Next Generation LIGHTING SYSTEMS

NGLS Connected Lighting Evaluations

WHAT HAVE WE LEARNED SO FAR?

NGLS Partners

Next Generation LIGHTING SYSTEMS

IES Illuminating ENGINEERING SOCIETY

INTERNATIONAL ASSOCIATION OF LIGHTING DESIGNERS IALD

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BUILDING TECHNOLOGIES OFFICE

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Kimco Realty Corporation

Dan Blitzer, FIES
Practical Lighting Workshop

Connected Lighting Advisory Group

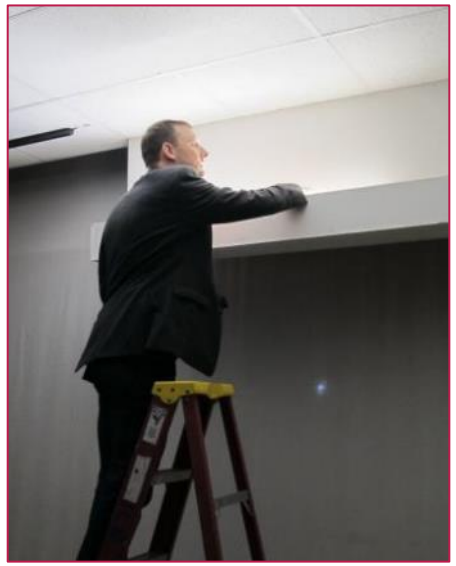
- Gabe Arnold - DLC, NLC
- Dave Bisbee - SMUD
- Peter Jacobson - Con Edison
- Levin Nock - DLC, NLC
- Michael Poplawski - PNNL/DOE
- Chris Wolgamott - NEEA

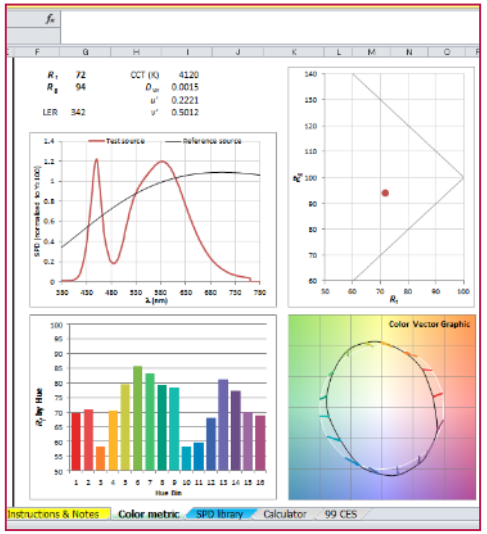
What We'll Cover Today

- NGLS Background
- Evaluation Framework
- What We Saw
- What We Learned
- Next Steps

The Old NGL

- Hands-on
  - Visual
    - Deliberative
      - Documented

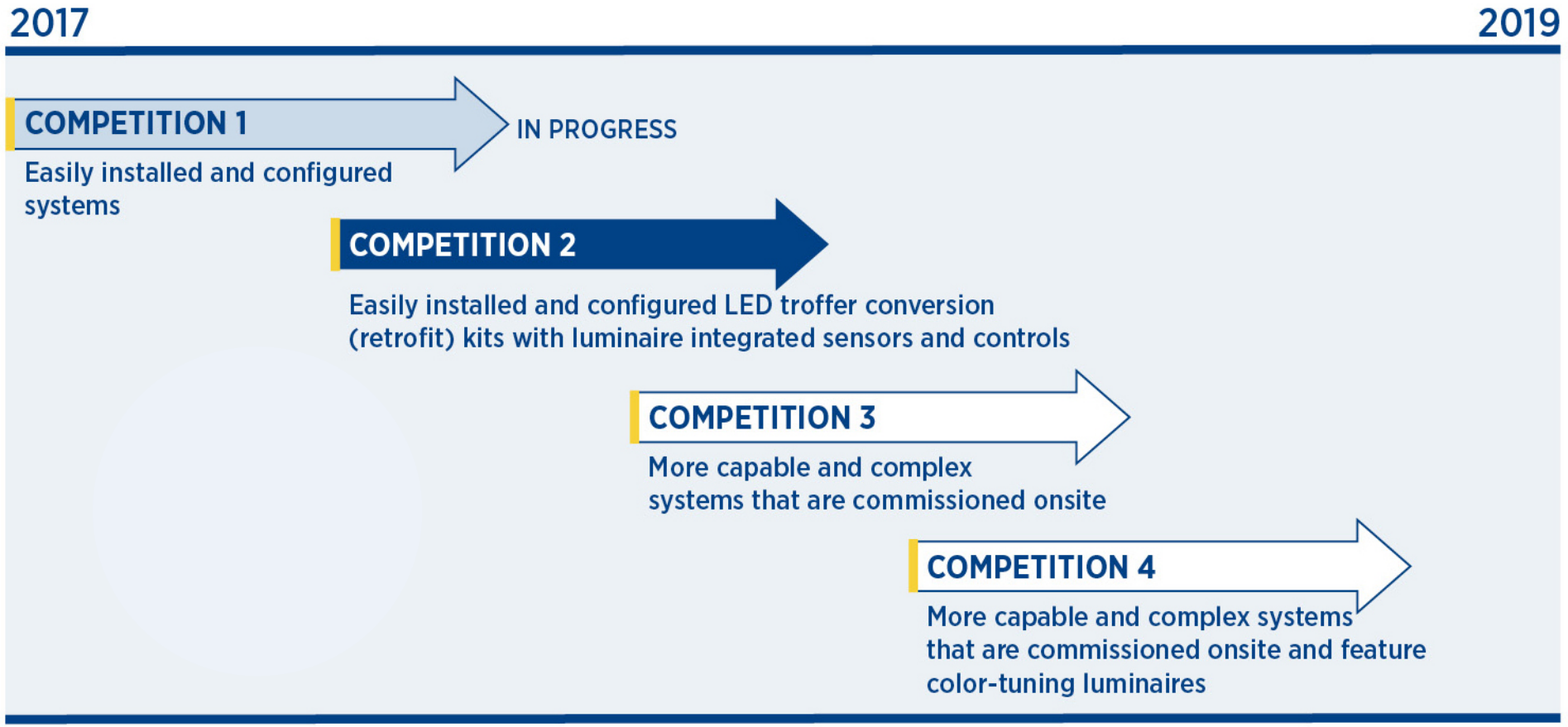




From NGL to NGLS

- 2008: Focus on LED luminaires of different types
- 2012: Split into separate Indoor and Outdoor Competitions
- 2015: Focus on controllability and serviceability
- 2016: Focus on specific applications and connected systems
- From **Next Generation** ***Luminaires***
  to **Next Generation** ***Lighting Systems***
- **2017*: Exclusively* Indoor Connected Lighting Systems**
- Build on 2016 experience
- Separate into levels of system complexity
- Permanent installations
- Ongoing evaluations

NGLS Indoor Competitions



Where We Are

- Comp 1 Installations – July 2017
- Comp 1 Performance Evaluation – September 2017
- Comp 2 Installations – January 2018
- Comp 2 Performance Evaluation – spring 2018
- Comp 1 & 2 User Evaluations - ongoing

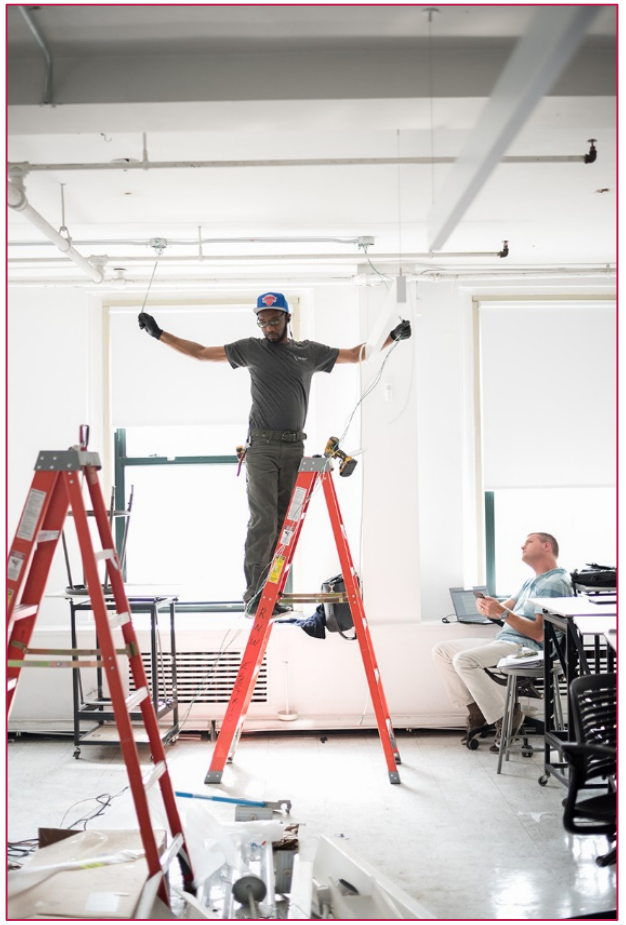
Competition Focus - Both 1 & 2

- Luminaire and control systems that are:
  - Marketed as “easy” to install and configure
  - Intended for contractor setup and configuration without prior trair
  - Configurable without manufacturer assistance
  - No lighting designer involved

Defining Easy

- What makes a system easy to install?
- What makes a system easy to configure?
- Will it also be easy to re-configure?

- Who Decides?
  - Specifier
  - Facilities Staff
  - Installation Contractor
  - Manufacturer



Role of Subjective Evaluations

- How do you determine if a system is too complex?
- What needs to be modified for a system to be used by a broader audience?
- What are the root causes of confusion and how are they different for different types of users?

Controls Challenges

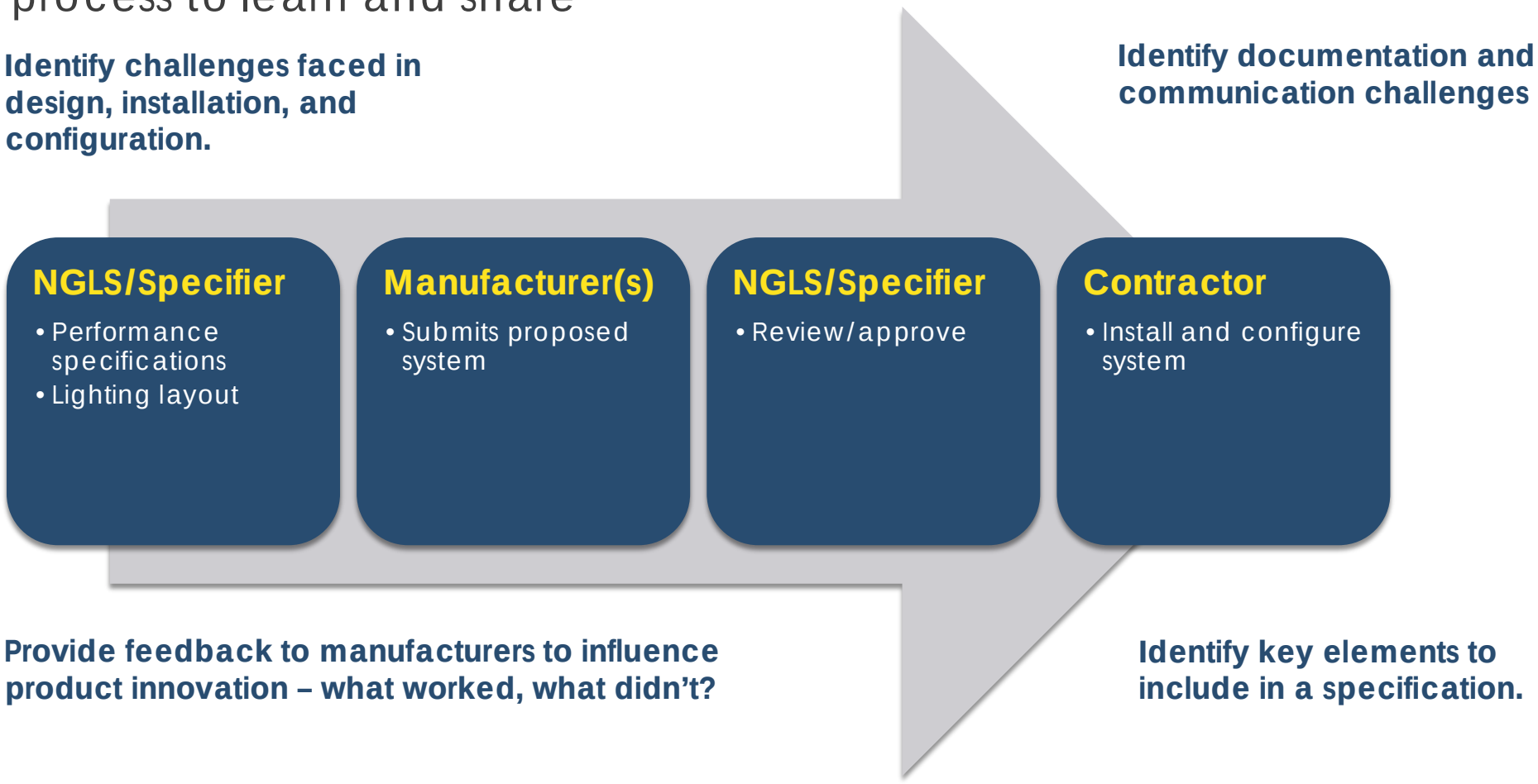
- New language and vocabulary to learn.
- How does the specifier explain what they want?
- Who takes the responsibility for implementation and result? Luminaire or controls manufacturer?
- How do things arrive on site? Parts and pieces, who puts them together, how do you know you have everything?
- What kinds of instructions are provided, in what format? How basic?
- What happens when the system doesn't work?
- Who decides when the system is working correctly? Manufacturer, designer, owner?

Configuration Complexity

- Systems that are overly complicated and time-consuming to configure have historically delivered less than ideal performance.
- Reduced configuration complexity increases the likelihood that deployed lighting controls will be correctly and consistently operating, increasing the persistence of energy savings.
- Broad deployment of connected lighting systems will require system configuration complexity to be well-matched to owner/occupant capabilities, greatly simplified, or effectively removed.

Design & Installation Process

- Model the process to learn and share



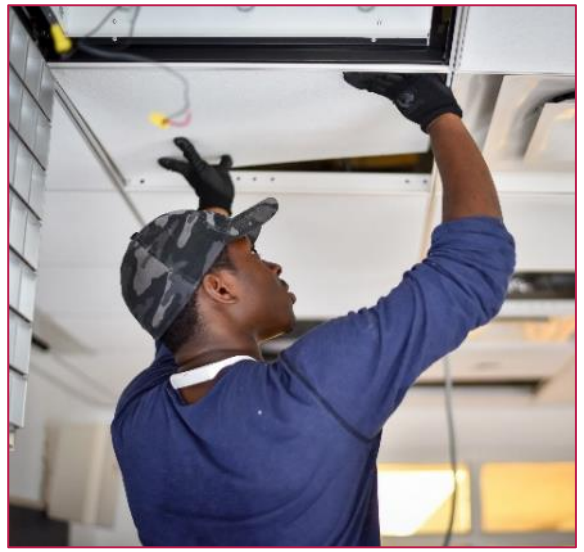
Location

Control Performance Requirements

1. Grouped into **two** zones as indicated on the room layout drawing. **Manual dimming** to 10% for each zone.
2. Occupancy control – for each of two zones, turns OFF, time out period of **20 minutes**. Vacancy operation **auto off**, **manual on**.
3. Daylight harvesting – light level in daylight zone changes in response to daylight.
4. High end trim/Task tuning – required capability, no specific setting specified.
5. Control settings shall be adjustable by the user **without factory assistance**.

Installation Evaluation Process

- Three evaluation phases
  - Install luminaires
  - Install and start up controls
  - Adjust control settings
- After each phase, contractor and NGLS judges independently evaluate:
  - Manufacturer's documents
  - Ease/difficulty
  - Strengths and weaknesses
- Conclude with videotaped contractor interviews



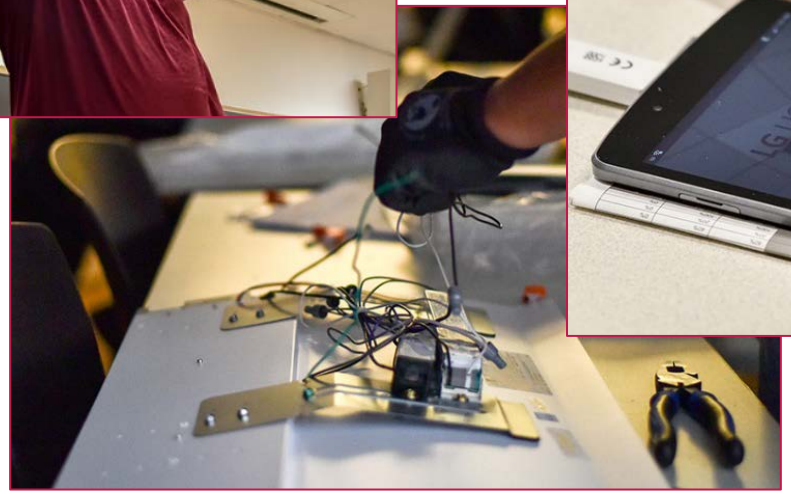
Performance Evaluation Process

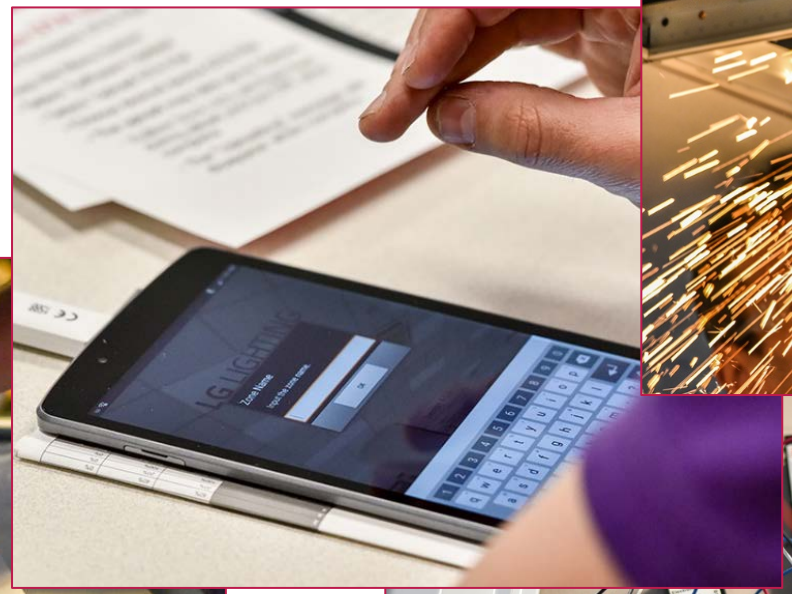
- Lighting Performance
  - Lighting effects, luminaire construction and appearance
  - Measured performance (illuminance, CCT, luminance, etc.)
- Control System Performance
  - Ease of use
  - Measured performance

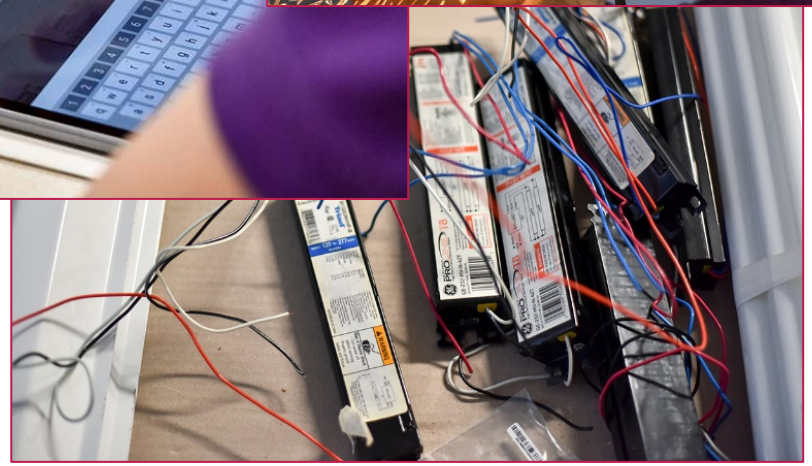
July 2017 Installations

Highlights Video #1

Competition Two – Retrofit Kits







Participating Manufacturers

Competition One

Company	Control System	Luminaire
Lumenwerx	Magnum	Reven SIB
Selux	Easy Sense	M36 D-1
Crestron	Zum	Starfire Versalux D-I
Philips Lighting	SpaceWise DT	Sona
RAB Lighting	RAB LightCloud	Swish 2x2
Cree	SmartCast	CR22
Nextek Power Systems	Sky Control	Independence iLED R Series

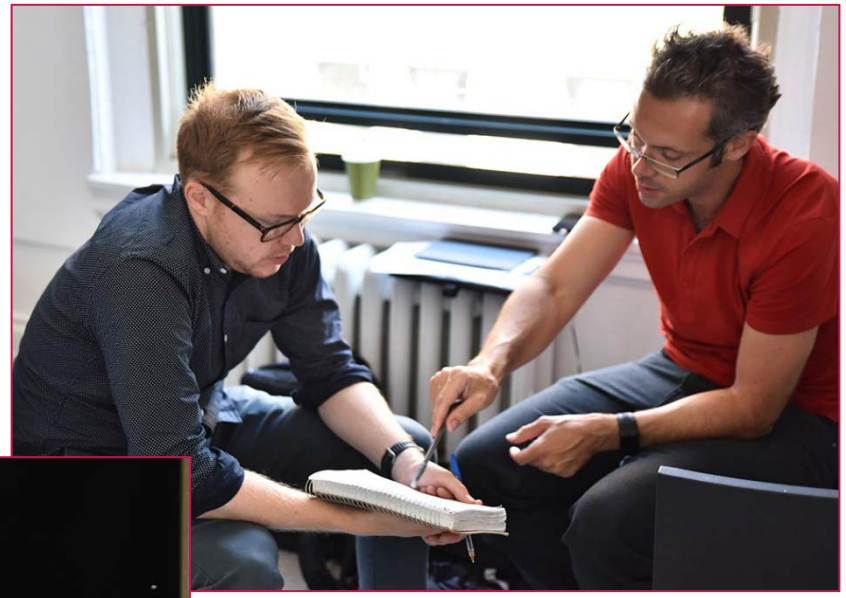
Competition Two

Company	Control System	Retrofit Kit
Philips Lighting	SpaceWise DT	EvoKit Troffer Retrofit Kit
Lutron Electronics	Vive	Orion Ison Retrofit Modular
Acuity Brands	nLIGHT AIR	BLT Relight Series Kit
Eaton	WaveLinx	Metalux Cruze LED Retrofit Kit
LG Electronics	Sensor Connect	Simple Choice Retrofit Kit

Different Approaches to the Problem

- Partnerships vs. proprietary solution
- Communication and documentation
- Pre-configuration/ re-configuration
  - Tools (remote, phone, computer)
  - Level of assistance needed/assumed
- Number and types of components
  - Wall Controls
  - Sensor placement
  - Use of wiring

Onsite Manufacturer Participation



The single biggest problem in communication is the illusion that it has taken place.

George Bernard Shaw

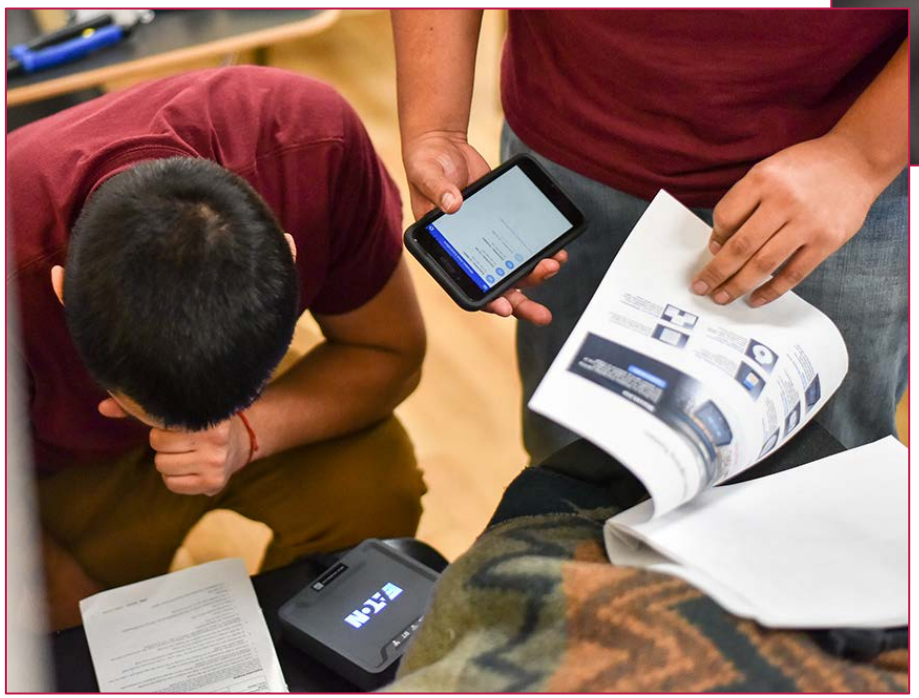
Vocabulary

- We all speak a different language
  - Designers
  - Product & IT Engineers
  - Contractors

Vocabulary In the Field

New Terminology Video #2

Documentation



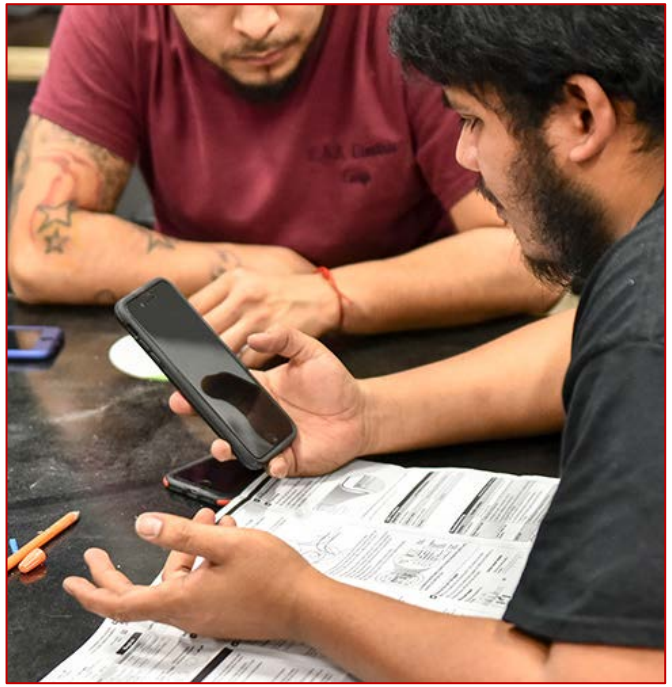
How much is too much?

Documentation In the Field

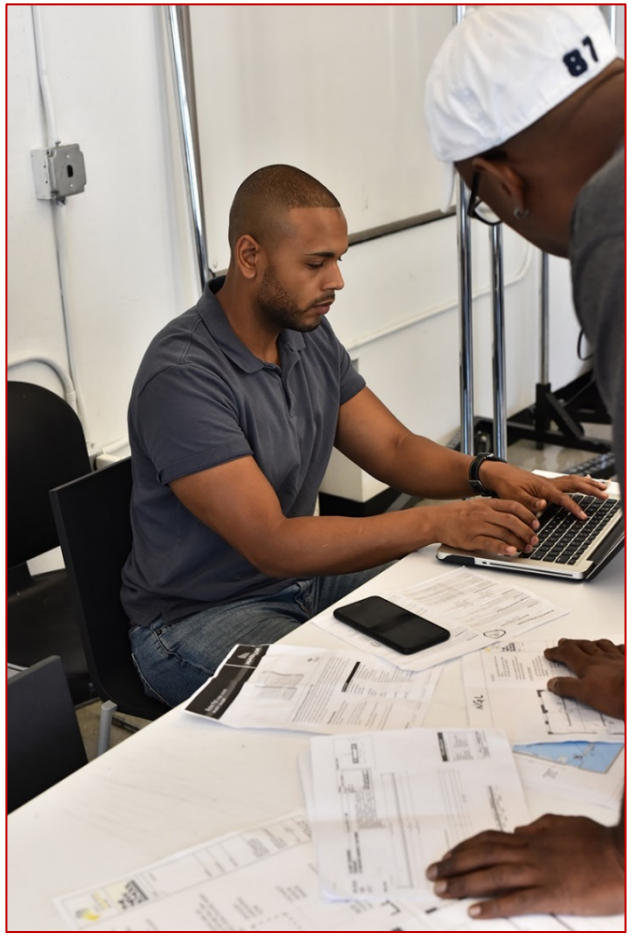
Documentation Video #3

Configuration Tools

Handheld Tool
(Cree)



Phone App
(Eaton, Lutron, Philips, Selux, Acuity, LG, Crestron)



Computer Front-end
(RAB, Nextek, Lumenwerx)

Configuration in the Field

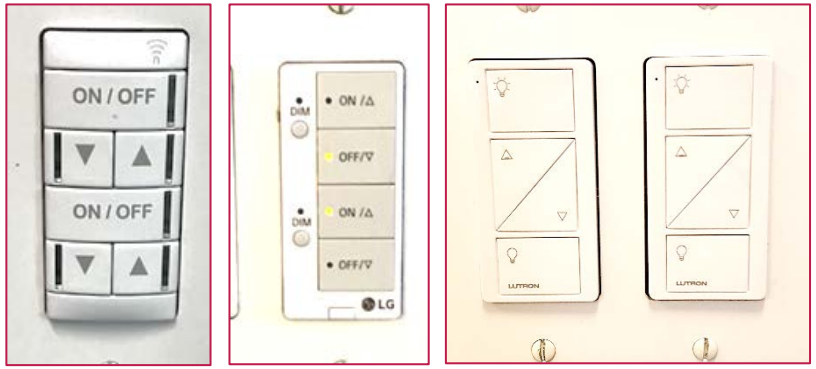
Particular Configuration Video #4

Number and Types of Components

Wall Controls – 4 Approaches

Pre-set Paddle Switch

(Cree, Philips, Selux, Lumenwerx)

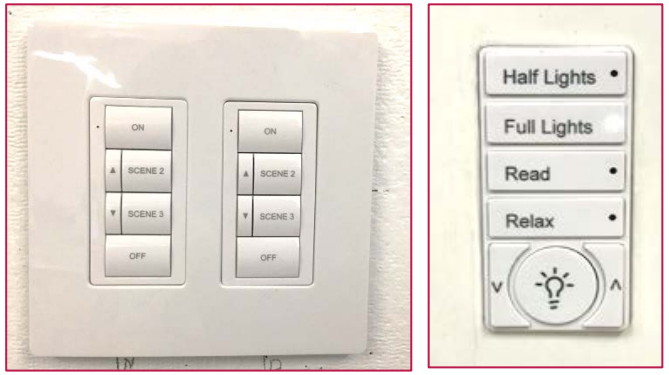


Pre-set Multi Button Switch

(Lutron, LG, Acuity)

Site Configurable Paddle Switch

(RAB, Nextek)

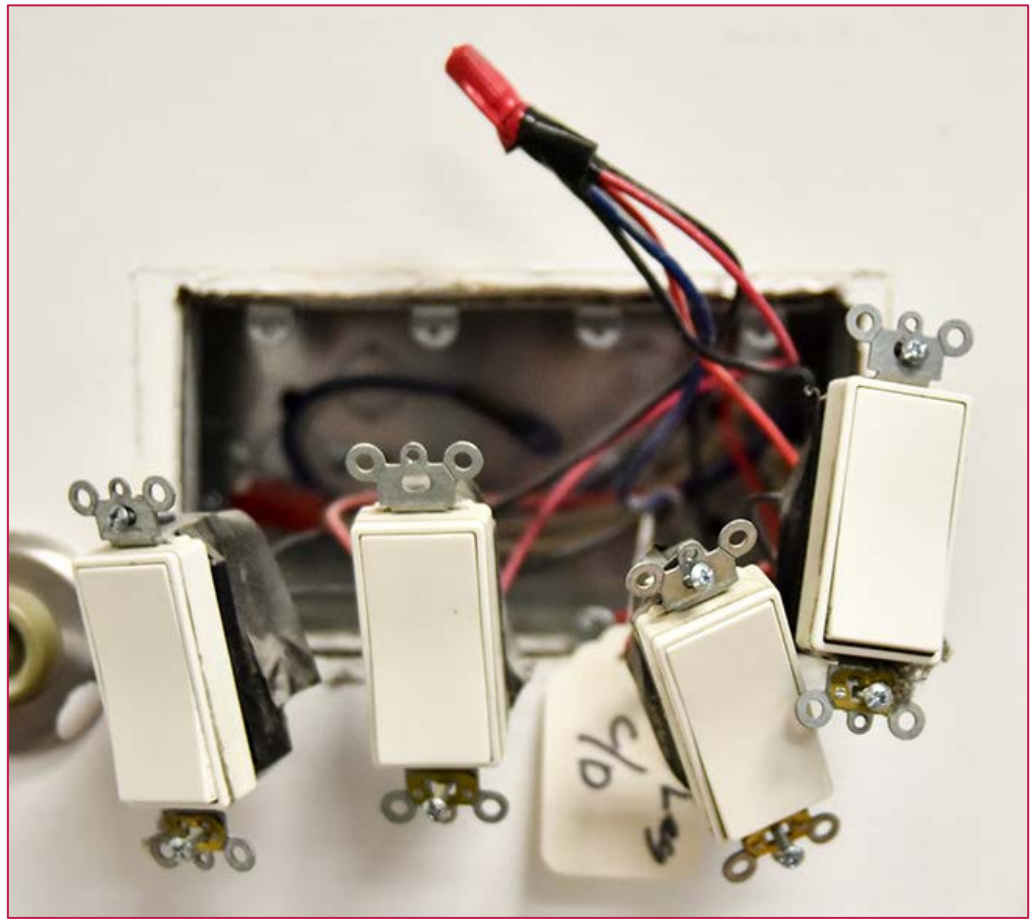


Site Configurable Multi Button Switch

(Eaton, Crestron)

Wall Controls in the Field

Wall Controls Video #5



How We Plan to Release Findings

- Conference presentations
- Feature articles in target publications
- NGLS website
- One pagers by topic and audience

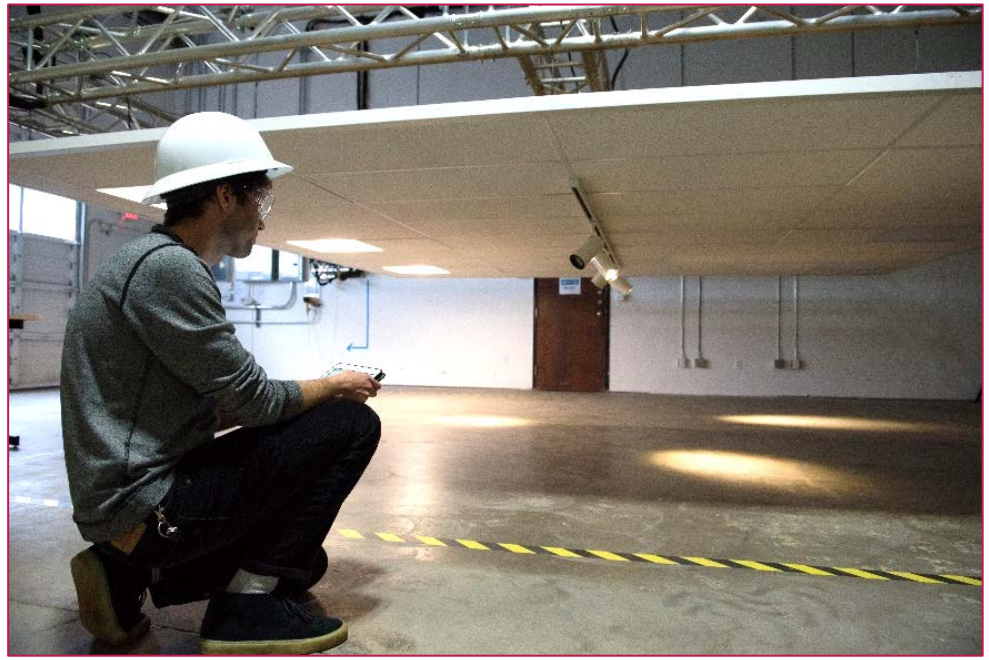
How Can NGLS Help?

- Facilitate industry collaboration
  - Vocabulary
  - Specification language
- Continue specifier/manufacturer communication
- Communicate what we learn as we go

How will you get involved?

Next Steps

- If there is consensus that things should be done the same way – work on standards
- If there are multiple ways to do things – work on templates or models
- If there is no consensus – conduct more studies to figure it out



How to Get Involved

- Enter future competitions
- Share your connected lighting stories
- Join NGLS working groups to be part of the solution, more information to come
- Contact us at ngl@pnnl.gov

Open House at LEDucation 12

- Date: Wednesday, March 14, 2018
- Location: 6 E 16th Street Building, Parsons School of Design
- Time: 6:00 PM

Thanks!
Questions?

Ruth.Taylor@pnnl.gov