



# Stakeholder MEETING

2017

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# DLC Networked Lighting Controls

# Presenters



**Gabe  
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*DLC*



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# DLC Lighting Controls Platform



**Demonstration Projects  
in Partnership with US  
DOE**



**Networked Lighting  
Control QPL**



**Training Programs for  
Designers and Installers**



**Advanced Control  
Savings Calculator**



**Lighting Control Savings  
Database**



**New Rebates and  
Incentive Models**

# Goal

**Full Scale Adoption of  
Networked Lighting  
Control Technologies**

# Objectives

*Create tools and resources to:*

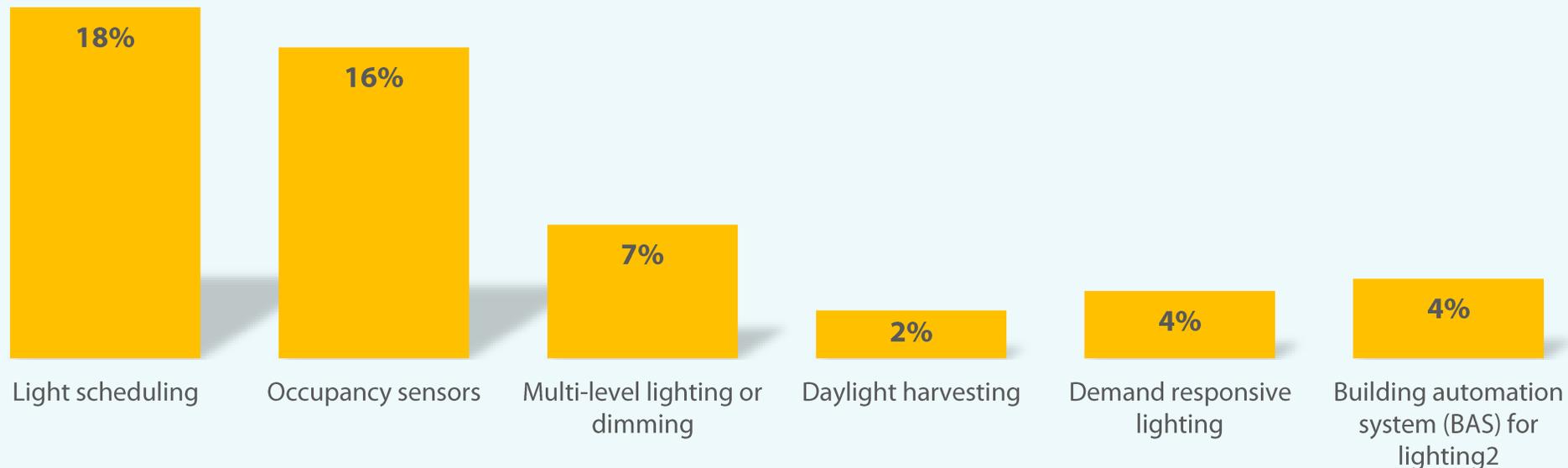
**Reduce or eliminate market  
barriers**

**Equip EE Programs with tools  
to scale up**

**Enable at scale partnerships  
between industry and EE  
programs**

# Advanced Lighting Controls have not been widely adopted

Percent of Buildings with Control Strategy



Source: 2012 Commercial Buildings Energy Consumption Survey, US Energy Information Administration

# Advanced Lighting Controls have not been widely adopted

Northwest Region Indoor Lighting Power by Control Type and Building Type

Control Type	All (n=791)	Assembly (n=104)	Food Service (n=43)	Grocery (n=69)	Lodging (n=69)	Office (n=113)	Residential Care (n=68)	Retail (n=129)	School (n=72)	Warehouse (n=43)	Other (n=81)
Manual	2,087 73% ± 2%	279 77% ± 6%	53 87% ± 7%	63 72% ± 8%	121 86% ± 3%	448 68% ± 6%	118 91% ± 3%	447 68% ± 7%	139 61% ± 8%	211 83% ± 7%	208 76% ± 6%
Occupancy Sensor	224 8% ± 1%	27 7% ± 4%	0 0% ± 0%	1 1% ± 1%	1 1% ± 1%	73 11% ± 4%	3 2% ± 2%	12 2% ± 1%	34 15% ± 5%	43 17% ± 7%	32 12% ± 4%
EMS System	256 9% ± 2%	33 9% ± 4%	2 3% ± 4%	6 7% ± 5%	0 0% ± 1%	45 7% ± 4%	1 1% ± 1%	120 18% ± 5%	30 13% ± 6%	0 0% ± 0%	18 7% ± 4%
Dimming	24 1% ± 0%	10 3% ± 2%	4 7% ± 5%	0 0% ± 0%	4 3% ± 1%	1 0% ± 0%	1 0% ± 1%	0 0% ± 0%	1 0% ± 0%	1 0% ± 1%	2 1% ± 1%
Timeclock	74 3% ± 1%	7 2% ± 2%	0 0% ± 0%	2 2% ± 3%	2 1% ± 1%	31 5% ± 3%	1 0% ± 0%	28 4% ± 3%	2 1% ± 1%	0 0% ± 1%	2 1% ± 1%
Photocell	13 0% ± 0%	0 0% ± 0%	0 0% ± 1%	0 0% ± 0%	1 0% ± 0%	4 1% ± 1%	0 0% ± 0%	8 1% ± 1%	0 0% ± 0%	0 0% ± 0%	0 0% ± 0%
Other	126 4% ± 1%	5 1% ± 1%	0 0% ± 0%	5 6% ± 3%	0 0% ± 0%	50 8% ± 4%	0 0% ± 0%	33 5% ± 3%	24 10% ± 5%	0 0% ± 0%	9 3% ± 2%
None (Continuous)	54 2% ± 0%	3 1% ± 0%	1 2% ± 4%	11 12% ± 6%	13 9% ± 3%	6 1% ± 0%	6 5% ± 2%	10 2% ± 1%	0 0% ± 0%	0 0% ± 0%	4 2% ± 1%

Source: 2014 Commercial Building Stock Assessment, NEEA, Navigant, 2014

# Barriers to Adoption

- Poor past experiences
- Unfamiliar with technology
- Too complex
- Not standardized
- High costs
- Weak value proposition



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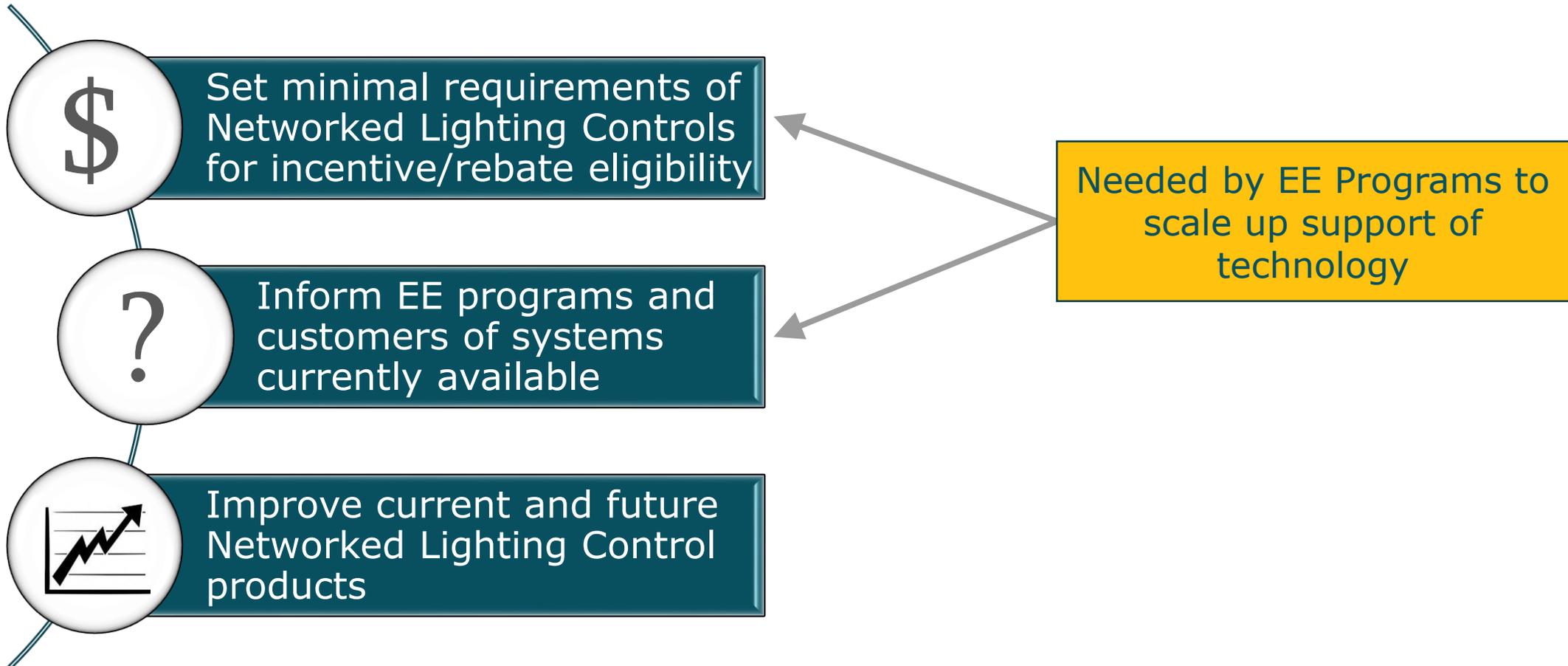
**New Rebates and  
Incentive Models**

# Why a QPL for Networked Controls?

*DLC aims to work in partnership with the Lighting Industry and Efficiency Programs to:*

- Drive significant new energy savings from networked controls
- Accelerate adoption; support market expansion
- Create a single point of entry and efficient process for manufacturers to participate with efficiency programs
- Reduce market confusion: create a resource to understand and evaluate Networked Control Systems

# Purpose of QPL for Efficiency Programs



# QPL Demonstration

 <b>Networked Lighting Control QPL: Qualified Systems by Capability</b>																		
<b>Instructions</b> * Press <input type="button" value="v"/> to filter list by company, brand, system name, or capability. * Hover mouse pointer over column heading for description of capability.												<b>Legend</b> Positive answers are shaded green. Negative answers are shaded red.						
Company	Name of Control System	Networked?	Wired / Wireless / Both?	Occupancy Sensing?	Daylight Harvesting?	High-End Trim?	Scheduling ?	Personal Control?	Demand Response?	Plug Load Control?	Zoning?	Individual Luminaire Addressable ?	LLC?	LLCi?	Continuous Dimming?	Local Processing?	Energy Monitor?	Building Systems Integration?
Acuity Brands	nLight Air®	Yes	Wireless	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Acuity Brands	nLight®	Yes	Wired and wireless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acuity Brands	XPoint Wireless	Yes	Wired and wireless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Autani, LLC	Energy Center	Yes	wired and wireless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Answer not public at provider's request	Yes	Yes	Yes	Yes
Cree, Inc.	SmartCast® Technology	Yes	Wireless	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Crestron Electronics	Crestron DALI	Yes	wired and wireless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes
Daintree Networks. Current powered by GE	Controlscope	Yes	Wireless	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

# V2.0 Technical Requirements

# Structure of Requirements

## “Required”

Capabilities that systems must have to be listed on the QPL. QPL will identify presence of, type, and/or characteristics on QPL.

## “Reported”

Capabilities that are not required, but QPL will identify presence of, type, and/or characteristics on QPL.

# Interior

## “Required” Interior System Capabilities

- Networking of Luminaires and Devices
- Occupancy Sensing
- Daylight Harvesting
- High-End Trim
- Zoning
- Luminaire and Device Addressability
- Continuous Dimming

## “Reported” Interior System Capabilities

- Control Persistence
- Scheduling
- Energy Monitoring
- Device Monitoring / Remove Diagnostics
- Type of User Interface
- Luminaire Level Lighting Control (LLLC, integrated)
- Personal Control
- Load Shedding (DR)
- Plug Load Control
- External System Integration
- Emergency Lighting
- Security
- Color Changing / Tuning
- Start-Up and Configuration Party

# Exterior

## “Required” Exterior System Capabilities

- Networking of Luminaires and Devices
- Occupancy Sensing AND/OR Traffic Sensing
- Photocell Control
- High-End Trim
- Scheduling
- Zoning
- Luminaire and Device Addressability
- Continuous Dimming

## “Reported” Exterior System Capabilities

- Control Persistence
- Energy Monitoring
- Device Monitoring / Remove Diagnostics
- Type of User Interface
- Load Shedding (DR)
- External System Integration
- Emergency Lighting
- Security
- Color Changing / Tuning
- Start-Up and Configuration Party

# Networked Controls Revision Cycle

Technical Requirements Revised  
Annually every June 1

Revision process begins every  
February to allow time for  
stakeholder input

*One Year* Grace Period



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**New Rebates and  
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# Control Adoption Lags

- Simple, manual switches in the US Northwest control 75% of all lighting
- Legacy lighting controls work well, but have “high-maintenance” reputations
- Manufacturers have listened, and new products are solving these problems



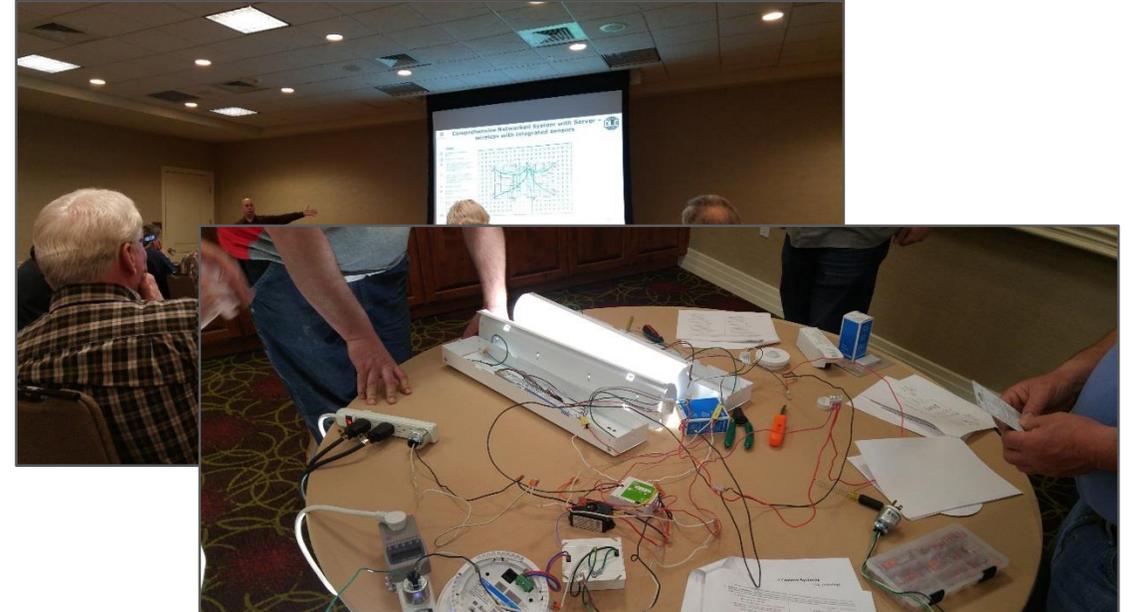
# Trades Are “The Last Mile”

- Product delivery network needs to be ready for ALCS
- Old experiences and assumptions make ALCS “seem” more expensive in quotes
- Show, don’t tell, our trade allies exactly how the products have changed



# Training Makes A Difference

- DOE, NEEA, and Idaho Power sponsored DLC's pilot ALCS trade ally training
- Blended approach of
  - Academic presentation
  - Design review
  - Hands-on commissioning
- High-impact results, with excellent student feedback



"I learned a huge amount about the growth and birth of developing technologies directly related to my industry and my future. These ideas and practices will definitely be used in residential and commercial aspects of my job."

# Deliver At Scale

- DLC is scoping how to delivery this training at scale, economically
- While we build the portal, we will fine-tune the course with in-person sessions for interested DLC Members
- There may be a role for manufacturers to play: sending hardware and instructors to hands-on wiring and configuration sessions



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# Demonstration Projects



 **Enlighted**

 **Daintree ControlScope**

 **Philips Connected PoE**

 **Digital Lumens**

 **Cree SmartCast**

 **Philips SpaceWise**

 **Lutron Vive Energi Tri-pak**

 **OSRAM Encelium**

 **Eaton DLVP**

- Technologies selected by RFQ process in 2015
- Scoring Criteria heavily weighted to products that used innovative approaches to overcome technology adoption barriers

# Features that were scored highly

- “Embedded” or “Integrated” Sensors
- Wireless
- Open-standards based or as interoperable as possible
- Distributed Intelligence
- Embedded energy meter
- Simple Commissioning
- Well-executed programming interface or GUI

# Five Projects Selected to Move Forward



## Two Roads Brewing Company – Stratford, CT

- Status: Case study published



## Rhode Island Public Utilities – Warwick, RI

- Status: Case study under development



## Multi-Tenant Medical Office Building – Avon, CT

- Status: Case study under development



## Yale University – New Haven, CT

- Status: Install Complete – Post Metering



## Super Stop & Shop – New Bedford, MA

- Status: Case study under development



# DLC Advanced Lighting Technology Demonstration: Digital Lumens

This demonstration is one in a series of advanced lighting demonstration projects being completed through a joint initiative between the DesignLights™ Consortium (DLC) and the U.S. Department of Energy.

## Demonstration Site

Two Roads Brewing Company, founded in 2012, is a brewery offering new twists on a variety of craft beers from their Stratford, Connecticut location in a renovated 1911, 103,000 ft<sup>2</sup> building. The 2012 renovation changed the building into an industrial-scale microbrewery with bottling operations, a tasting room, offices, restrooms, shipping / receiving, and storage. Although the 2012 renovation installed efficient fluorescent technology,

The software allows operations staff to manage energy use, optimize lighting to the application thereby supporting employee safety and comfort. Furthermore, the system has automatic measurement and reporting of energy use along with a suite of additional features for optimizing operations.

The Cadmus company measured the lighting system energy use before and after the upgrade to capture the energy usage with and without lighting controls. Replacement of older fluorescents with LEDs alone saved 50.0% of the estimated annual lighting energy use. With occupancy sensing controls, energy savings

TWO ROADS BREWING



Two Roads Brewing Company located in Stratford, Connecticut modernized their lighting to capture energy savings and convenience. Photo courtesy of Two Roads Brewing.



Digital Lumens LED luminaire with

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# ALCS Calculator Reduces Uncertainty

- What kind of energy savings will an ALCS give me in this specific situation?
  - Quick-mode: apply DEER default assumptions based on space type and building area, and year of construction
  - Project-specific-mode: for up to 100 rooms, use detailed survey data for high-resolution calculations
  - Calculate versus as-built, and versus current code
  - Assign savings per control measure to weigh cost-benefit

# Quick Screening Calculator

Welcome to the  
Adv

## Lighting Energy Savings Results

**EXISTING Baseline**  
(Before - 1999 vintage building)

Space Types	ENERGY SAVINGS (kWh/yr)				DEMAND SAVINGS (kW/yr)			
	Ltg. Only	Add. Ctrl.	Total	Ltg. Only	Add. Ctrl.	Total		
	Office (Executive/Private) <250sf (23 sq.m)	7,495.6	4,702.4	<b>12,198.0</b>	2.7	1.7	<b>4.4</b>	
Corridor	153.0	252.9	<b>405.8</b>	0.1	0.1	<b>0.1</b>		
Lobby (Office Reception/Waiting)	764.9	2.0	<b>766.8</b>	0.3	-	<b>0.3</b>		
Conference Room	122.4	394.3	<b>516.7</b>	0.0	0.1	<b>0.2</b>		
Copy Room (photocopying equipment)	61.2	109.6	<b>170.8</b>	0.0	0.0	<b>0.1</b>		
Restrooms	229.5	147.5	<b>377.0</b>	0.1	0.1	<b>0.1</b>		
Mechanical/Electrical Room	428.3	128.5	<b>556.8</b>	0.2	0.0	<b>0.2</b>		
<b>TOTAL</b>	9,254.8	5,737.1	<b>14,991.9</b>	3.3	2.1	<b>5.4</b>		

**CODE Baseline**  
(ASHRAE 90.1-2013)

Space Types	ENERGY SAVINGS (kWh/yr)				DEMAND SAVINGS (kW/yr)			
	Ltg. Only	Add. Ctrl.	Total	Ltg. Only	Add. Ctrl.	Total		
	Office (Executive/Private) <250sf (23 sq.m)	923.7	4,702.4	<b>5,626.1</b>	-0.5	1.7	<b>1.2</b>	
Corridor	-3.6	252.9	<b>249.3</b>	-0.0	0.1	<b>0.1</b>		
Lobby (Office Reception/Waiting)	11.5	2.0	<b>13.4</b>	0.0	-	<b>0.0</b>		
Conference Room	-34.3	394.3	<b>360.0</b>	-0.1	0.1	<b>0.1</b>		
Copy Room (photocopying equipment)	-108.6	109.6	<b>1.0</b>	-0.1	0.0	<b>-0.0</b>		
Restrooms	262.6	147.5	<b>410.1</b>	0.0	0.1	<b>0.1</b>		
Mechanical/Electrical Room	-29.8	128.5	<b>98.7</b>	-0.0	0.0	<b>0.0</b>		
<b>TOTAL</b>	1,021.5	5,737.1	<b>6,758.5</b>	-0.6	2.1	<b>1.5</b>		

Quick Screening Results - ALCS Energy Estimation Tool (Version 1.0b7-NEEP-b01)

# Project Specific Calculator

- Same calculation as the Quick Screening mode, but with no default assumptions
- Specify occupancy hours, windows and skylights, existing luminaires and controls

Welcome to the  
Advanced Lighting Control Systems (ALCS)  
Energy Estimation Tool

Please make sure you have enabled macros, then launch the tool  
using one of the two options below:

Instructions | Building Level Inputs | Room Level Inputs | Room Level Results

Select U | Hours of Occupancy | Window Schedule | Existing Luminaire Schedule

QUICK SCREENING CALCULATOR

The Quick Screening Calculator is designed to give a **quick estimate** of savings expected from Advanced Lighting Controls for a project. This calculator uses limited inputs to minimize data entry time. Outputs from this calculator should be considered **preliminary results**, and may not be used in a utility program application.

Launch Quick Screening Calculator

Replacement Luminaire Schedule | Control Schedule

The Project Specific Calculator is designed to give a more **detailed estimate** of savings from Advanced Lighting Controls for a project. The calculator requires detailed inputs based on a building audit. Outputs from this calculator can be considered as **final results**, and may be used in a utility program application.

Launch Project Specific Calculator

# What's Next

- Our Member utilities will be using it soon for their EE programs
- DLC will collecting user reports, requests on how to grow this tool further
  - Excel v. web tool?
  - Utility staff v. expanding pool of intended users?
  - Update underlying occupancy-space type data set with new ALCS data sets?
  - Program to check calculated predictions of the tool v. real-world experience?

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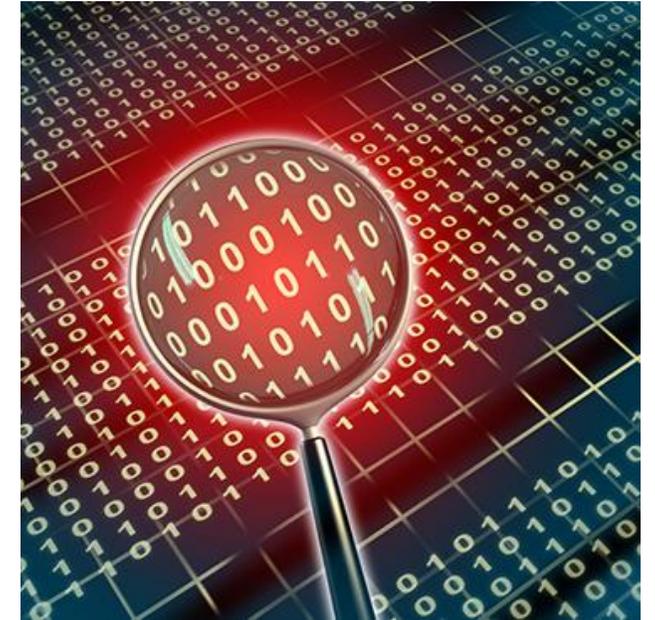
# Lighting Controls Data Project

## Overview

- Collect, Normalize, and Analyze Project Data from Manufacturers and Verified Case Studies
- Create database of Advanced Lighting Control savings
- Publish citable report of energy savings estimates from Advanced Controls

## Objectives

- Develop assumptions to support utilities in developing new program offerings, rebates, incentives
- Refine savings assumptions of ALCS Energy Estimator Tool under development



Phase 1 Report  
coming  
September 2017

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# Two Complementary Methods



## Easy to use, prescriptive

- Works well with Luminaire Level Lighting Controls (LLLCs)
- DLC per Luminaire rebate PLUS
- **Additional** per luminaire rebate if controlled by DLC Qualified LLLC system

High  
Volume



## Custom w Predictable Rebate

- For more complex systems, projects
- Predictable \$/ft<sup>2</sup> rebate
- Custom Savings Calculation using new tool
- Bonus \$ for energy monitoring
- Pay for Performance?

Low  
Volume

# Programs that Require Networked Controls to be DLC Qualified

With Special Promotions	No Special Promotions Yet
Baltimore Gas & Electric (BGE)	Efficiency Smart (OH)
Con Edison	Efficiency Nova Scotia
Efficiency Maine	Eversource (CT)
Efficiency Vermont	FortisBC
Eversource (MA)	Hydro-Québec
National Grid (MA, RI, NY)	New Hampshire Saves
Southern Maryland Electric Cooperative	Public Service Company of New Mexico
United Illuminating Company	Sacramento Municipal Utility District
Wisconsin Focus on Energy	SaskPower
Idaho Power (starting 2018)	Xcel Energy (Colorado)
Pacific Gas & Electric (starting 2018)	Xcel Energy (Minnesota)
	Xcel Energy (South Dakota)
	Reading Municipal Light Dept. (MA)

\*Based on survey data from approximately 45% of DLC Members

# Thank you!



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