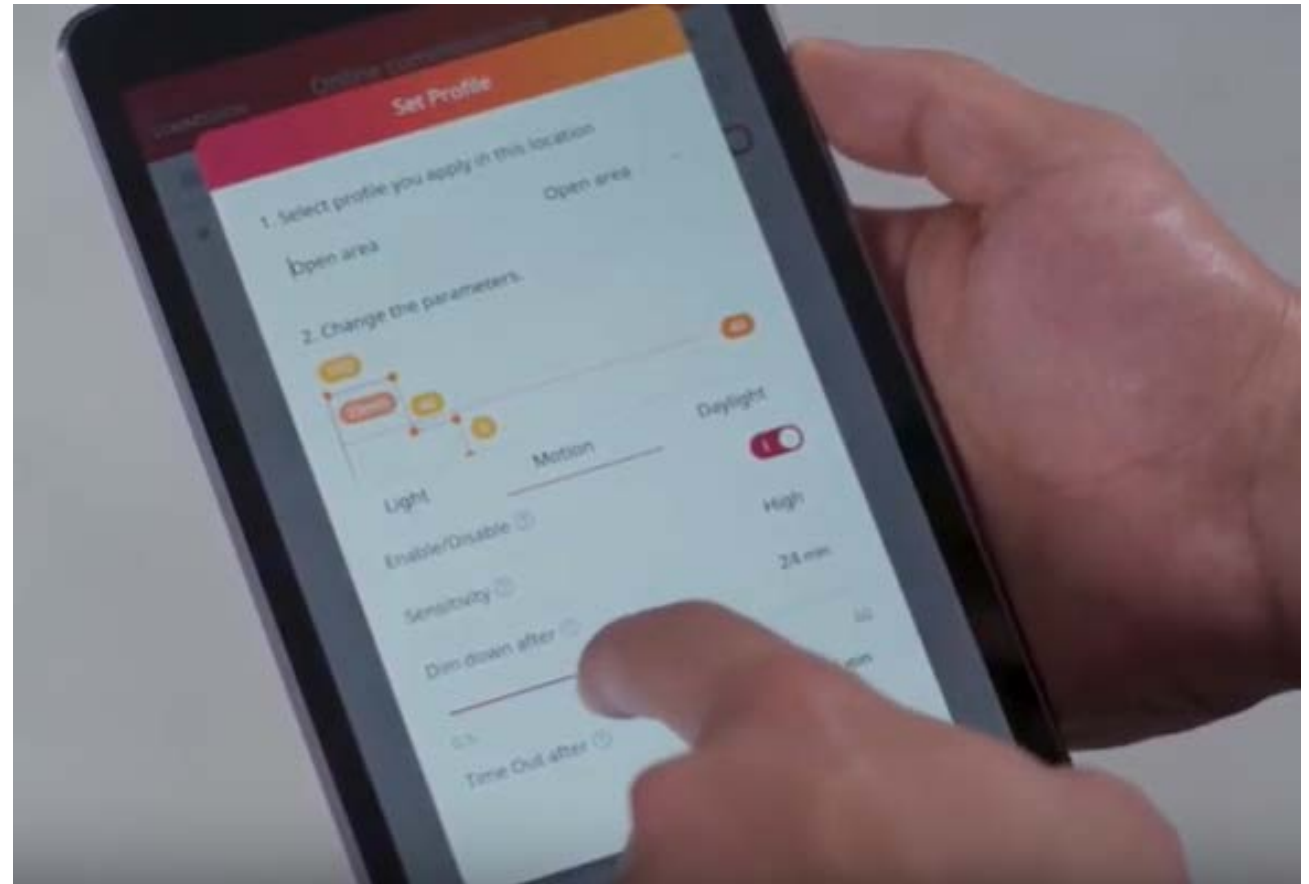
SPACE TYPE	CONTROL METHOD				
	HIGH END TRIM	DAYLIGHT SENSOR	MANUAL SWITCH	OCCUPANCY SENSOR	TIME CLOCK
Conference	X	X	X	X	
Equipment	X	X		X	
Office - open	X	X		X	X
Office - private	X	X	X	X	
Restrooms	X			X	



[Click to access LDL Sequence of Operations learning guide](#)

NLC Tech Terms & Basic Concepts: **Configuration Tools**

- How MOST modern NLC lighting systems are
 - Setup,
 - Programmed, and
 - Commissioned
- Increasingly App based
- Some companies offer as a service

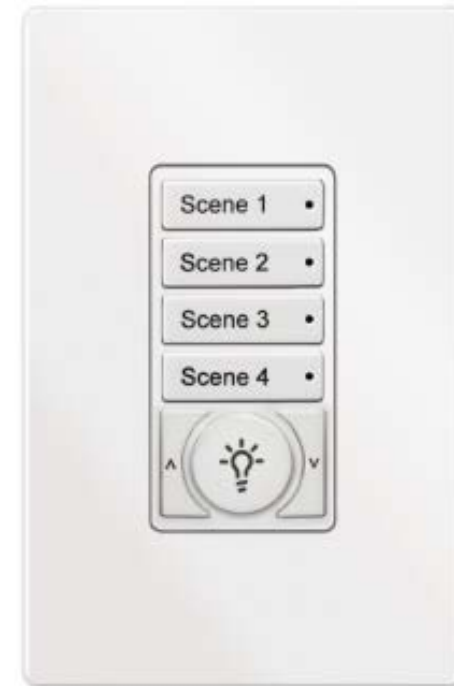
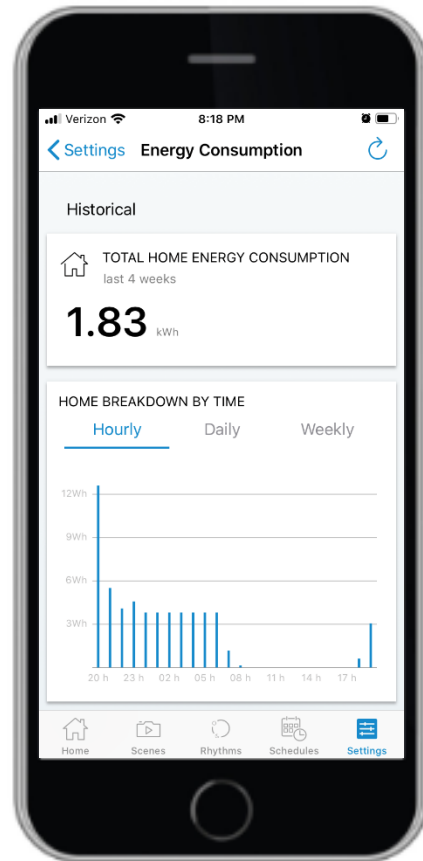


Configuration Tools & Wall Stations

These are the two ways *most* modern lighting systems are programmed, commissioned, and used.



*example of
CREE SmartCast
remote



POLL

Do you have direct experience working with NLC configuration tools?



PAUSE FOR
QUESTIONS

The Four Primary Control Strategies – *crash course*

High End Trim
or Task Tuning



Occupancy
& Vacancy



Daylight
Harvesting



Scheduling



Control Method #1 High End Trim or Task Tuning

Starting with the *RIGHT* amount of light

High End Trim will

- Deliver the target illuminance level
- Reduce glare
- Extend the life of the fixture
- Provides reliable energy savings













High-end trim sets the new
100% light output level

Control Method #2 Occupancy & Vacancy

Occupancy / Vacancy?

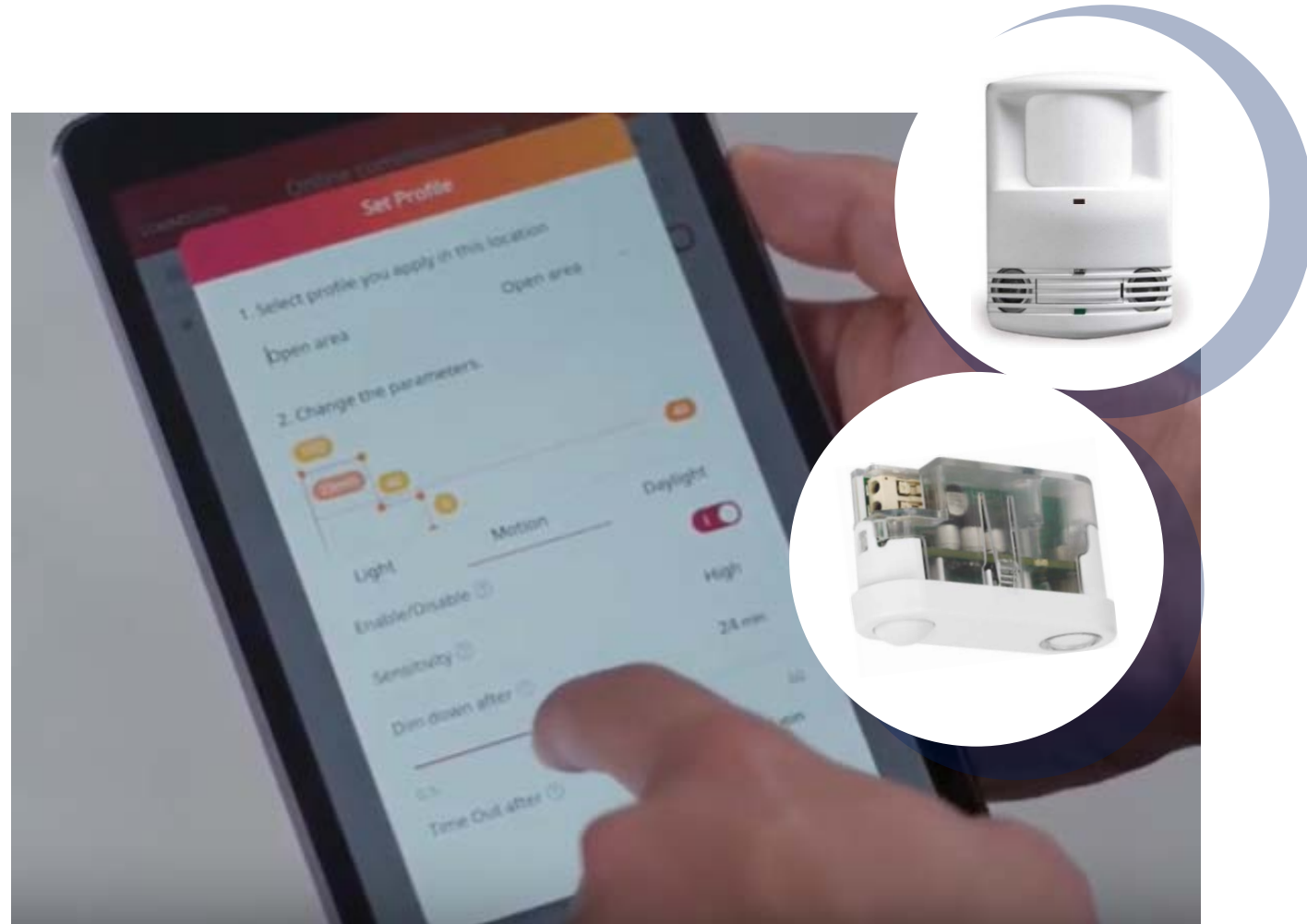
- *We got a class for that*

Wired vs. Wireless?

- *We got a class for that*

How to Configure?

- *We got a class for that*

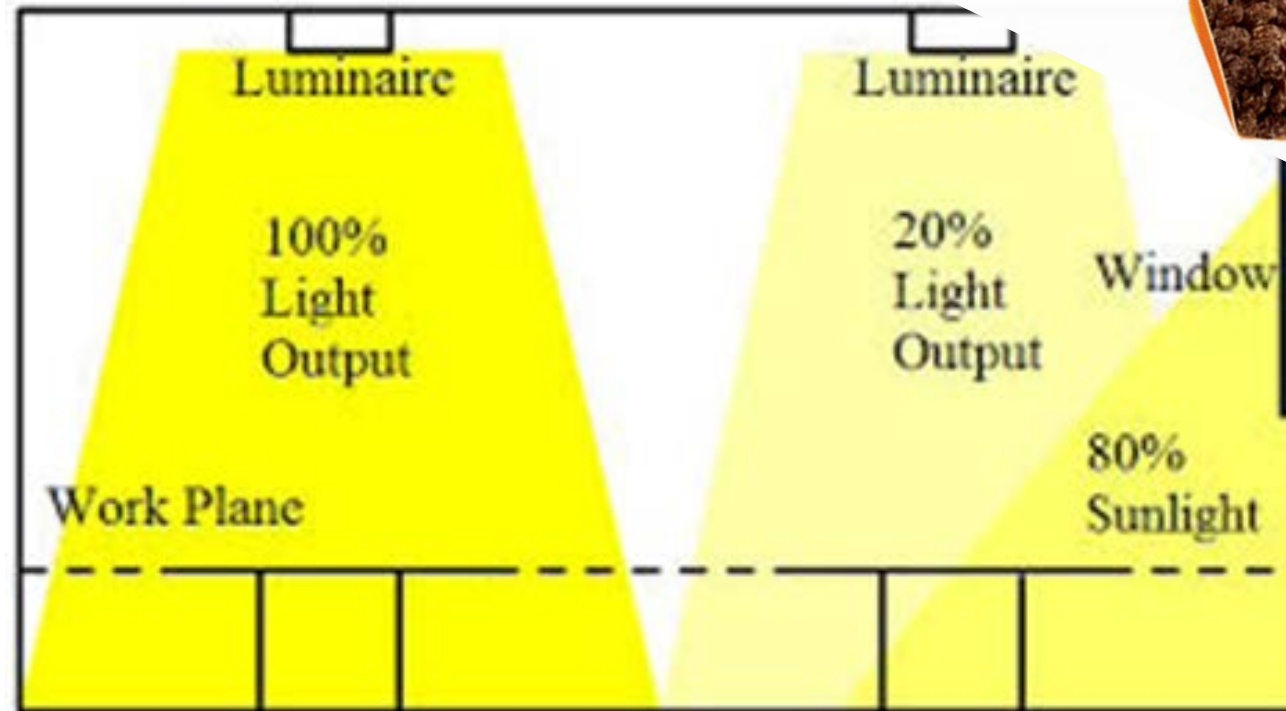


Control Method #3 Daylight Harvesting

Leverage Available Daylight

Dim Artificial Light

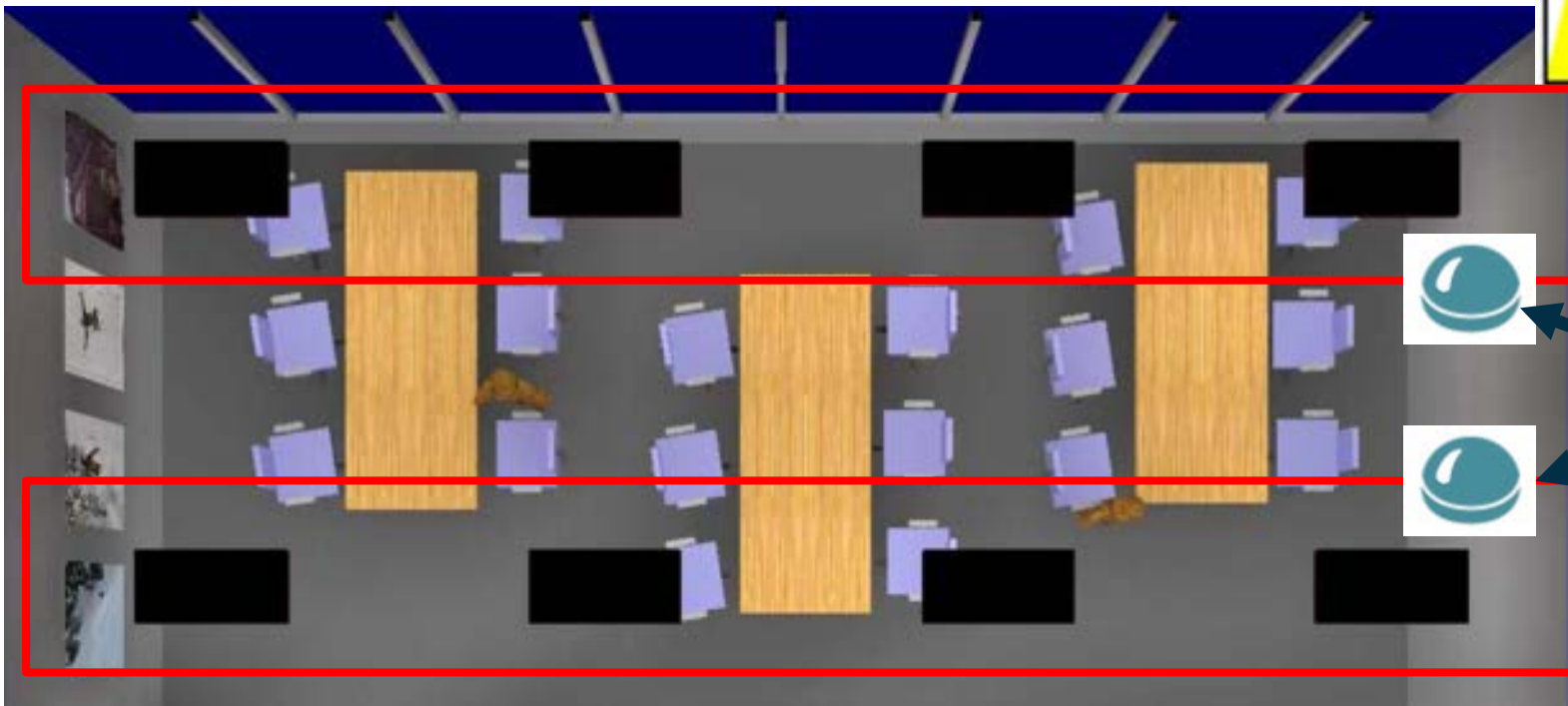
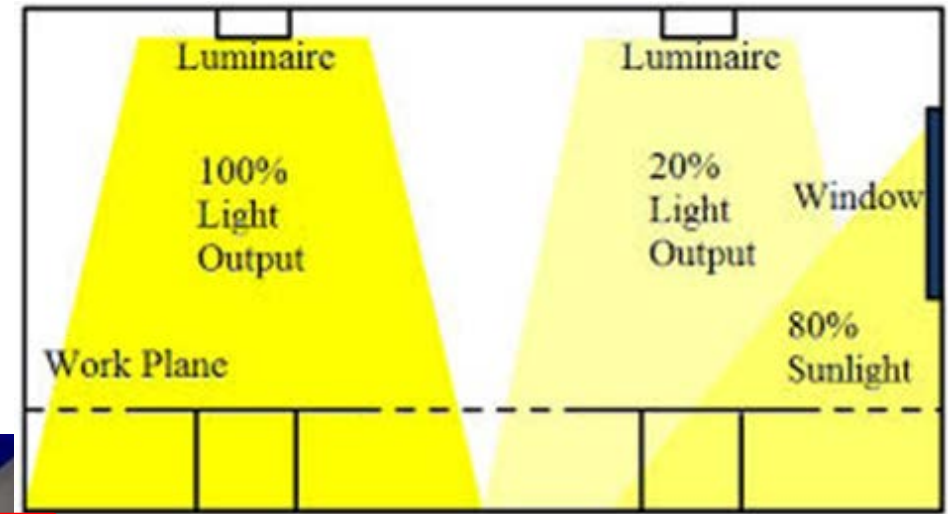
- Comfort in maintaining appropriate light level
- Reduces glare
- Saves energy



Control Method #3 Daylight Harvesting

For Networked Lighting Controls

- Primary Daylight Zone
- Secondary Daylight Zone

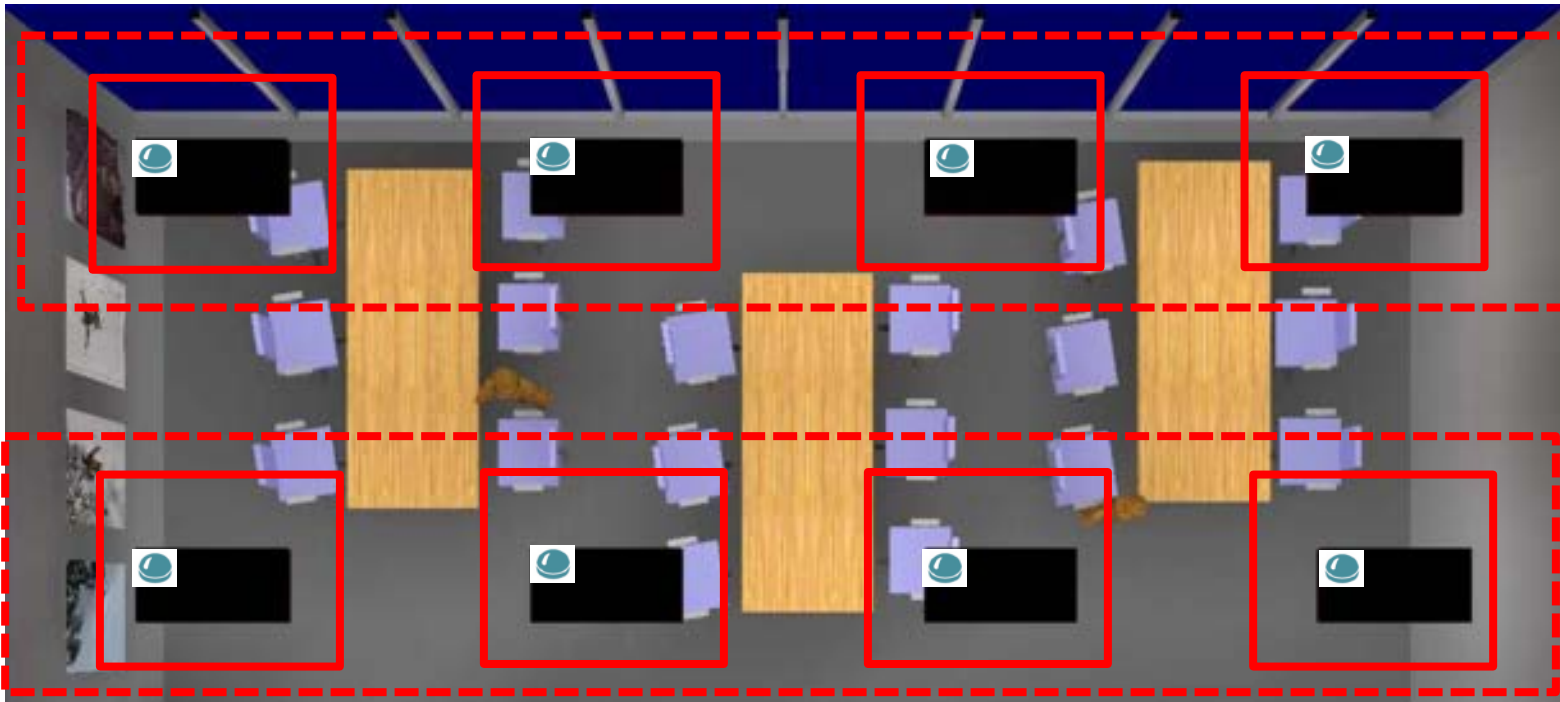


**Two separate light
sensors, controlling
each zone**

Control Method #3 Daylight Harvesting

For Luminaire Level Lighting Controls

- Individual daylighting zones **OR**
- Same zones as NLC configuration



LLLC CONFIGURATION



1-8 zone capable
out of the box

**Both are
acceptable!**

Control Method #4 Scheduling

High End Trim



Scheduling



Occupancy & Vacancy



Daylight Harvesting



Poll Question 2

High-End Trim with neutralizing 5G quantum nano-layer technology plus thumb-drive





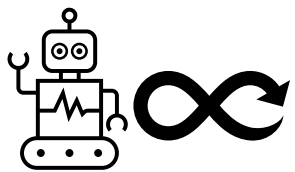
PAUSE FOR
QUESTIONS

Understanding Current NLC Market Trends – *crash course*

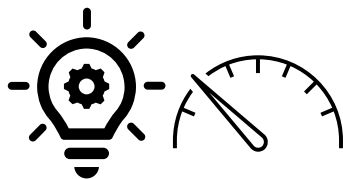
Configuration Tools - *The shift from bumpy to smooth...*



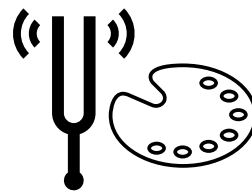
The Proliferation of *FEATURES*...



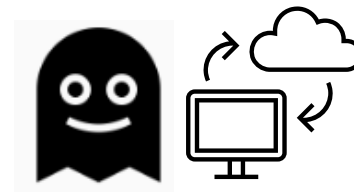
*Controls
Persistence*



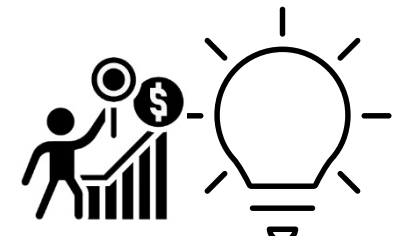
*Energy
monitoring*



Color tuning



Cyber security



*Demand
Response*

... and so many more

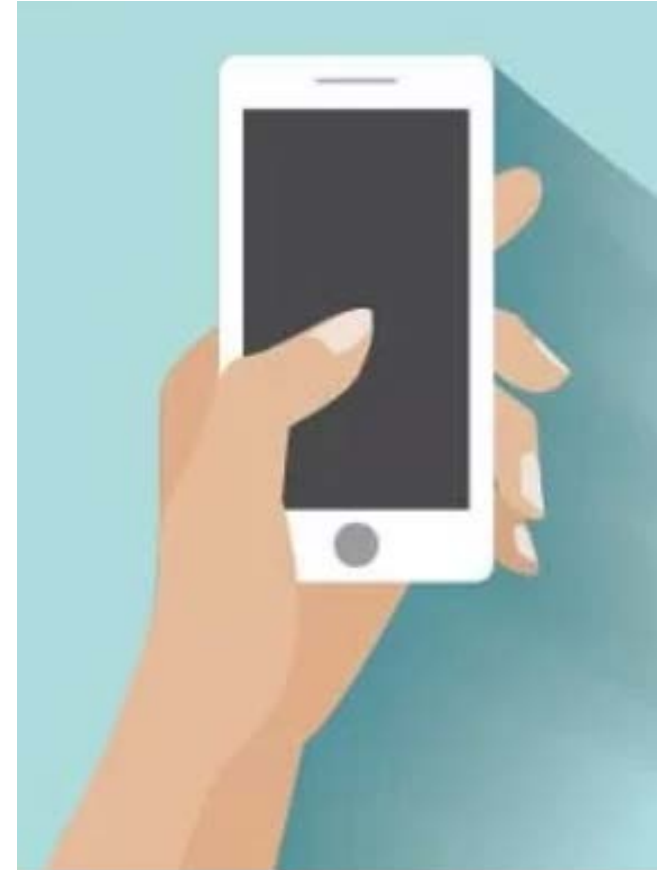
Understanding Current NLC Market Trends: **Configuration Tools**

From manually coding to smart devices



MORSE CODE

A ·—	M — —	Y — · — —
B — · · ·	N — ·	Z — — · ·
C — · — ·	O — — —	1 · — — — —
D — · ·	P · — — ·	2 · · — — —
E ·	Q — — · —	3 · · · — —
F · · — ·	R · — ·	4 · · · · —
G — — ·	S · · ·	5 · · · · ·
H · · · ·	T —	6 — · · · ·
I · ·	U · · —	7 — · · · ·
J · — — —	V · · · —	8 — — · · ·
K — · —	W · — —	9 — — — ·
L · — · ·	X — · · —	0 — — — —



Understanding Current NLC Market Trends: **Configuration Tools**



Desired Timeout (Minutes)	Number of Flashes from Light/Motion Sensor
1 Minute	2 Flashes
5 Minutes	3 Flashes
15 Minutes	4 Flashes
30 Minutes	5 Flashes

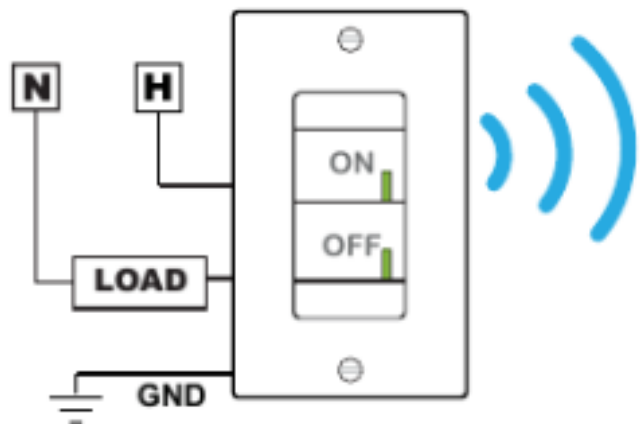


Press n' Hold for **Pairing Mode**

Press, Press, Release, Press to **change mode**

Release, Press, Hold, Keep holding, to **reset**

It was a confusing time...



Understanding Current NLC Market Trends: **Configuration Tools**

Configuration tools are great when they provide

- An ordinal process
- Visual confirmation of settings
- Integral help features

Some are still pretty confusing!

Not every system uses an app



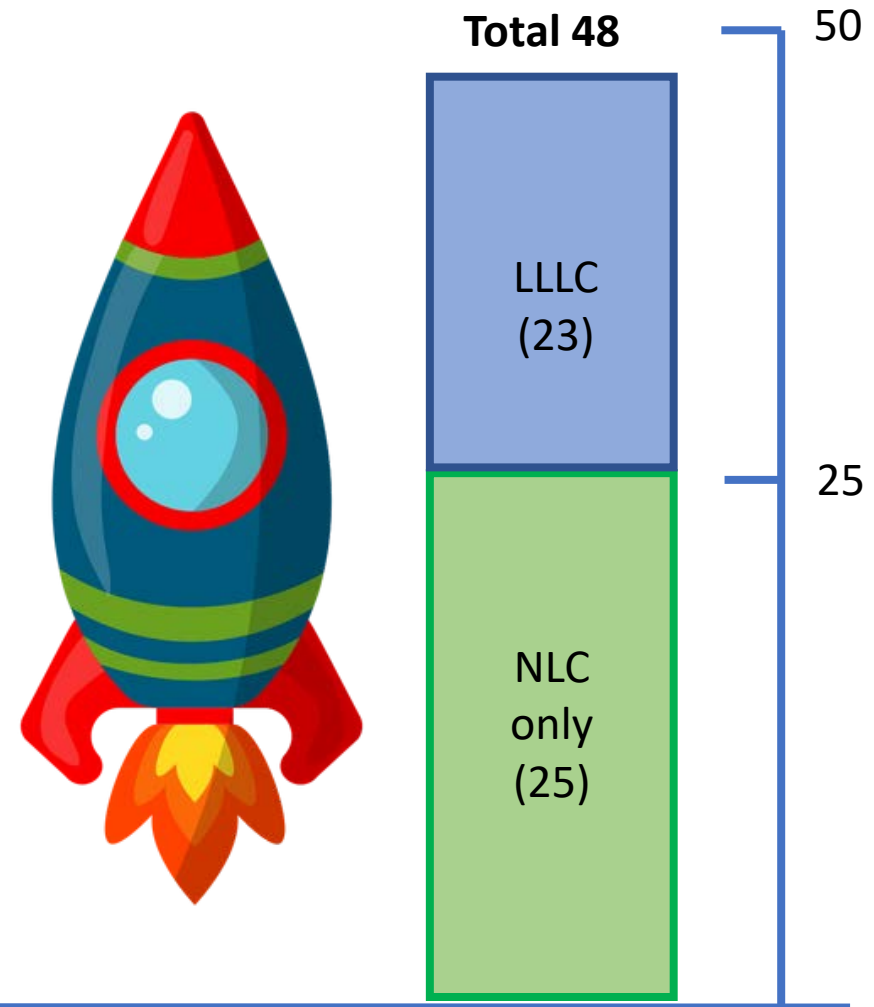
Current Market Trends & Dynamics

Market Proliferation*

- **48** systems currently on DLC NLC QPL
- **23** systems are LLLC

Just a Few System Features

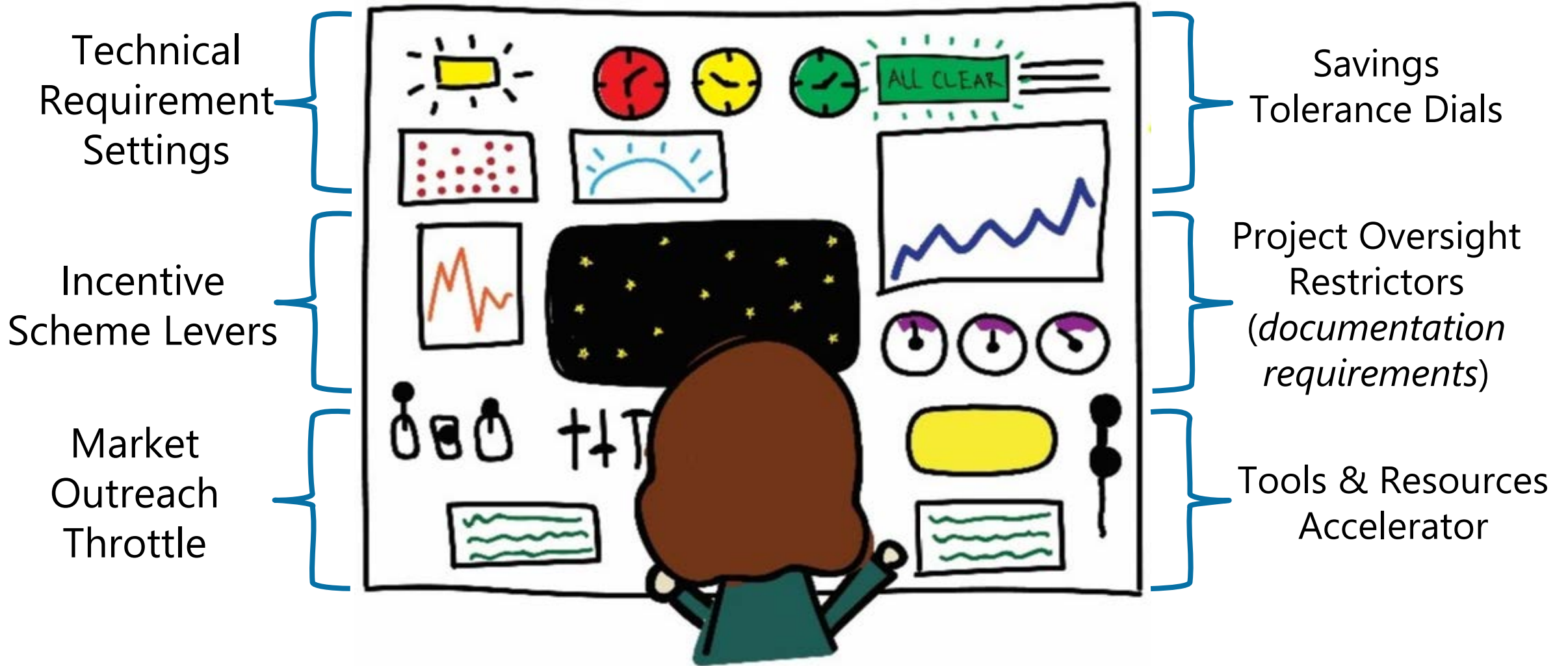
- Controls Persistence (66%)
- Energy Monitoring (87%)
- Cyber Security (10%)
- Color Tuning (37%)
- Demand Response (64%)



**Total system count and features pulled from DLC's
Networked Lighting Controls QPL 5/27/20*

PROJECT IMPLEMENTATION

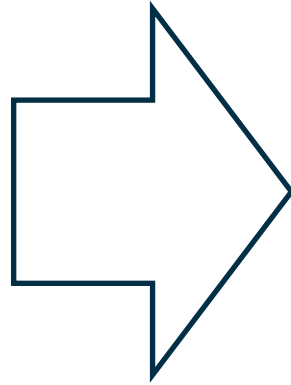
The Program Design Control Panel



The Program Design Control Panel



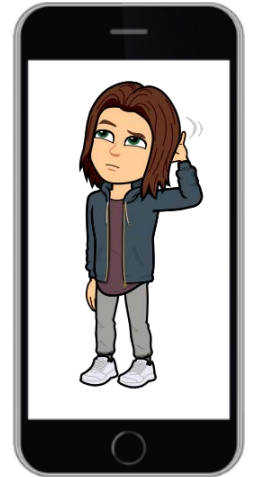
Program Design Considerations: **Technical Requirements**



Networked Lighting Control System Technical Requirements V4.0

Download as PDF

Rhetorical Question: When is the sum less than its parts?



...when the system stops working or can't be maintained



lighting design lab

The Program Design Control Panel



Program Design Considerations: Savings & Incentives

Example of prescriptive savings in City Light's lighting program

Space Use Type	Networked Lighting Controls	Luminaire Level Lighting Controls
Break Room	40%	50%
Classroom	25%	25%
Hallway	40%	50%
Lobby	40%	50%
The Loo	40%	50%
Warehouse	40%	50%

And so on and so forth...

Regional Technical Forums: Non-Residential Lighting Retrofits protocol

Dictionary

Search for a word



pro·vi·sion·al
/prəˈvɪʒənəl/

1. Arranged or existing for the present, *possible to be changed later*

Simplify Approach:

- prescriptive savings
- prescriptive incentives



Right-Sized Incentive

- \$50-75 incentive bonus –
In addition to performance savings!





PAUSE FOR
QUESTIONS

The Program Design Control Panel



Which type of project oversight is more meaningful?



Program Design Considerations: Oversight & Documentation



VS

Reviewing sequence
of operation



Program Design *Considerations*: Developing a Sequence of Operations

The Sequence of Operations is how the system designer communicates intent

Area	Typical open office		
	Lights	Zones (a) - (d)	Fully dimmable lights controlled in this area
	Daylight Zones	Zones (a) - (b)	Daylight rows 1 and 2 will dim independently. Lights will automatically adjust to daylight maintaining recommended 30FC on task surfaces
	Manual Wall Control	Zones (a), (b), (c), (d)	For each independent zone, the user can select scenes on/off, 50%, and can raise/lower the zone

	CONTROL METHOD				
SPACE TYPE	HIGH END TRIM	DAYLIGHT SENSOR	MANUAL SWITCH	OCCUPANCY SENSOR	TIME CLOCK
Conference	X	X	X	X	
Equipment	X	X		X	
Office - open	X	X		X	X
Office - private	X	X	X	X	
Restrooms	X			X	

Consider pre and post submission to ensure
a) There is a plan and
b) You have something to verify against

[Click to access LDL Sequence of Operations learning guide](#)

Program Design Considerations: **Oversight & Documentation**

What do we
need to
document?

How does a
utility conduct a
post inspection?



Program Design *Considerations*: **Oversight & Documentation**

In a perfect world...



- Detailed Sequence of Operations Summary
- Walk site with programming agent
- Access to programming interface

NOT REALISTIC

(Remember - Not all NLC system uses apps / smart devices)

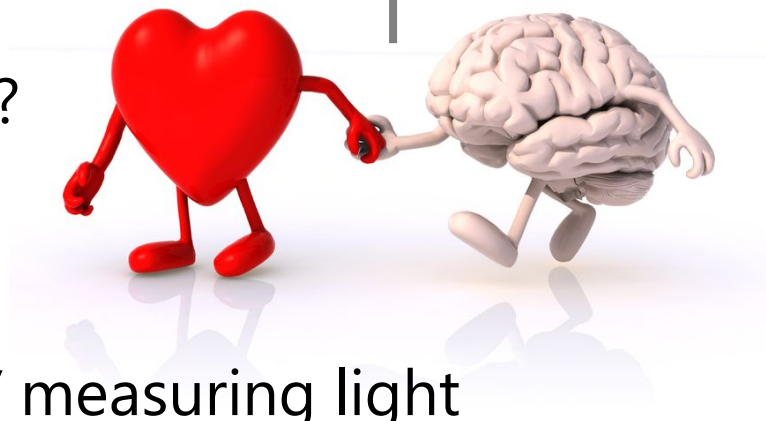
Project Requirement *Considerations*

Reasonable Today

- Pre and post Sequence of Operations Summary
- Post-inspection **sampling** of
 - Light levels
 - Movement settings
 - Daylighting operational?
- In the form of
 - screen shots / pictures / measuring light levels

Tomorrow

- Systems that *Measure* become program / industry standard
- Exportable *As Built* Sequence of Operation Reports



The Program Design Control Panel



Education & Market Development



LDL's Flagship Workshop

1 & 2 Day NLC Workshops

for

EVERYBODY...

featuring

Hands-On Learning & Practical Application

- Specifics of control methods
- Developing sequence of operations
- Specification writing & interpreting
- System design & set up
- And so much more!!!



Education & Market Development

LDL's Suite of NLC Education Offerings



Tunable Light



NLC For School
Districts



NLC For
Warehouses



Light & Health



Power Over
Ethernet



Exterior Lighting



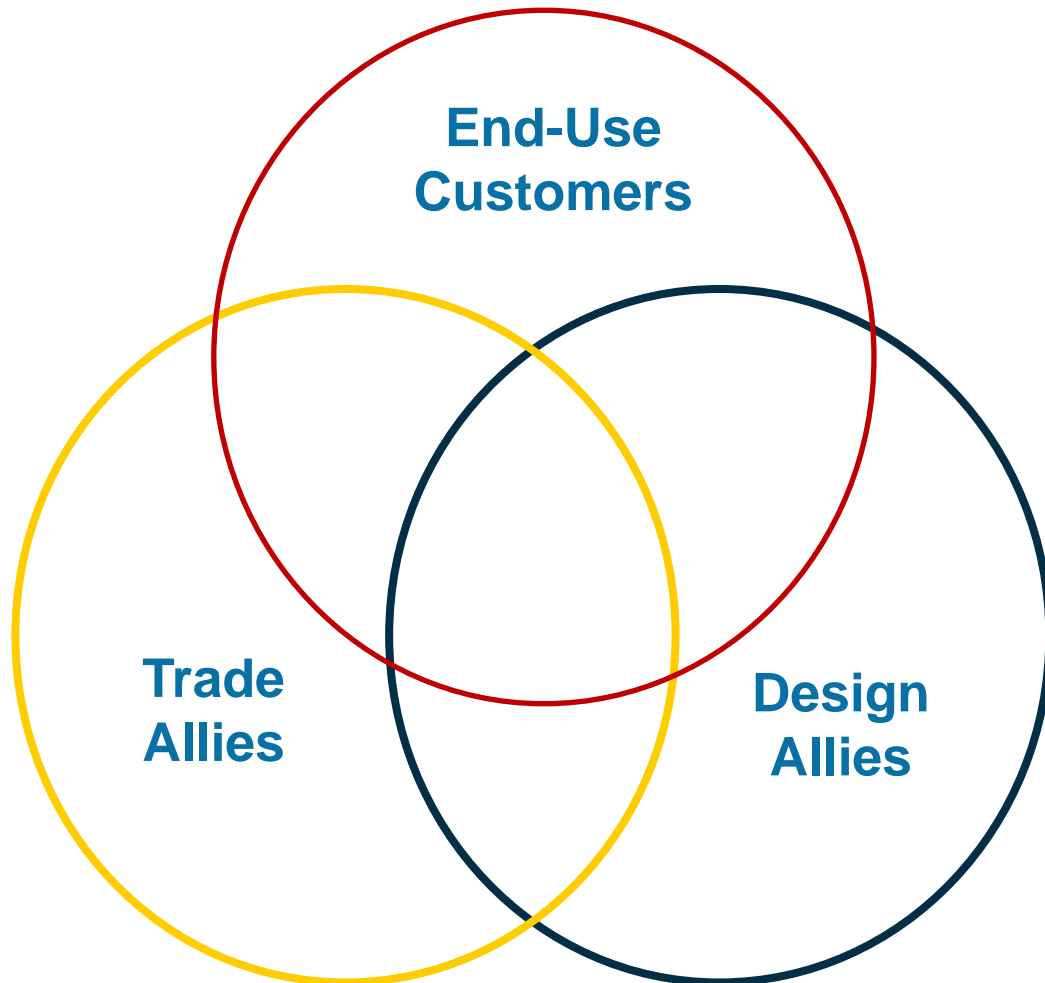
Communicating the Value of NLC



NLC For Healthcare

Education & Market Development

Market size and dynamics warrant a compressive approach



Targeted approach:



NLC for *School District Staff*

Full spectrum approach:

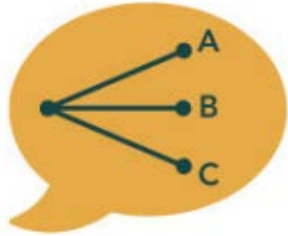


NLC for Lighting & Building Professionals

Trade Allies, Design Allies, Facility Staff, ESCO's, Utility staff

Education & Market Development

It's about the *STAKEHOLDERS* – not just the decision maker



Tenants

Living with
the system



Facility
Professionals

Leveraging
the system



Contractors /
Installers

Installing
the system



Owners

Investing in
the system

Tools & Resources

NETWORKED LIGHTING CONTROLS SERIES



COMMUNICATING THE VALUE PROPOSITION

This guide will help simplify and clarify your value proposition by outlining distinct stakeholder groups and detailing what matters to them.

KNOW YOUR AUDIENCE – PLAN YOUR APPROACH

Networked lighting control systems offer plenty of benefits – but potential customers can feel overwhelmed or turn skeptical when they perceive too many promised benefits. Effectively communicating the value of NLC systems starts with knowing your audience – and planning your approach.

STEP 1: IDENTIFY YOUR STAKEHOLDERS

Yes, working with the key decision maker is paramount to making a project come together – but the key decision maker represents a cohort of stakeholders whose opinions matter.



STEP 2: SIMPLIFY YOUR MESSAGE

Instead of trying to convey all the potential system benefits to a general audience – examine the needs for each stakeholder group and use concise language to address their needs.



NETWORKED LIGHTING CONTROLS SERIES - COMMUNICATING THE VALUE PROPOSITION

Part #3: Networked Lighting Controls and Luminaire Level Lighting Controls, What's the Difference?

Now that you understand the basic components and concepts, we can take a closer look at the two primary ways these lighting systems operate in commercial buildings.

LLLC IS A TYPE OF NETWORKED LIGHTING CONTROLS SYSTEM

NLC and Luminaire Level Lighting Controls (LLLC) systems both deploy the same control strategies to ensure code compliance, tenant comfort, and sustained energy savings. Some products can be configured to operate in either mode.

The primary difference (and key concept) between these two approaches can be understood as a 1 to 1 vs. a 1 to many relationship.

NETWORKED LIGHTING CONTROLS

A Networked Lighting Controls (NLC) system is the combination of sensors, network interfaces, wall stations, and controllers that affect lighting changes to luminaires.

In a NLC system configuration there is a **one to many** relationship with one sensor controlling many luminaires.

LUMINAIRE LEVEL LIGHTING CONTROLS

Increasingly, manufacturers are integrating NLC system components directly into luminaires. With LLLC, there is a **one to one** relationship with every light fixture being capable of being controlled directly. Each luminaire is its own control zone or may be grouped into zones with multiple luminaires – simplifying design, installation, and space reconfiguration.

BASIC NLC CONFIGURATION



1-8 zones possible with additional sensors

LLLC CONFIGURATION



1-8 zone capable out of the box



NETWORKED LIGHTING CONTROLS SERIES - CONTROL TECH TERMS

NETWORKED LIGHTING CONTROLS

Consist of a combination of sensors, network interfaces, and controllers that affects not just light output, but how the lights operate throughout the day.

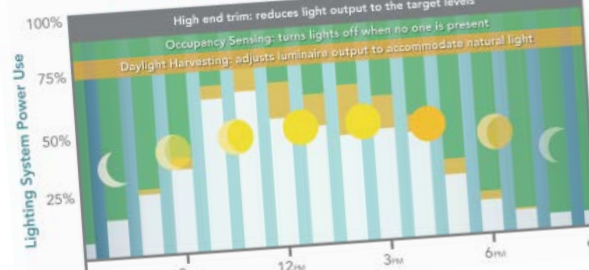


Did You Know?

Many manufacturers offer fixtures with ambient light and occupancy sensors built into the future. When these features are networked and dimmable, they are known as Luminaire Level Lighting Controls.



How these control strategies work throughout the day



ALSO CONSIDER...

Other control strategies that can save energy and add benefits are:
System scheduling – can dim or turn lights off at certain times of day, such as after business hours
Manual dimming – allows users to adjust the lighting to their own personal preference

NETWORKED LIGHTING CONTROLS SERIES - PRIMARY CONTROL STRATEGIES

NETWORKED LIGHTING CONTROLS SERIES



EMERGING TECHNOLOGY TRENDS

This guide outlines emerging technology trends you should be aware of, so you are well positioned to meet new demands from customers.

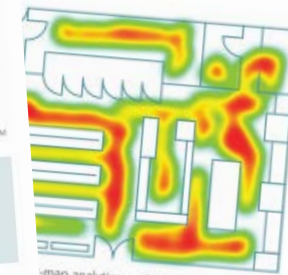
The lighting and controls industry is moving rapidly towards a future where connected lighting is the communication and infrastructure backbone for the Internet of Things (IoT). Networked lighting controls will play a key role as we enter the era of smart buildings, connected luminaires, and smart cities.

Lighting will be the backbone of the IoT

Lighting is in our homes, in our businesses, and on our streets. Lighting is ubiquitous throughout the world we live in – and it is energized. This simple fact is why many believe lighting will be the backbone of the IoT market.

With IoT occurring as an increasing number of buildings employ integrated sensors such as LLLC

If sensors now being integrated into luminaires the application. Office lights are equipped with sensors that can talk to HVAC. In retail applications, infrared sensors detecting sensors embedded in the lights tracking patterns.



2. Map analytics enabled by IoT Ecosystem

Light & Health



There has been a recent resurgence in the focus on lighting quality, and the physiological effects of light on humans in our homes, businesses, and outdoors.

Ongoing research suggests that lighting – both daylight and electric – play central roles in our endocrine and circadian systems and overall health.

Lighting controls may help to modulate the variables currently being researched, including lighting intensity, duration, timing, and spectral power distribution.

NETWORKED LIGHTING CONTROLS SERIES - EMERGING TECHNOLOGY TRENDS

[Click to access the LDL networked lighting control learning guides](#)

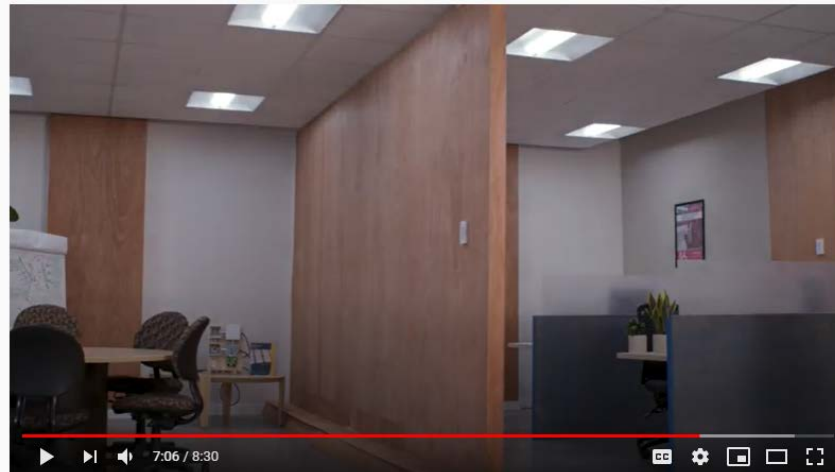
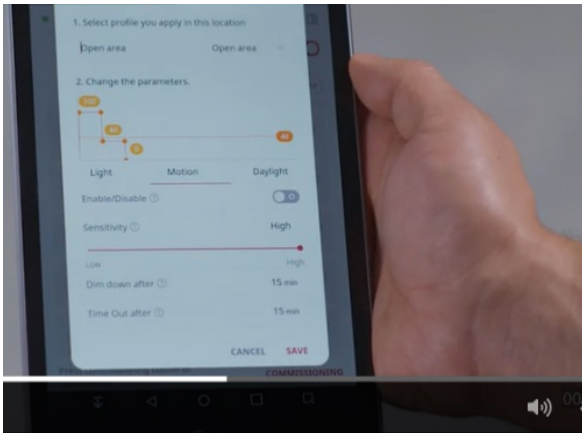
Networked Lighting Controls Learning Guides & Video

- LLLC Video
 - X3 short vids
 - **Demonstrates** primary control strategies
 - Simulates tenant improvement to highlight system flexibility
- For utility staff, TA's / DA's / Customers

CHECK IT OUT!

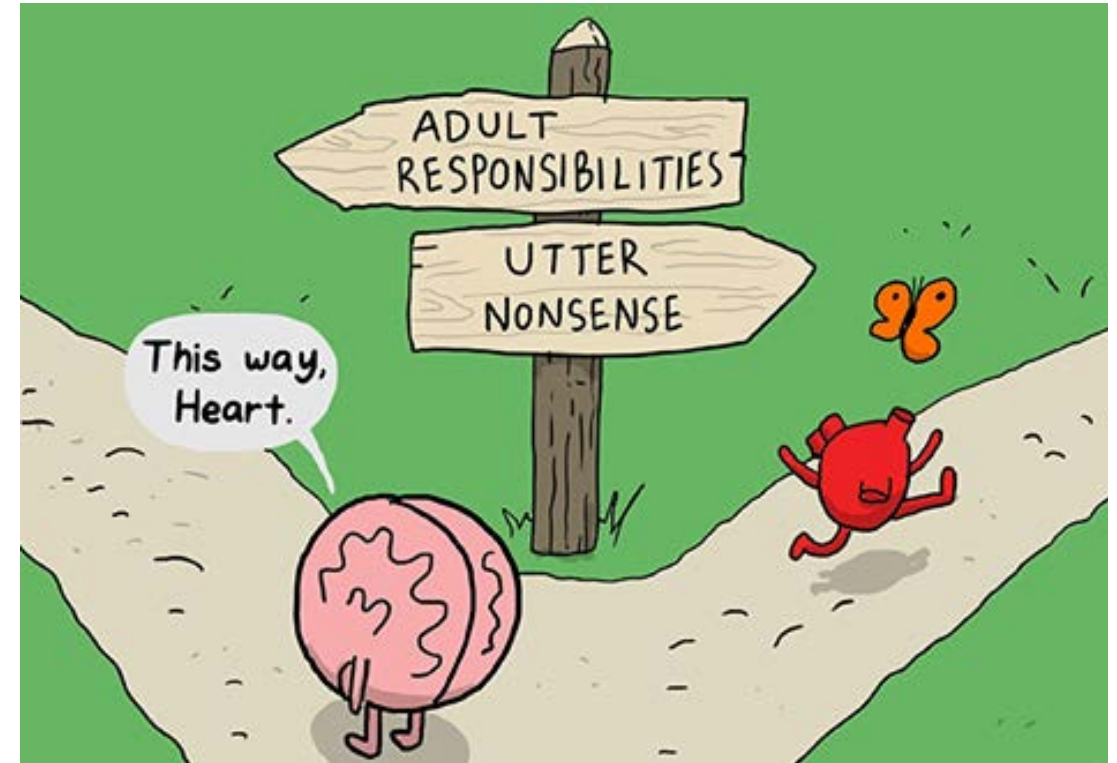


[Click here to watch now!](#)



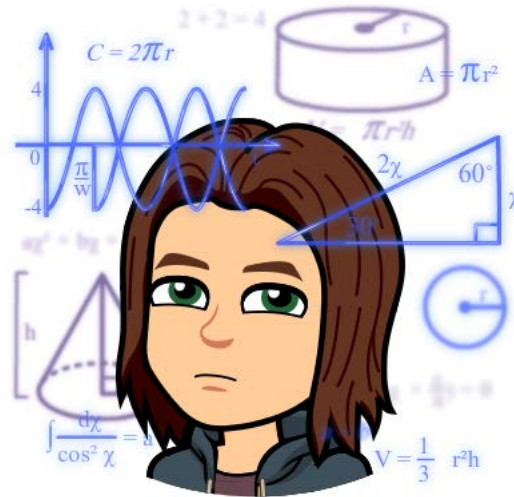
NLC Program & Project *Considerations in Summary*

- Leverage the DLC's Networked Lighting Controls Qualified Products List
- Require pre and post submission of the project sequence of operations
- Leverage a SAMPLING of configuration tool screen shots
 - *But don't require it*
- Invest in tools and resources that support the market



Final Poll

Do you plan to leverage these LDL Tools & Resources?





Last call for questions...

And now – a few words from LDL

Upcoming LDL Online Events

LDL Course	Delivery Date	Time
<u>Light Sources & Luminaires</u>	June 16	10:00 - Noon
<u>Communicating the NLC Value Proposition</u>	June 30	10:00 - Noon
<u>Fundamentals of NLC (Side A – Theory & Technology)</u>	July 14	10:00 - Noon
<u>Fundamentals of NLC (Side B – Practical Application)</u>	July 15	10:00 - Noon
<u>The Lighting Design Process</u>	July 28	10:00 - Noon

Today's slide deck and previous online courses
can be found on our [website](#)

Click – Call – Connect

- ▶ John Arthur Wilson – Stakeholder Solutions Manager
 - ▶ 206.418.9195
 - ▶ John.Wilson@Seattle.gov

let's
DISCUSS



Visit us online

Education

Advance your knowledge of complex lighting systems and energy-efficient strategies. From the science of light to the best practices of design...

LEARN MORE

Resources

Linking you to programs and technology experts that enhance your projects and support your business.

TAP INTO

OR

Email Us

lightingdesignlab@seattle.gov

Today's slide deck
will be posted
here!

 lighting design lab

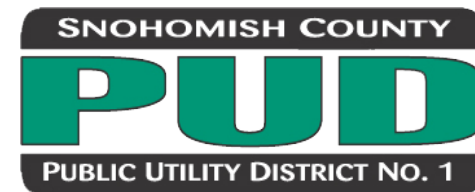


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Please take the online survey once you exit the webinar

We'll *SEE* you on the next call... 😊