

## Designers Light Forum

Connected Lighting Systems: How Easy is Easy?

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Dan Blitzer

Ruth Taylor

March 14, 2018

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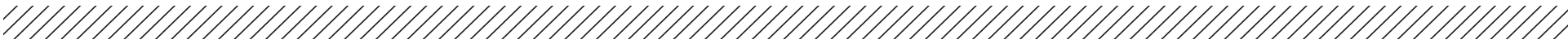
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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.





# Learning Objectives

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At the end of the this course, participants will be able to understand:

1. How easily actual systems install, including time and difficulty
2. How effectively actual systems are commissioned, including difficulty and success
3. How well the completed systems perform, including operation, illumination, sensors and dimming
4. Suggestions for improving the specification and communication process



# NGLS Partners



# NGLS Steering Committee

**Melanie Taylor**, IALD, LEED AP  
Vice President  
Lighting Design  
WSP

**Craig Bernecker**, Ph.D., FIES, LC  
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Lighting Designer  
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Improvements  
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



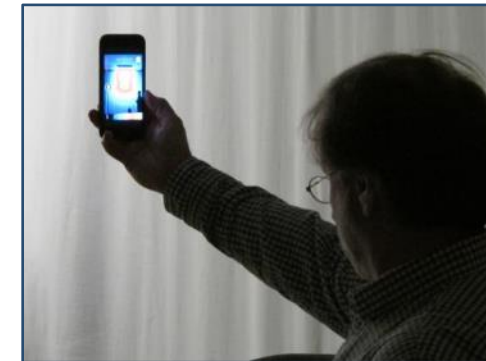
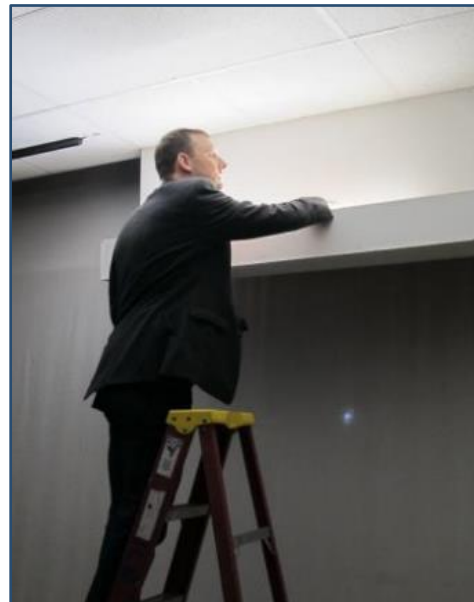
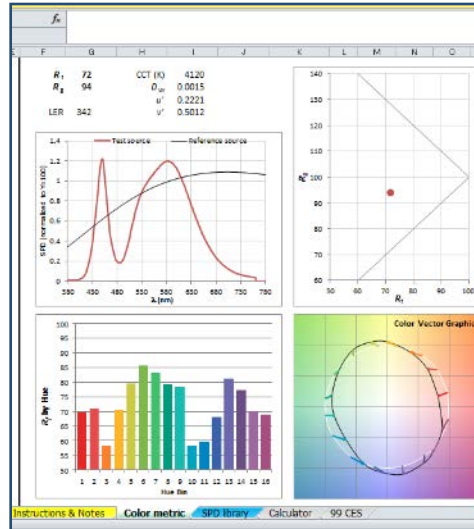
[leducation.org](http://leducation.org)

# What We'll Cover Today

- NGLS Background
- Evaluation Framework
- Competition Specifications
- Submission Details
- Results
- Lessons Learned
- Next Steps

# The Old NGL

- Hands-on
- Visual
- Deliberative
- Documented





# From NGL to NGLS

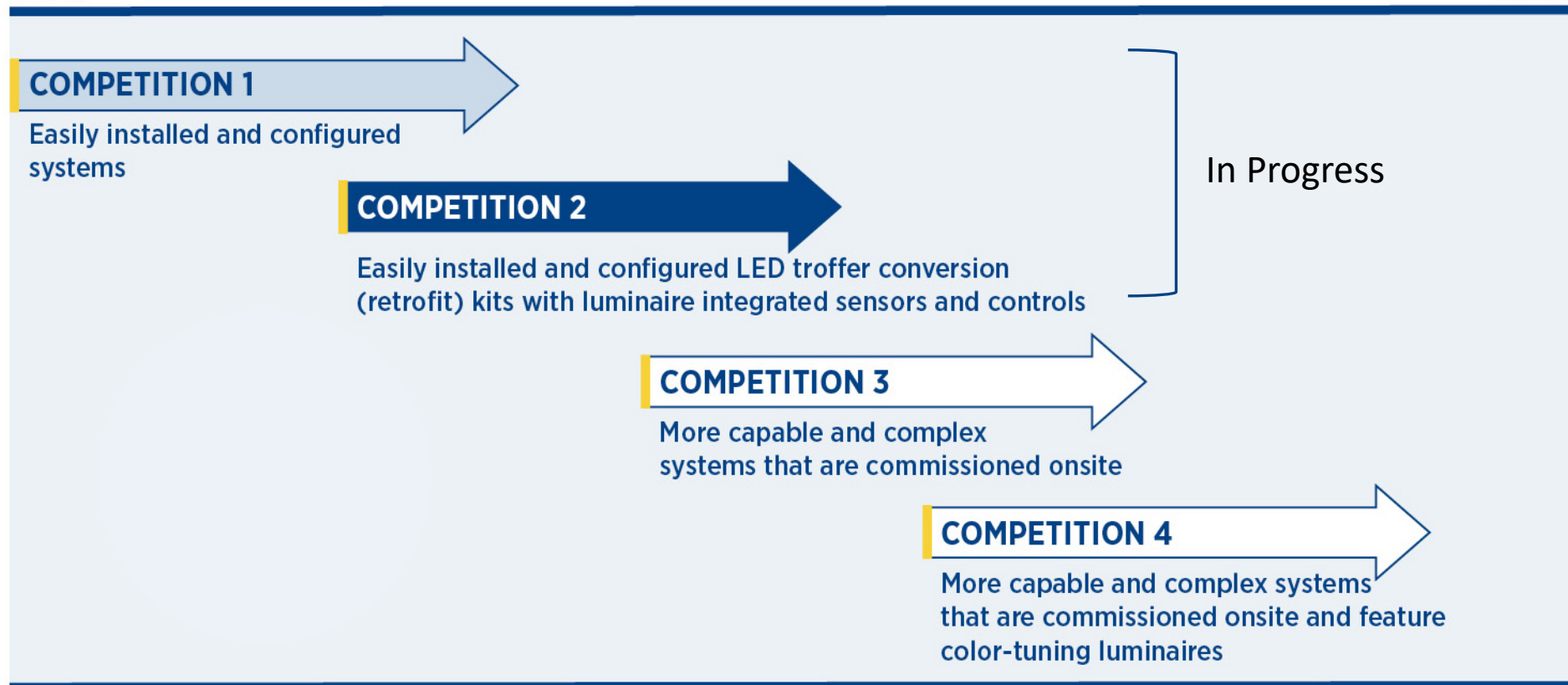
- 2008: Focus on LED luminaires of different types
- 2012: Split into separate Indoor and Outdoor Competitions
- 2015: Focus on controllability and serviceability
- 2016: Focus on specific applications and connected systems
- From **Next Generation Luminaires** to **Next Generation Lighting Systems**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



# NGLS Indoor Competitions

2017

2019



# Location



# Competition Current Status

- 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

# Focus

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



# Specifications and Process

# Lighting Performance Targets

<b>Task Plane Illumination</b>	<b>Illuminance Uniformity</b>	<b>Maximum Luminance Ratio</b>	
Average initial at full power	Average to minimum across work plane	Between task and immediate background surfaces	Between task and distant background surfaces (ceiling, walls, floor)
45 – 55 fc	2:1	3:1	10:1 or 1:10

# 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**.



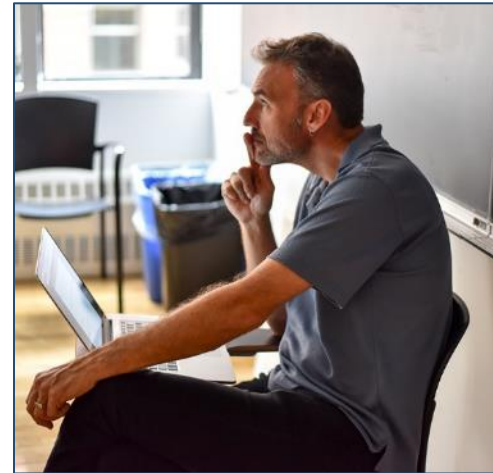
# Installation Evaluation Process

- 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



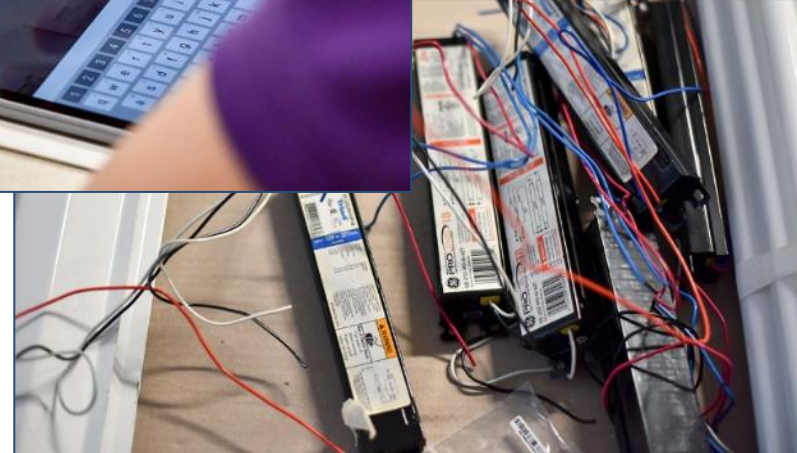
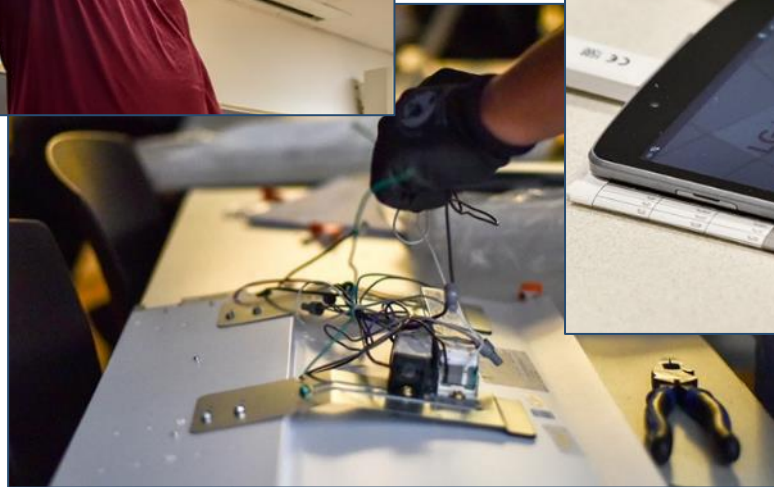
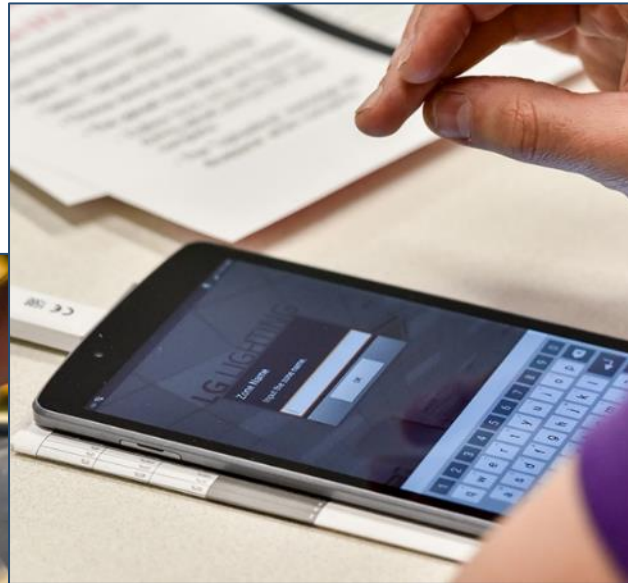
# Performance Evaluation Process

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





# Competition Two – Retrofit Kits



# July 2017 Installations

Video clip #1

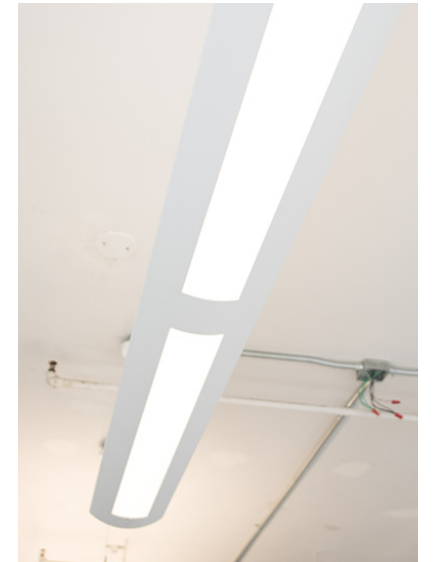


## Submission Details



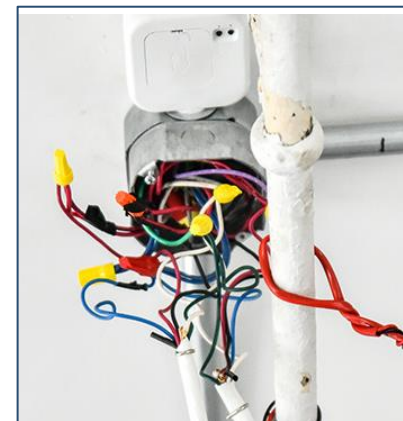
# Evaluated Systems

- Luminaires
  - recessed 2x2s, pendants
- Retrofit Kits
  - recessed 2x4s, 2x2s, 1x4s
- Efficacy range – 94 to 140 lm/W
- Lumen range – 2063 to 5150 lumens
- Wattage range – 24 to 70 watts

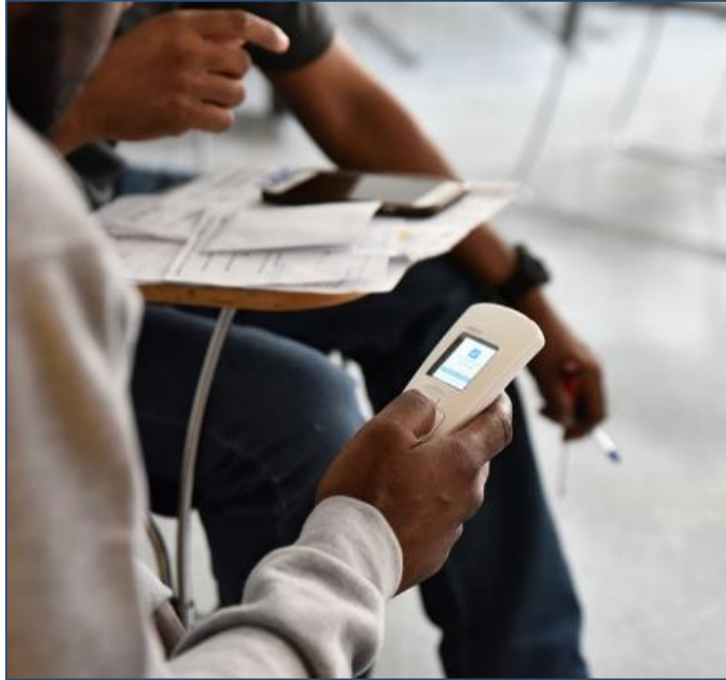


# System Components

	Least Complex	Moderately Complex	Most Complex
Components	<ul style="list-style-type: none"> <li>✓ Luminaire-integrated sensor and control</li> <li>✓ Wall switch</li> </ul>	<ul style="list-style-type: none"> <li>✓ Luminaire-integrated sensor and control</li> <li>✓ Wall switch</li> <li>✓ Local area network device</li> </ul>	<ul style="list-style-type: none"> <li>✓ Remote mounted sensor and control</li> <li>✓ Wall switch</li> </ul>
Connection	<ul style="list-style-type: none"> <li>✓ Wireless</li> </ul>	<ul style="list-style-type: none"> <li>✓ Wireless</li> </ul>	<ul style="list-style-type: none"> <li>✓ Wired</li> <li>✓ Wireless</li> <li>✓ PoE</li> </ul>



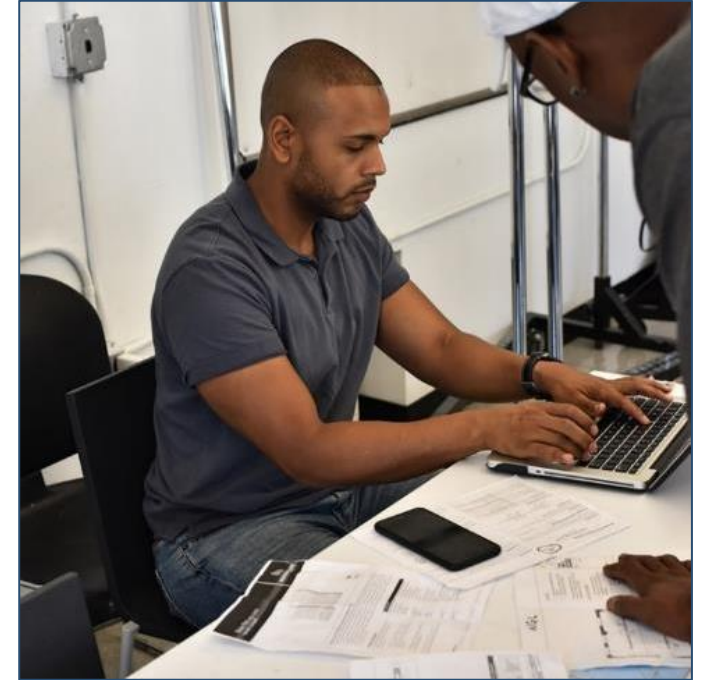
# Configuration Tools



Handheld Tool



Phone App



Computer Front-end



# Wall Controls



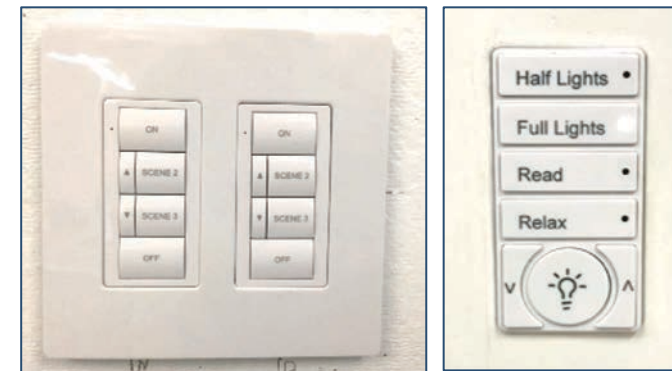
Pre-set Paddle Switch



Pre-set Multi Button Switch



Site Configurable Paddle Switch



Site Configurable Multi Button Switch

# System Performance

# Lighting Performance Ranges

- Room power density - .32 to .66 LPD
- Avg desk plane illuminance - 44.4 to 65.2 fc
- Avg/min ratio - 1.32 to 2.10
- Max/min ratio – 1.52 to 2.78

# Control Performance

- Configuration and operation
  - Without difficulty – 1 system
  - Some difficulty, in timeframe – 4 systems
  - Not configured within timeframe – 7 systems



## Lessons Learned

# Specifier

- Clear specification (not necessarily detailed) is critical
- Identify the “must haves” vs. “nice to haves”
- Capability (good) comes at the price of complexity and cost
- Simplicity and economy (good) come at the price of extended functionality
- Choose an experienced installer (or one you trust to learn quickly)
- Require documentation and training on the system
- Label the wall controls
- Carefully review and respond to system submittals

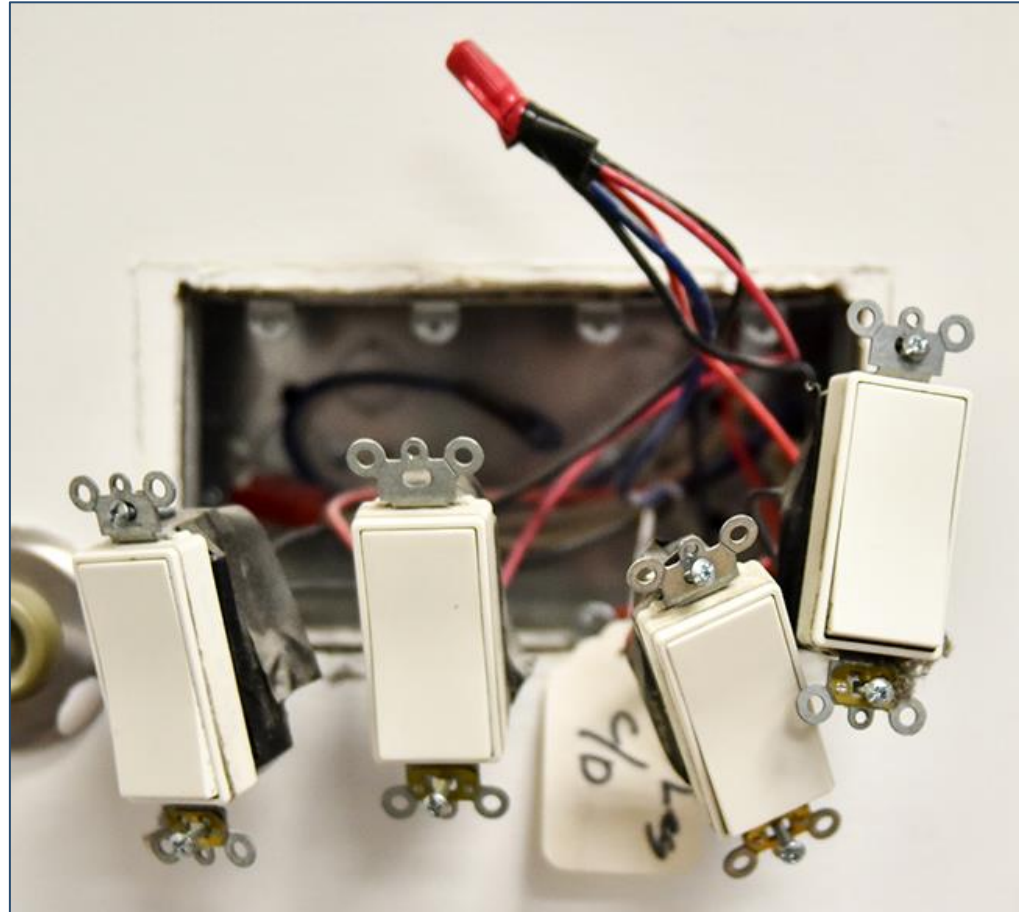
# Vocabulary In the Field

## New Terminology - Video #2



# Wall Controls in the Field

## Wall Controls - Video #3





# Installer

- READ the documentation and specification
- Secure/check required equipment (configuration tools, components) *before* install
- Take advantage of trade channels for hands-on training and coaching
- If you are unfamiliar with the specific product, read the documentation
- Something may look familiar, but it ain't necessarily so

# Configuration in the Field

Particular  
Configuration -  
Video #4

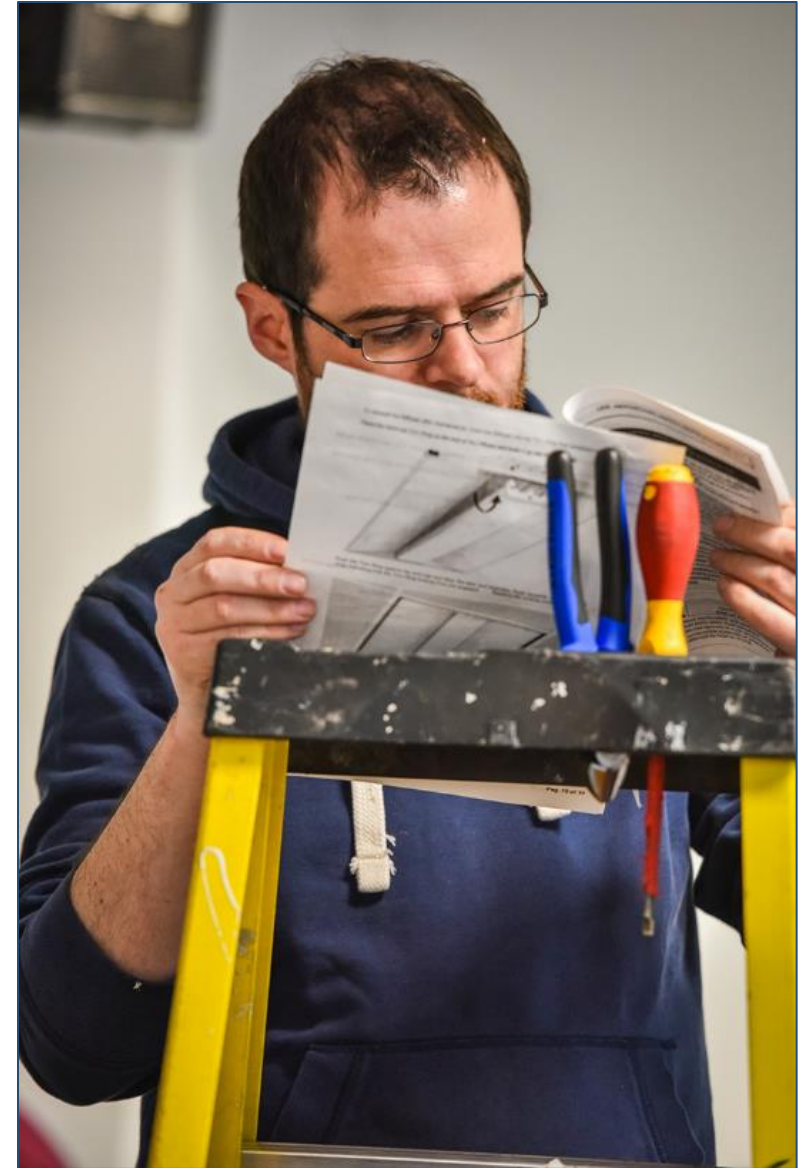


# Manufacturer

- Use good illustrations and simple copy for Instruction Sheets (IS)
- Create drawings as installer will see it during the install
- Instructions in the app are easier than instruction sheets that need to be read.
- Make it easy to find online videos (good for set up and install) and documentation
- Test the product and IS with installers (not just your own engineers)
- Installer’s first impression is critical – be sure the IS has an overview.
- Quick Set Up guide makes it simpler; defer complicated options for “advanced”
- Have a clear, reliable chain for tech support, so installer can easily reach someone who really knows!

# Documentation In the Field

Documentation - Video #5



# How We Plan to Release Findings

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



# 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
- Contact us at [ngl@pnnl.gov](mailto:ngl@pnnl.gov)

# Join us for Tours this Evening

- **Date:** Wednesday, March 14, 2018
- **Location:** 2 West 13<sup>th</sup> Street Building, Parsons School of Design
- **Time:** 6:00 PM





Thanks!  
Questions?



This concludes The American Institute of Architects Continuing  
Education Systems Course



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