Incentivizing Lighting Quality

The role of utilities to advance lighting quality through targeted rebates and new technologies

2015 Better Buildings by Design

-Efficiency Vermont

Presenter:

Edward Bartholomew, LC, LEED AP, IES

Commercial Lighting – Program Manager | National Grid

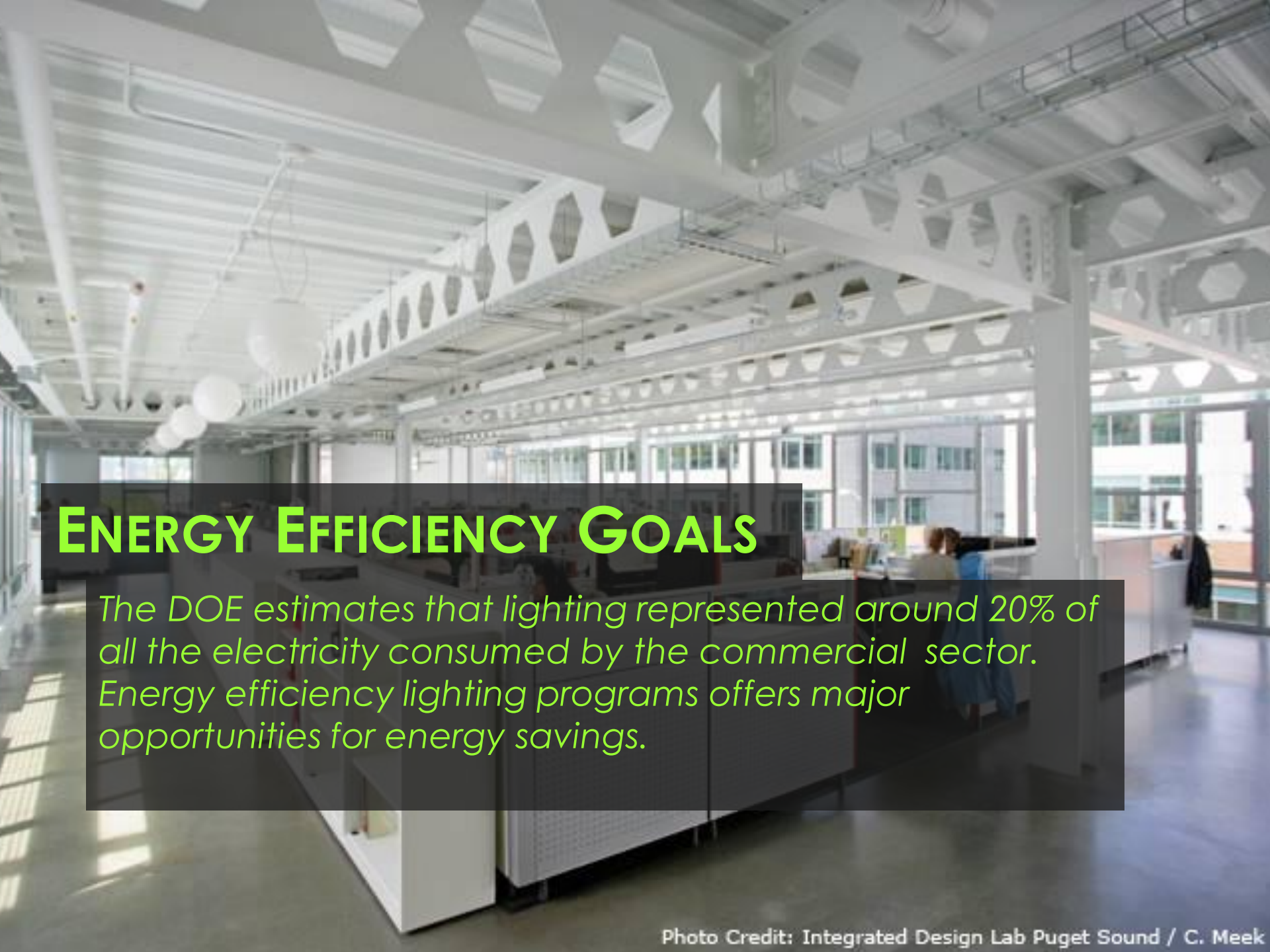
My Role: Lighting Program Manager
My Goal: Market Transformation

Lighting Efficiency Enabler:

1. Promote industry tested, quality and efficient lighting
2. Subject matter expert, providing industry perspective on new lighting technologies, and initiatives.
3. Develop financial incentive programs that makes energy efficient lighting technologies & designs cost-effective and long lasting
4. Motivate the design & construction industry to embrace energy efficiency from the start of a project, through research, education and sponsorship.
5. Nurture the market transformation of the lighting industry toward qualitative energy efficiency.

Incentivizing Lighting Quality:

- Goals of energy efficiency
- Lighting opportunities in energy efficiency
- Levers to achieve market transformation
- Anatomy of lighting efficiency programs
- Critical performance attributes of energy efficient lighting and the organizations that apply them
- Energy efficiency aligned with sustainability
- Project focused energy efficiency lighting programs



Energy Efficiency Goals

The DOE estimates that lighting represented around 20% of all the electricity consumed by the commercial sector. Energy efficiency lighting programs offers major opportunities for energy savings.

Photo Credit: Integrated Design Lab Puget Sound / C. Meek

Obama Administration's New Climate Change Rules Monday June 2, 2014

President's New Energy Efficiency Standards Will Lead to Big Electricity, Consumer, Carbon Savings

Posted May 9, 2014 in Curbing Pollution, Green Enterprise, Living Sustainably, Solving Global Warming, U.S. Law and Policy
Tags: climateactionplan, DOE, electricmotors, energyefficiency, energyefficiencystandard, globalwarming, presidentobama, walkincoolersandfreezers, walmart

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"I cannot see a credible resolution for our climate change challenges without an enormous contribution from the demand side," he said. "We can't get there on our supply side [alone]."

-US Energy Secretary Ernest Moniz

EPA carbon emission limits may shift energy mix

Wendy Koch, USA TODAY 7:58 a.m. EDT June 3, 2014

Tax Code Section 179D
Renewed by Congress, Dec. 2014

Best tax provision you've never heard of

Senate's votes to extend section 179D energy efficient commercial building tax deduction just prior to adjourning for the year. A tax policy to encourage energy-efficient buildings incentivized builders who surpassed industry standards for energy efficiency in new construction and renovations. The more energy-efficient the building is, the bigger the deduction (up to **$1.80 per square foot**)

The statute and regulations measure energy efficiency in three areas: The building envelope, the HVAC system and the **lighting**. Congress is, in short, incentivizing building owners who want to lower operating costs and increase operating profits. - **By former Reps. Jim Ramstad (R-Minn.) and Rick Lazio (R-N.Y.) Dec. 2014**

Energy Efficiency Investment

Projected Energy Efficiency Utility Spending to Increase

US Utilities Spent **$5.3 Billion** on EE Programs in 2012

Potential **$6 billion 2015 to $15 billion 2025**

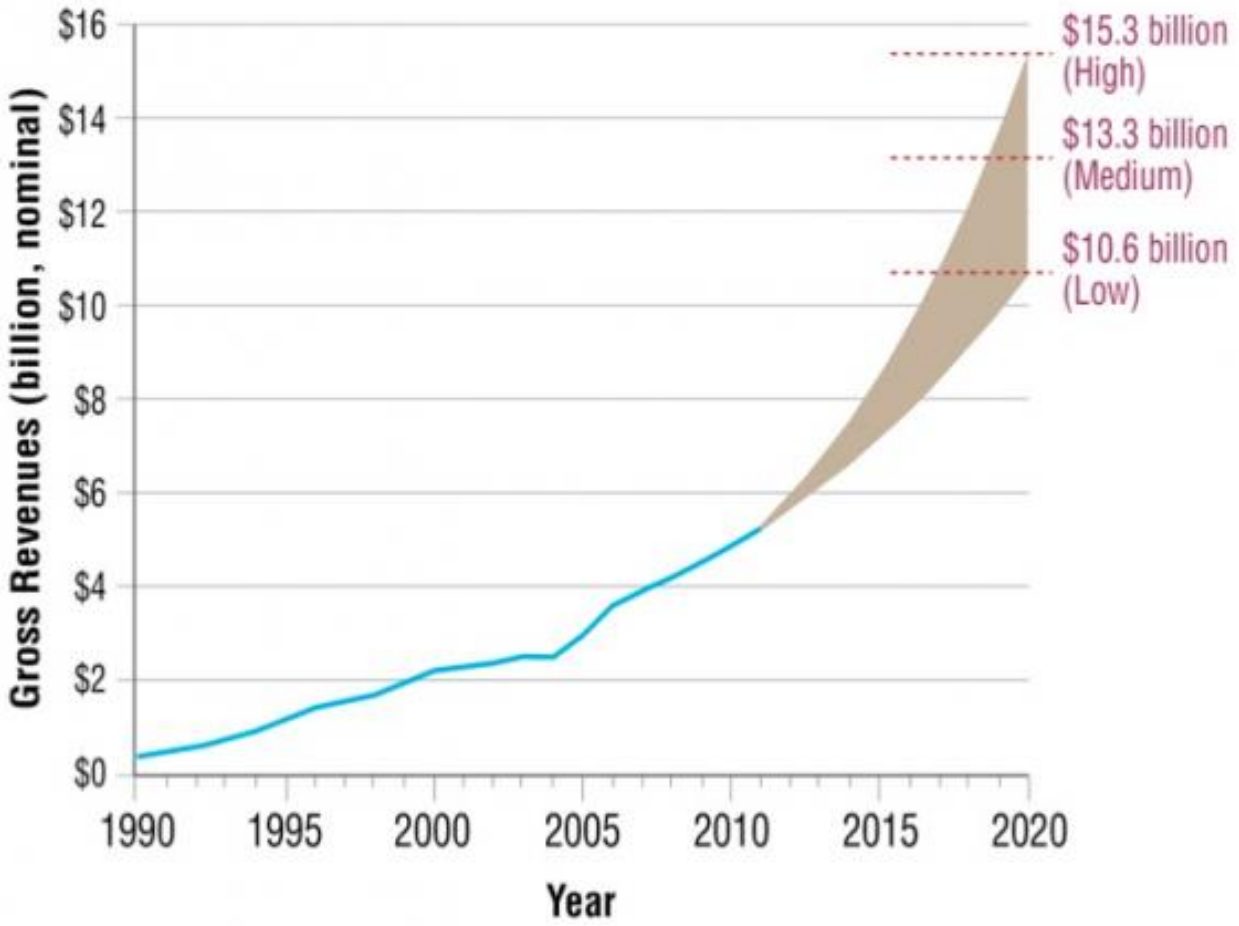
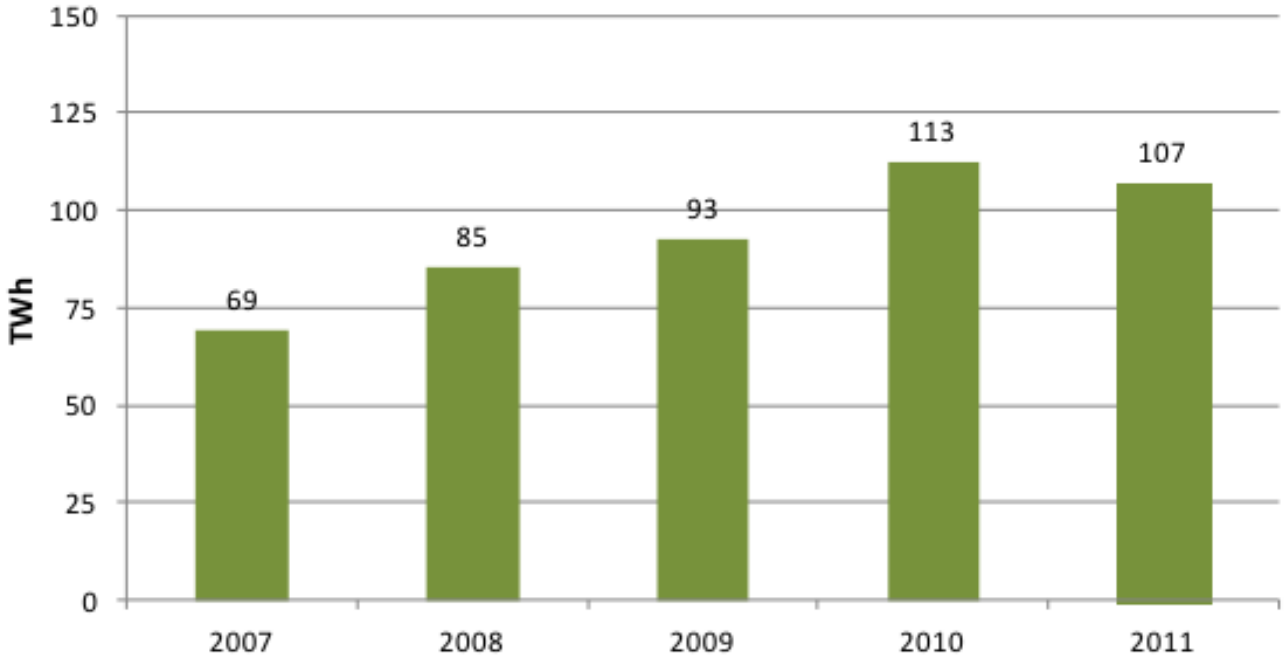


Figure 3: NEEP, Northeast Energy Efficiency Snapshot Energy Efficiency Policy By the Numbers

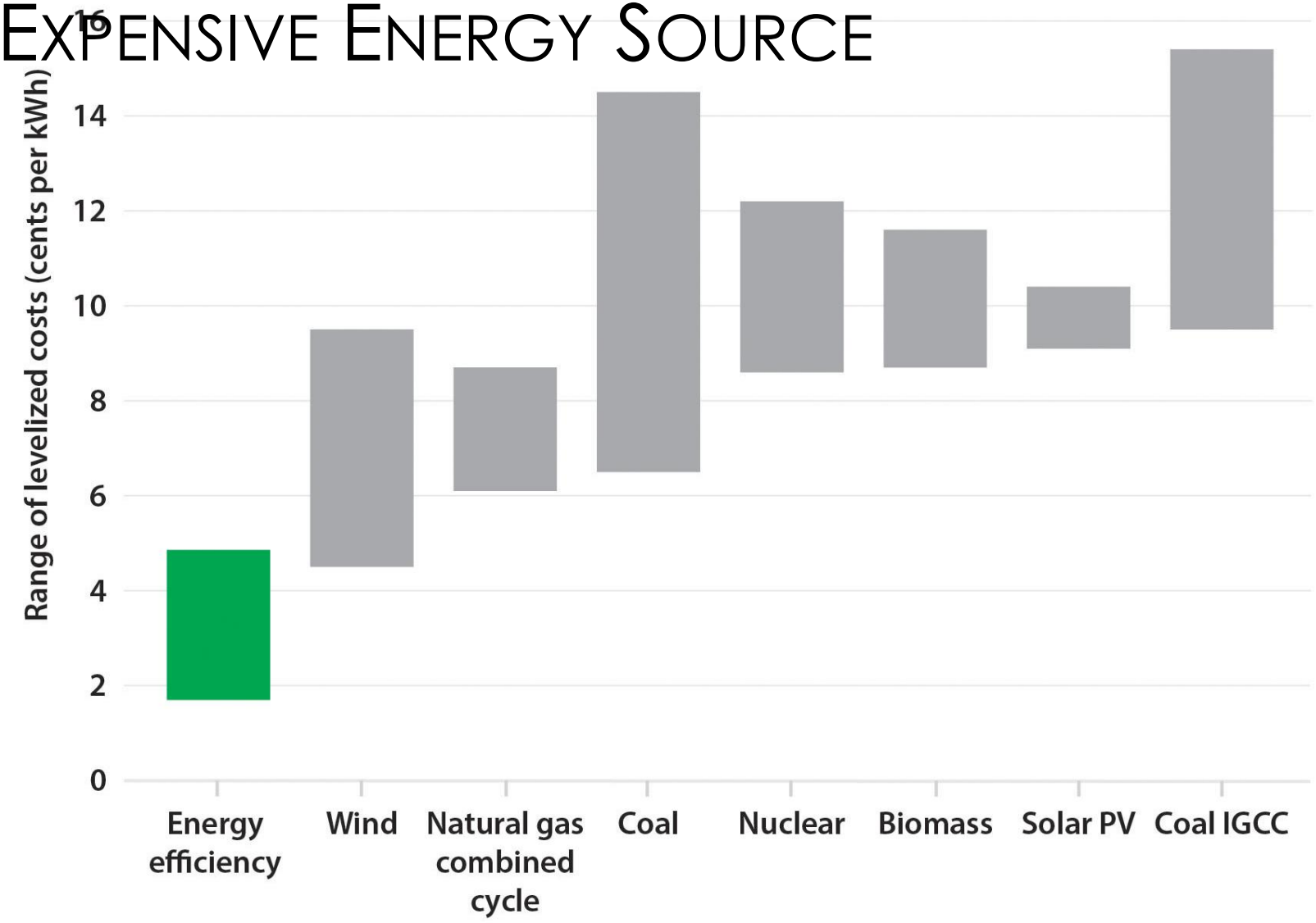
Energy Efficiency Savings

$16.4 Billion in energy costs over the lifetime of EE measures.
85 million tons of carbon emissions.
4 million jobs by 2030



U.S. Electric Efficiency Savings (2007-2011)

Energy Efficiency is the Least Expensive Energy Source

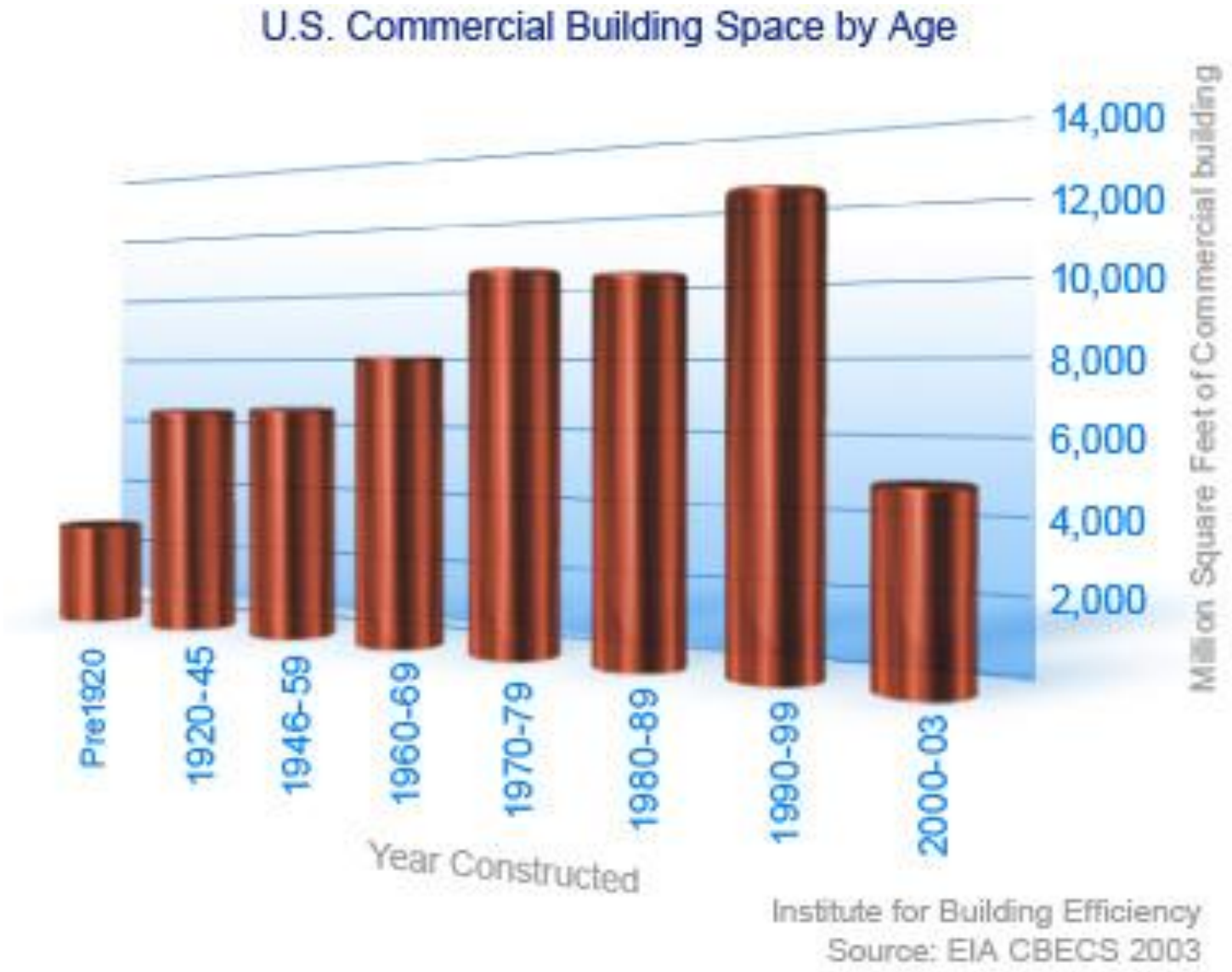


ACEEE & LBL study on energy efficiency costs relative to new generation.

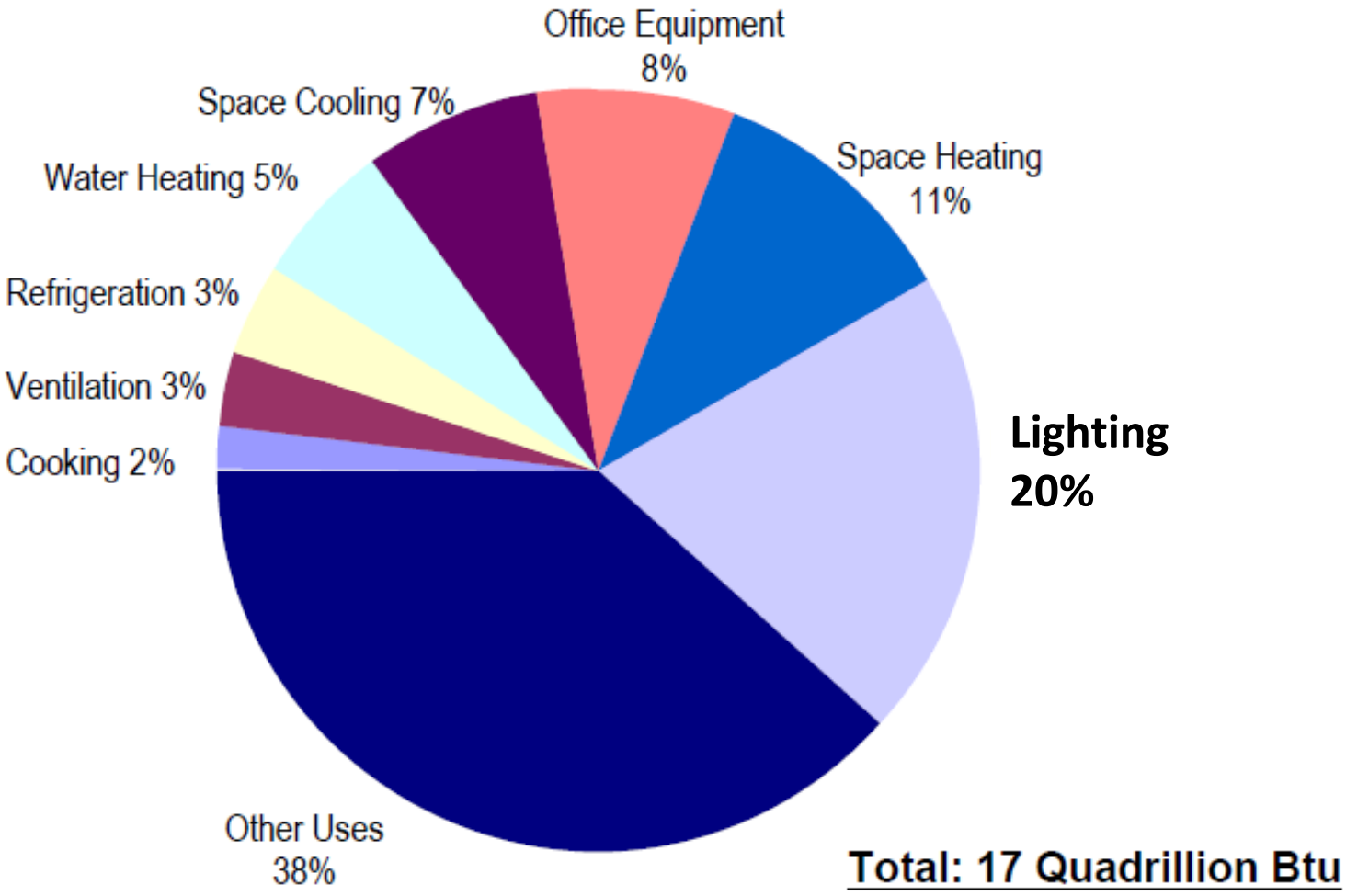
OPPORTUNITIES

Existing buildings and retrofit lighting represent the biggest opportunity for improving lighting efficiency and lighting quality.

Existing Buildings vs. New Construction

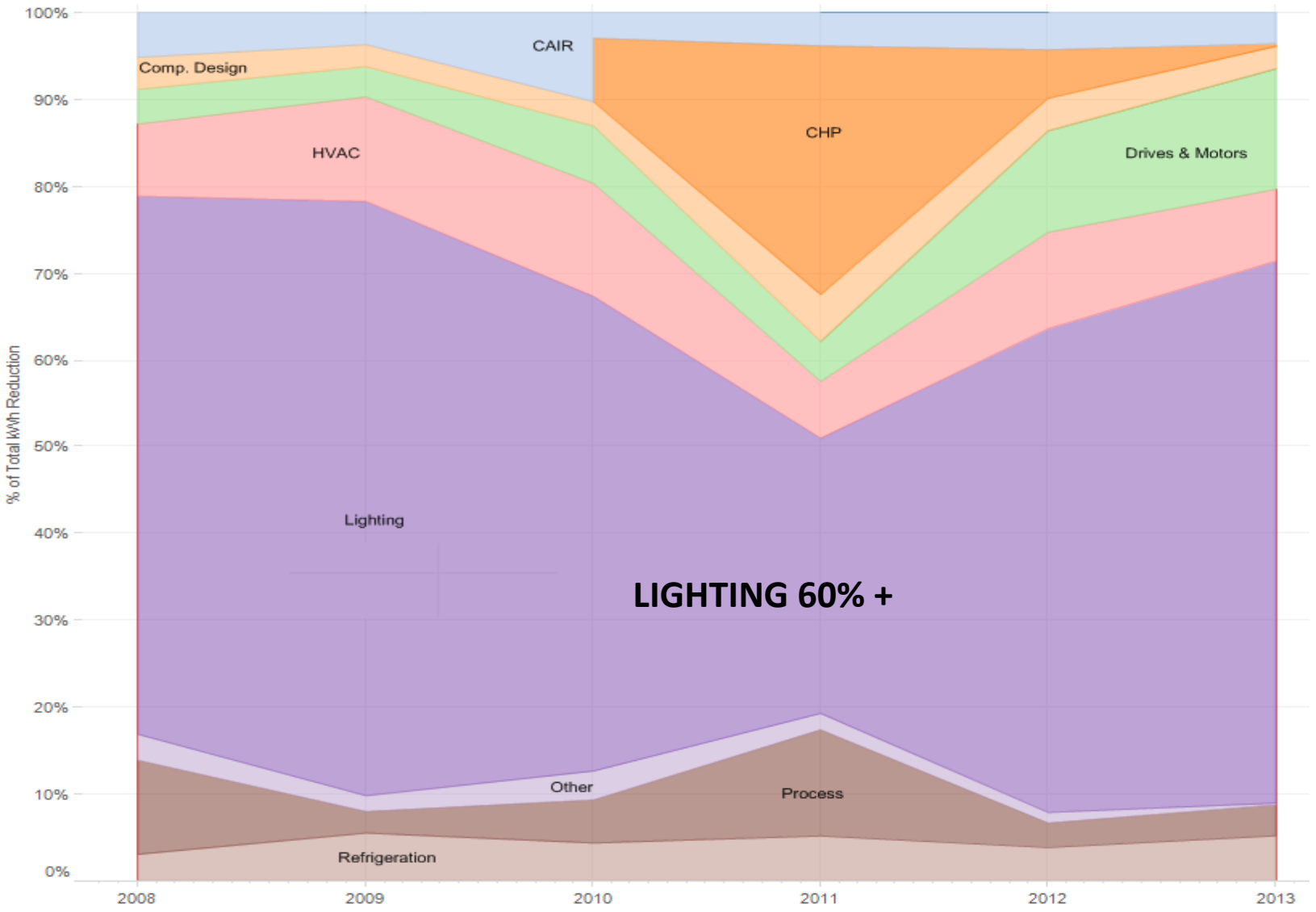


US Commercial Building Energy Use



EERE - 2005 Commercial Buildings Energy End-Use Expenditure

THE ROLE OF LIGHTING IN EE



National Grid Energy Efficiency Savings Profile by Technology

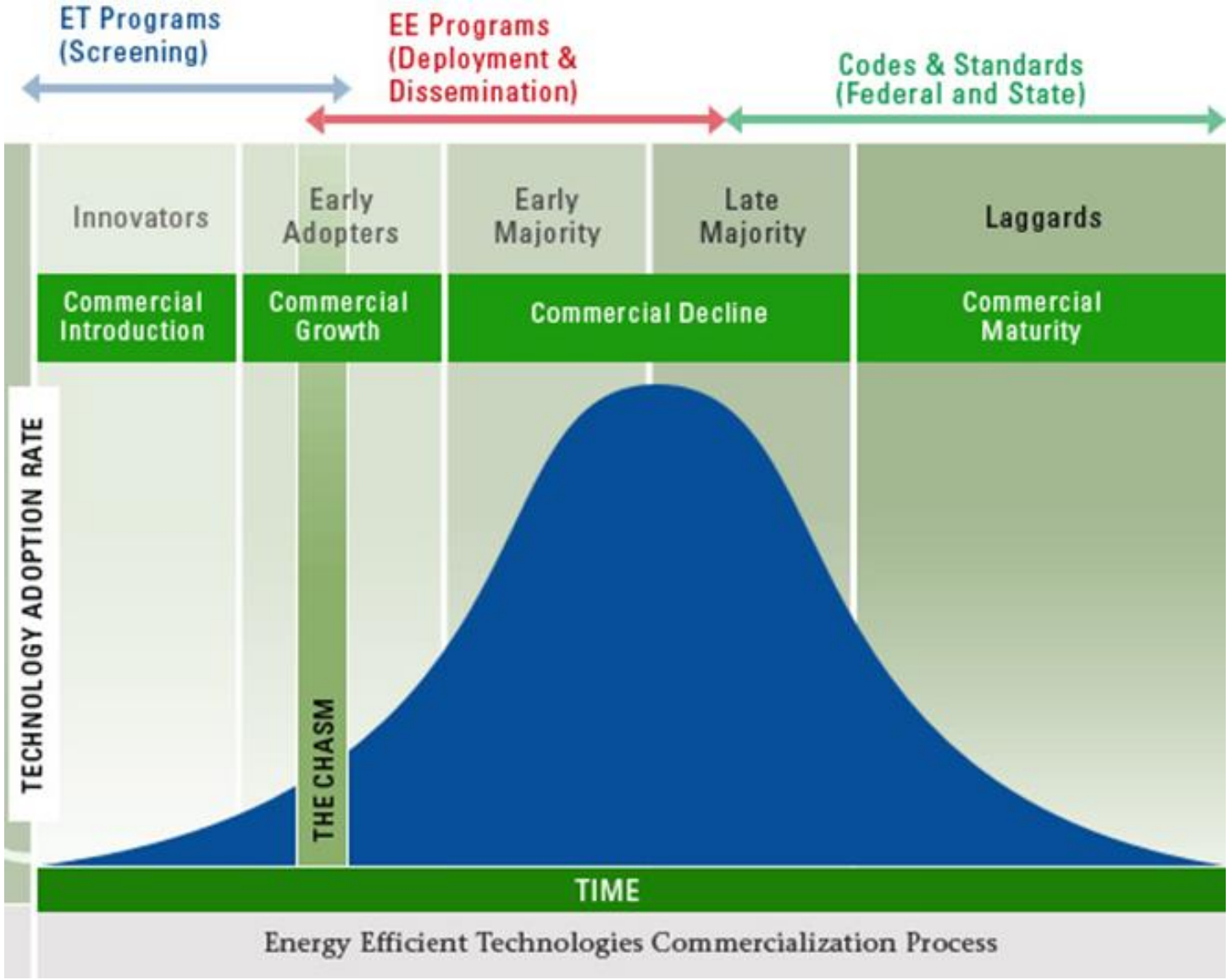
Levers of Control

How do we influence the lighting industry and market so that energy efficiency is a priority along with lighting quality?

The Stick and the Carrot

Market transformation toward energy effective "right sized" lighting.

GOAL: **MARKET TRANSFORMATION**



-American Council for an Energy-Efficiency Economy (ACEEE)

Utility Leverage

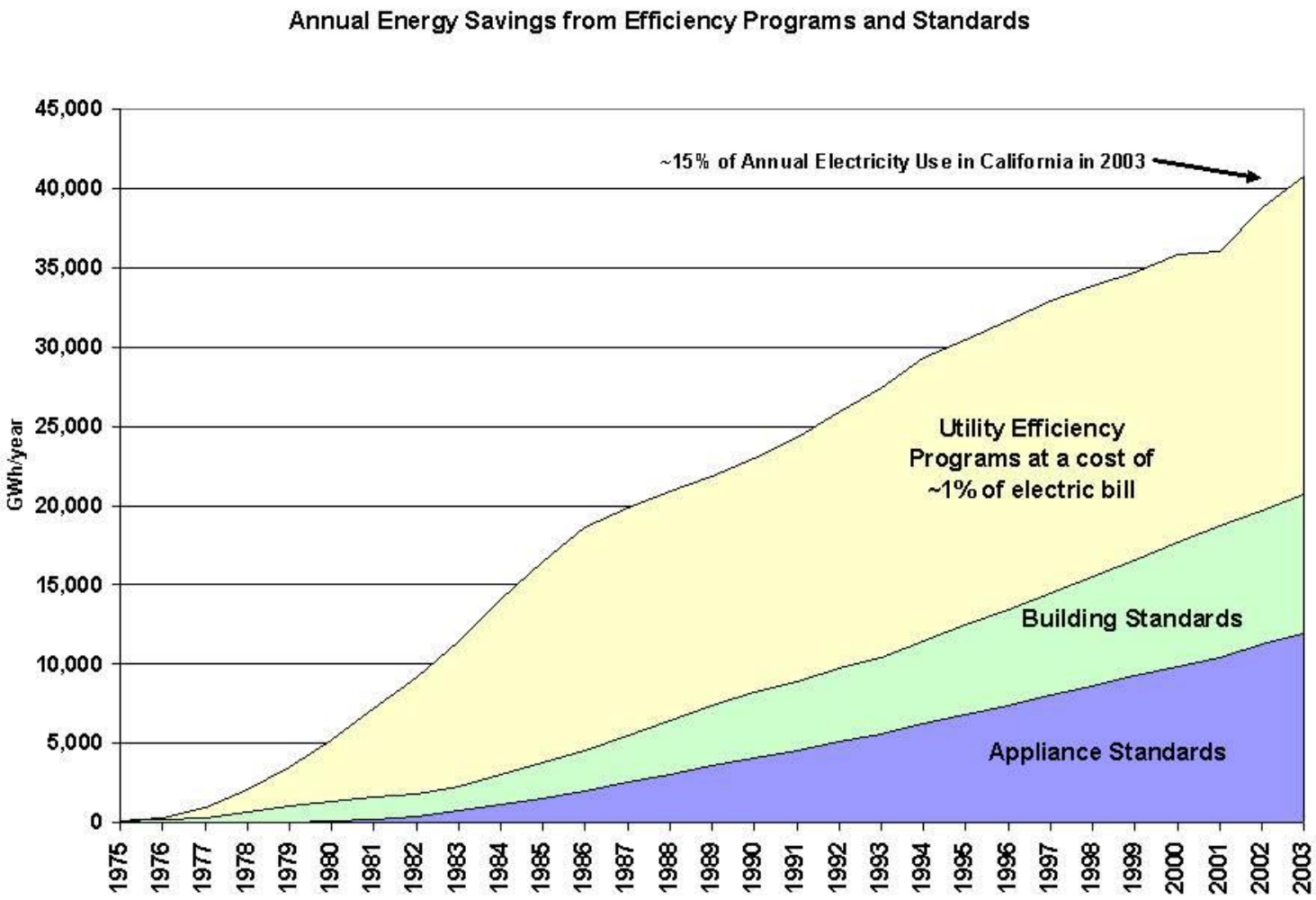
Primary Levers

- Financial incentives
- Behavioral motivation

Secondary Levers

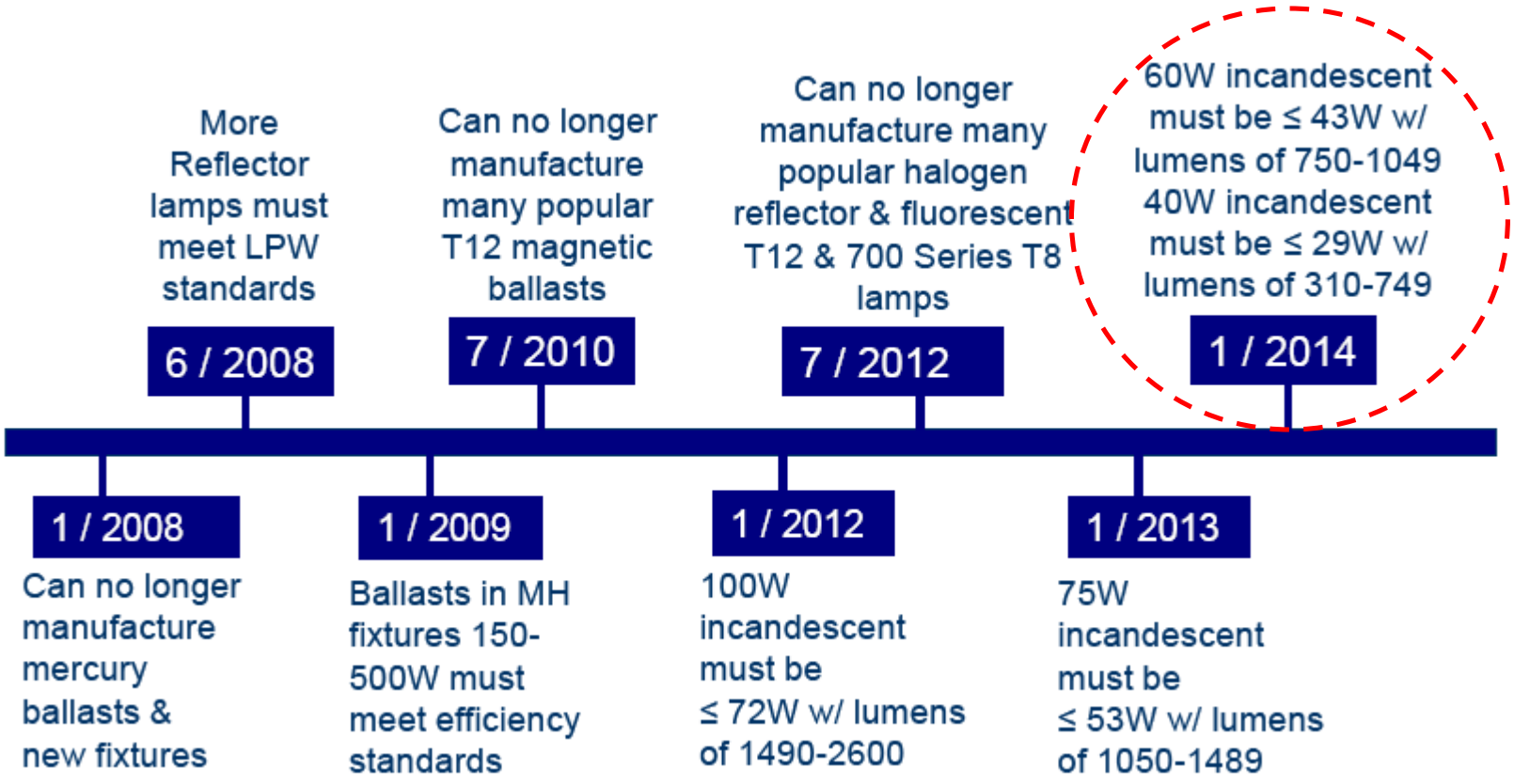
- Ease of process
- Alignment with industry supported values (sustainability)

CA ANNUAL ENERGY SAVINGS FROM EE



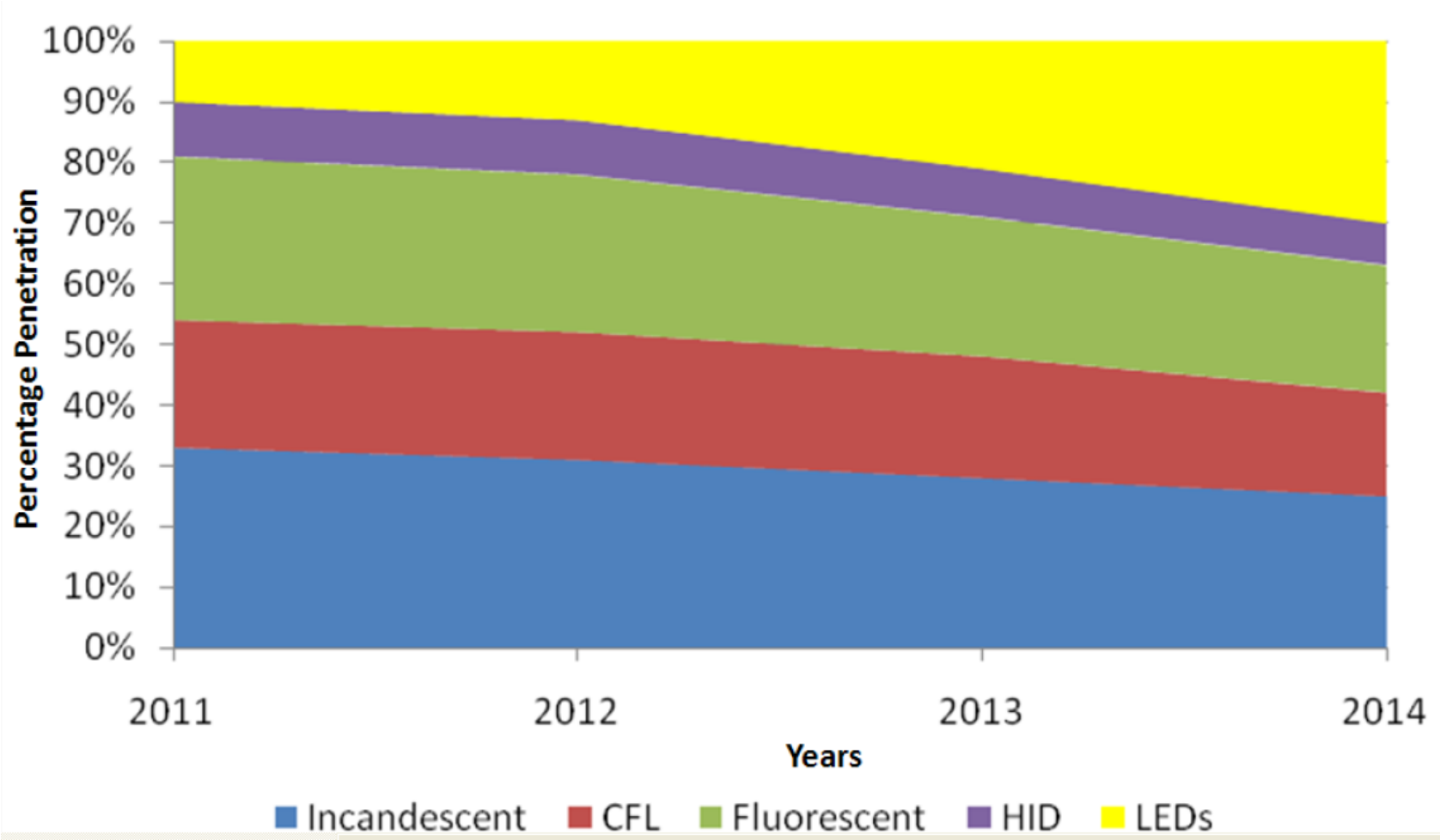
California's annual energy savings from efficiency programs and standards (Source: Rosenfeld 2008)

TIMELINE OF FEDERAL LIGHTING STANDARDS - EISA



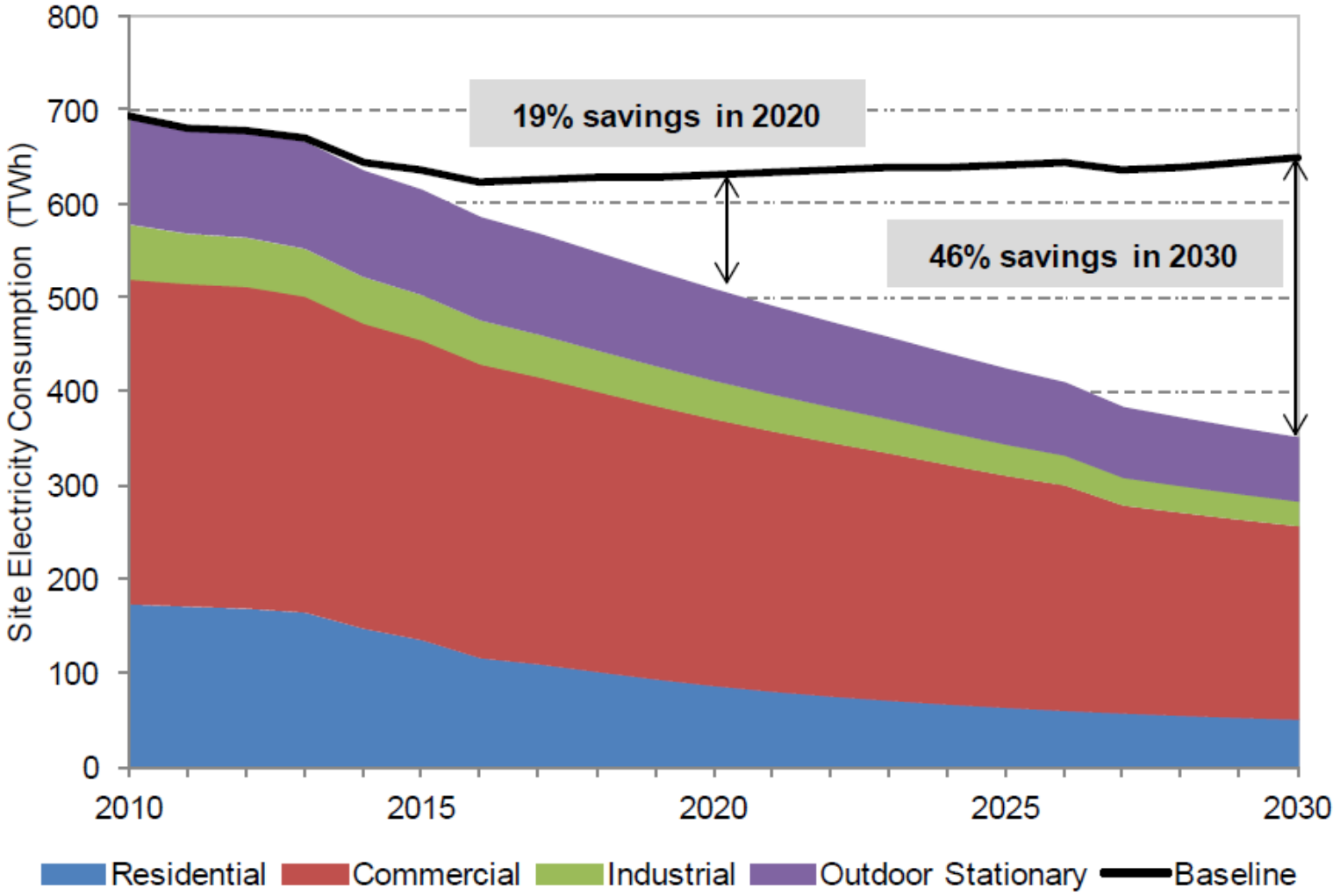
Energy Independence and Security Act -Source: OSRAM Sylvania

Lighting Market Source Trends 2011 - 2014



US DOE SSL Multi Year Program Plan 2012

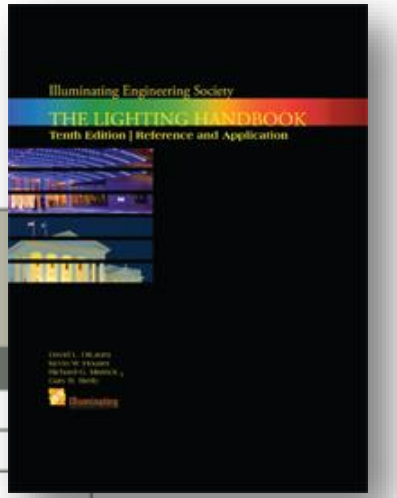
ENERGY SAVING POTENTIAL OF LED'S



Forecasted US Lighting Energy Consumption & Savings, 2010 – 2030
Energy Savings Potential of Solid State Lighting in General Illumination Applications -2012

Transition to LED Technology through Incentive Amounts

IES Lighting Standards:



Building Area & Task	Average Maintained Foot-Candles (Horizontal) (FC)	Range of Maintained Foot-Candles (Horizontal) (FC)	Average Maintained Foot-Candles (Vertical) (FC)	Range of Maintained Foot-Candles (Vertical) (FC)	Comments
WAREHOUSING & STORAGE					
Bulky Items—Large Labels	10		5		
Small Items—Small Labels	30		15		
Cold Storage	20	10 - 30	10	5 - 15	
Open Warehouse	20	10 - 30			
Warehouse w/Aisles	20	10 - 30	10	5 - 15	
COMMERCIAL OFFICE					
Open Office	40	30 - 50			@30" Above Finished Floor (AFF)
Private Office	40	30 - 50			@30" AFF
Conference Room	30				Matte surface reflectance for the table 40% recommended
Restroom	18	7.5 - 30			
Lunch & Break Room	15	5 - 20			
EDUCATIONAL (SCHOOLS)					
Classroom	40	30 - 50			@30" AFF
Gymnasium					
Class I (Pro or Div. 1 College)	125		30		
Class II (Div. 2 or 3 College)	80		20		
Class III (High School)	50		150		
Class IV (Elementary)	30		100		
Auditorium	7.5	3 - 10	5	2.5 - 10	
Corridor	25	10 - 40			

This guide is a collaborative effort of Energy Trust of Oregon, Lighting Design Lab in Seattle, WA

LIGHTING ENERGY CODES

Common Space-by-Space Types	LPD (w/ft²)
Atrium – First 40 feet in height	0.03 per ft. ht.
Atrium – Above 40 feet in height	0.02 per ft. ht.
Audience/seating area – permanent	
For auditorium	0.9
For performing arts theater	2.6
For motion picture theater	1.2
Classroom/lecture/training	1.30
Conference/meeting/multipurpose	1.2
Corridor/transition	0.7
Dining area	
Bar/lounge/leisure dining	1.40
Family dining area	1.40

(partial table)

Building Area Type	LPD (w/ft²)
Automotive facility	0.9
Convention center	1.2
Courthouse	1.2
Dining: bar lounge/leisure	1.3
Dining: cafeteria/fast food	1.4
Dining: family	1.6
Dormitory	1.0
Exercise center	1.0
Fire station	0.8
Gymnasium	1.1

(partial table)

IECC 2012 Section 505: Electrical Power and Lighting Systems

IECC 2012 –LIGHTING MANDATES

- For lighting alterations/retrofits <50%: only the altered lighting needs to be brought up to code. **However, IF this change does not increase the lighting power, THEN there is no need to bring the lighting up to code.**

- When >50% or more of the luminaires in a space are replaced, **that entire space or building must meet the current code LPD requirements.**

Energy Efficient Program Design

The goals of utility EE lighting programs are to ensure that the financially supported EE lighting components and systems generate persistent energy savings. These energy savings must last while providing a benefit for the occupants.

Energy Efficient Lighting Program Types

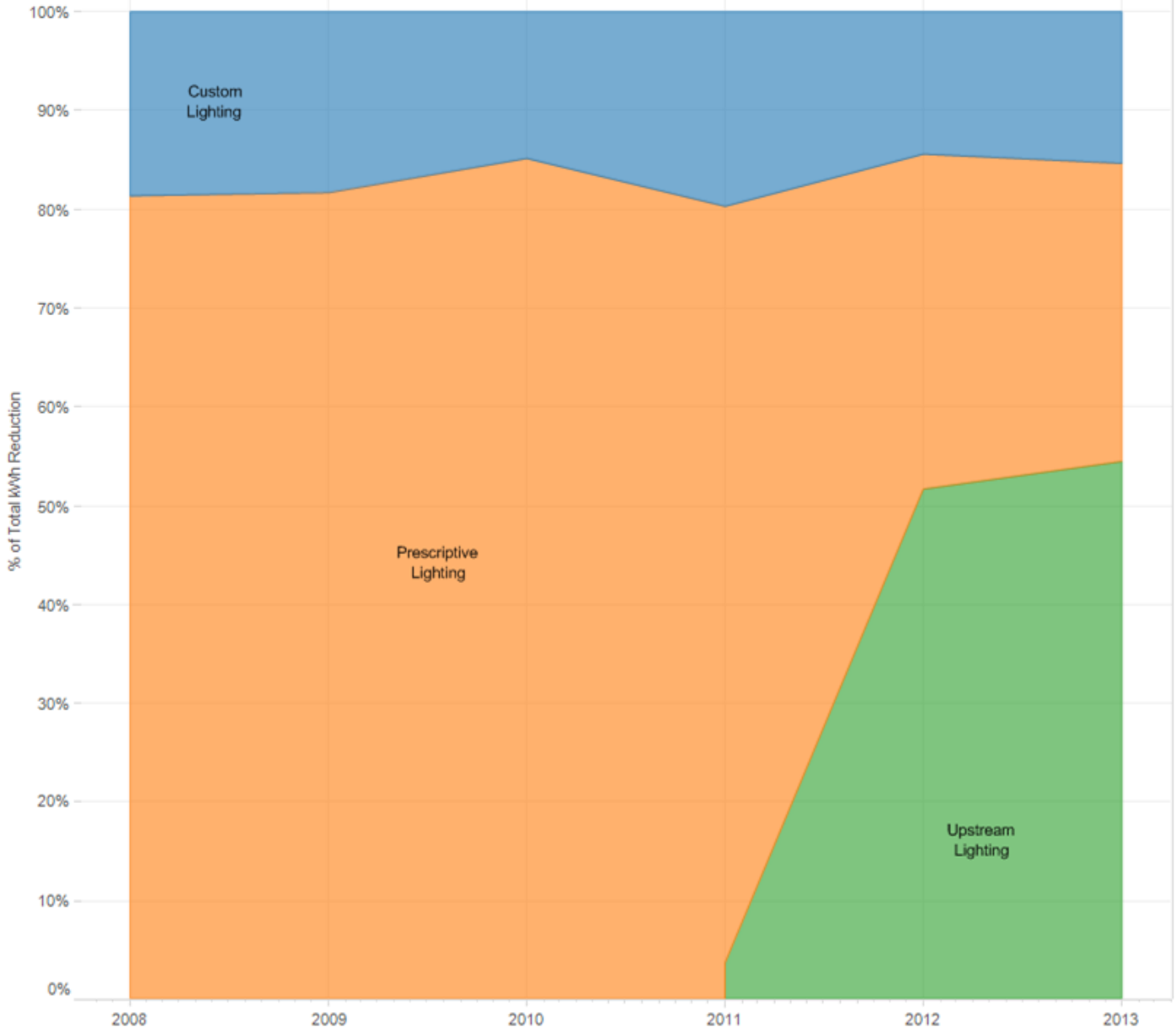
Widget(fixture) based solutions

- Upstream Lamp Buy-down
- Prescriptive Incentives for lighting fixtures

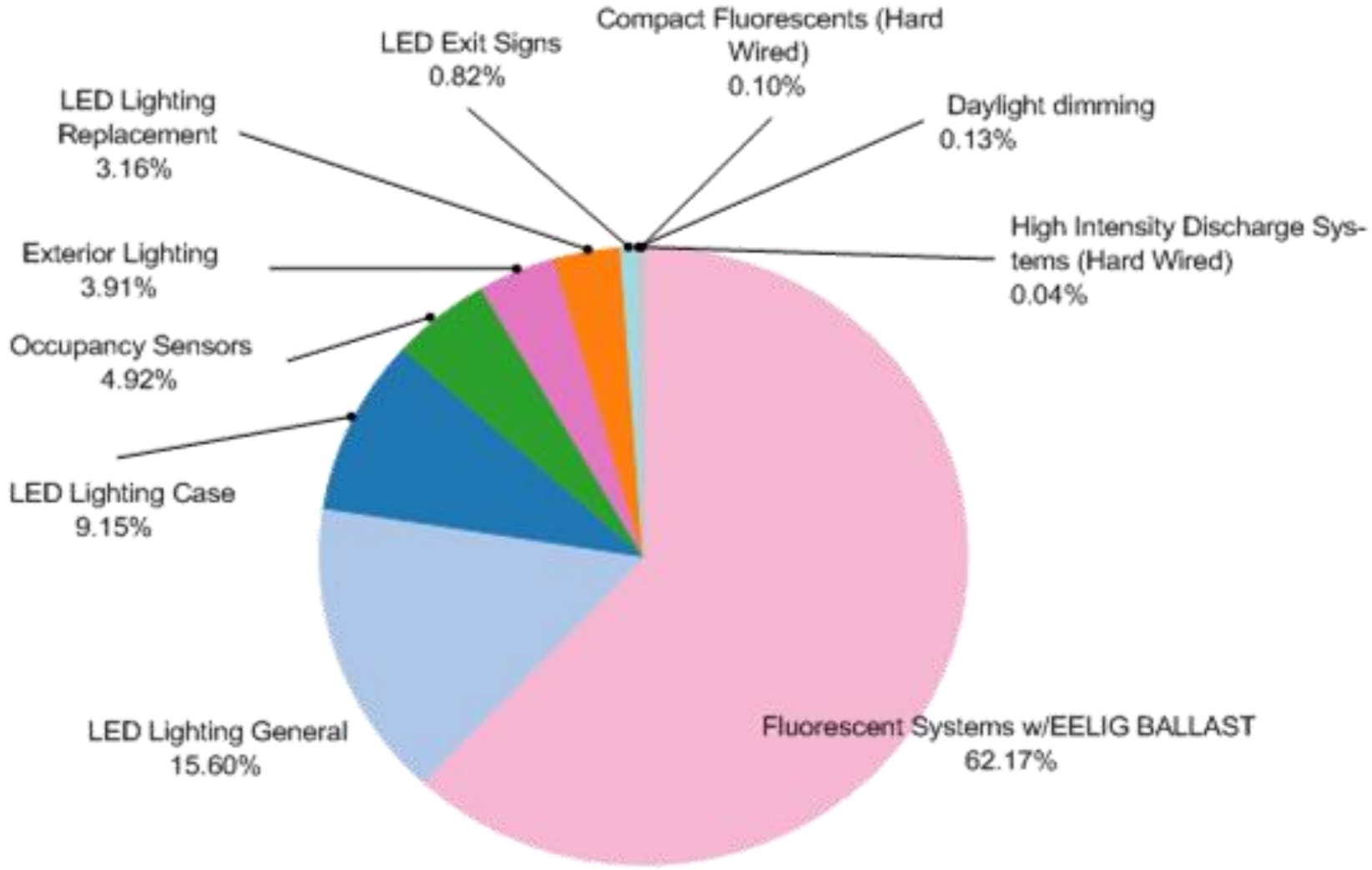
Design (project) based solutions

- Comprehensive Design
- Application based Lighting Design
- Better than code LPD
- Lighting Re-Design

MA -Lighting Program Incentives Payments 2013



2013 -LIGHTING FIXTURE KWH SAVINGS-MA



Do you want to Build a Lighting Incentive Program

1. Identify a new energy saving lighting technology
2. Establish the initial cost of this new technology
3. Identify the old technology and its initial costs
4. **Determine performance standards that would establish the new technology as equal or better than the old**
5. Determine the incremental cost of the new technology (the difference between the old and the new initial costs)
6. Determine the energy saved between the old and the new technology (kW or kWh), and what can be claimed to regulators
7. EE Benefit Costs:-this test calculates the utility's avoided cost benefits with energy efficiency program costs. Including incentives plus administrative costs. This is usually calculated at $ per kWh saved.
8. Determine the right channel to apply this incentive: UpStream, MidStream, DownStream, Special Targeted Programs

Energy Efficiency Barriers

- **Initial Costs/Long Paybacks**
  When the initial EE technology costs are too high for the relative energy savings benefit, or the payback is too long for the customer/owner
- **Imperfect Information**
  A lack of knowledge of the costs of equipment, the right performance metrics for EE equipment, technologies, and systems. Value proposition.
- **Imperfect Incentive Program Delivery**
  Mismatch of the way savings are calculated to for the incentive delivery method, to the units that the incentive is tied to. Unclear or complicated incentive process.

- **Imperfect Competition**
  When there is no competitive market for the EE technology and the costs may be inflated and availability/stocking is limited. Proprietary technology.
- **Complexity**
  Sophisticated EE technologies requires effective training to make sure that they are installed properly, and are operating as intended.
  Mock-ups are critical to help installers, owners, and occupants.

Lighting Component Performance

One for one replacement of older lighting fixtures and lamps is the most common approach for generating energy savings on retrofit projects. Requiring good performance from these components can ensure that these energy saving technologies will provide the promised energy savings while benefiting the occupants for the life of the component.

LIGHTING PRODUCT QUALIFICATIONS

Why do efficiency programs require lighting product qualification?

- **Regulatory:** Validate energy & lifetime claims based on the Technical Requirements of the regulators
- **Customer satisfaction:** Ensure product performance meets / exceeds threshold
  (Program self-qualification is not sustainable)
- **Organizational Support:** ENERGY STAR® & DesignLights Consortium® - DLC list pre-qualified LED fixtures and lamps

LIGHTING PRODUCT SPECIFICATIONS

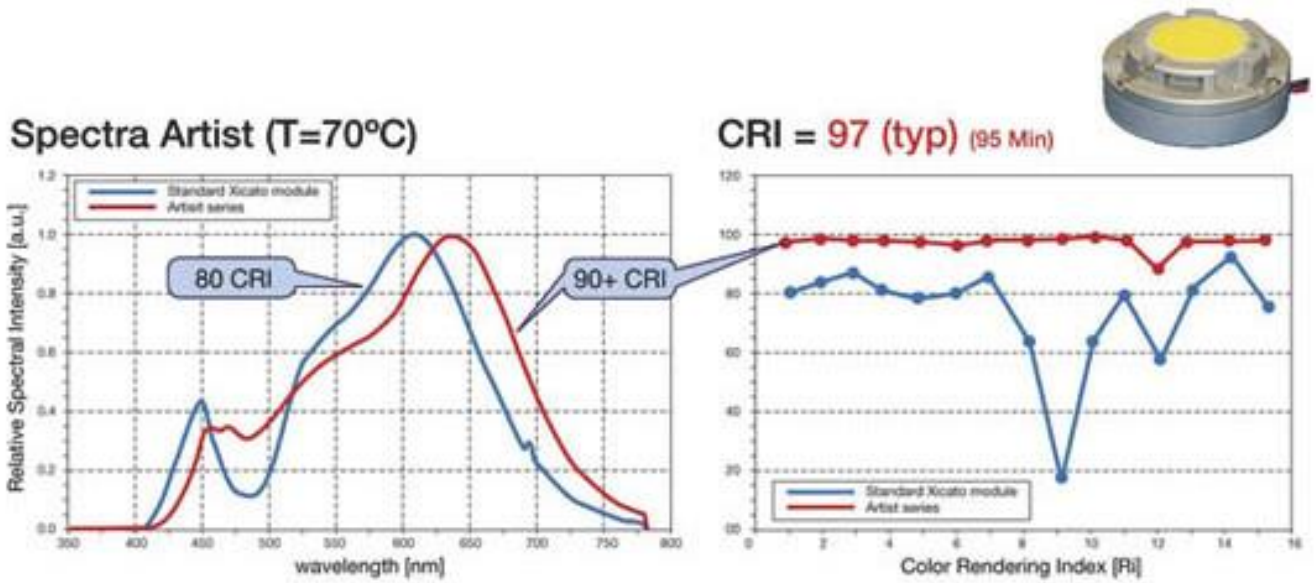
- ENERGY STAR® Lamp Specification
- ENERGY STAR® Luminaire Specification
- DesignLights Consortium® Technical Requirements
- California Title 24 – Appendix JA-8 High Efficacy
- Voluntary California Quality Light-Emitting Diode (LED) Lamp Specification
- CEE Technical Specification for HPT8 lamps and ballasts
- CEE Replacement Lamps Specification (draft)
- Lighting Design Lab LED Qualifying Products

**Utility efficiency programs sponsor DLC, LDL & CEE*

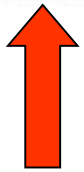
Critical Product Performance Criteria

- Lumens (Luminous Flux) – lm
- Watts – W
- Lumens per Watts – lm/W
- Luminous Intensity – Candle Power – CP
- Correlated Color Temperature – CCT
- Color Rendering Index – CRI
- Spacing Criteria
- Zonal Lumen Density
- Lumen Maintenance/Projected Life

LED's & Color Rendering Index -CRI



	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
Standard	81	80	85	89	81	78	80	86	66	16	64	79	58	81	93	75
Artist	98	98	99	98	98	98	97	98	98	98	99	98	88	98	98	98



IES LM-79

IES LM-79 is an approved method for taking electrical and photometric measurements of SSL products.

- Total flux (light output)
- Electrical power
- Efficacy
- Chromaticity
- Intensity distribution

INTEGRATING SPHERE TEST REPORT

May 24, 2012

IES LM79-08 Section 9.1

Technical Report

TÜV SÜD America

JR1205762-3-LM79

Sample Tested: L4-18W-41K-132 (TÜV SÜD# 208-3) **Manufacturer:** RedBird LED

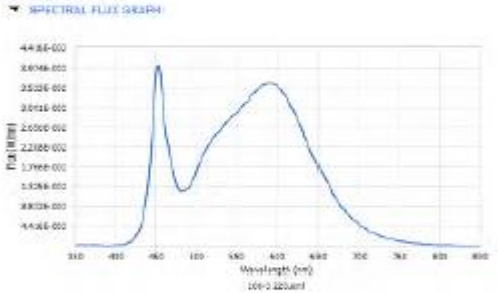
Sample Description: LED Replacement Tube 4ft

Test Orientation: Intended (Horizontal)

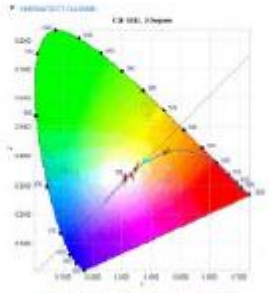
Date of Test: May 24th 2012

Tested by	Reviewed by
Tim Gentry	Bryan Cubitt
TÜV SÜD Project Handler	TÜV SÜD Program Manager

Test Results:



Spectral Response



Chromaticity Diagram

Tristimulus Values: x / y = 0.3794 / 0.3806

Photometric Test Results	
Luminous Flux (Lumens)	2,104
Efficacy (Lumens/Watt)	110.2
Color Temperature (CCT K)	4055
Color Rendering Index (CRI)	81.9
R_9 Value	3.4
Radiant Flux (W/nm)	6.36
Chroma u' / Chroma v'	0.2229 / 0.5031
Duv	0.00210

Electrical Test Results	
Input Power (Watts)	19.09
Input Voltage (Volts)	220.03
Input Current (Amps)	0.0921
Power Factor	0.963
A-THD / V-THD	14.47% / 0.13%
Input Frequency (Hz)	60.0
Stabilization Time	40 minutes
Ambient Temperature	25.3°C

TÜV SÜD America, Inc.
5945 Cabot Parkway, Suite 100,
Alpharetta, GA 30005 USA
Telephone: 678-341-5900 www.tuvamerica.com

Confidential Report

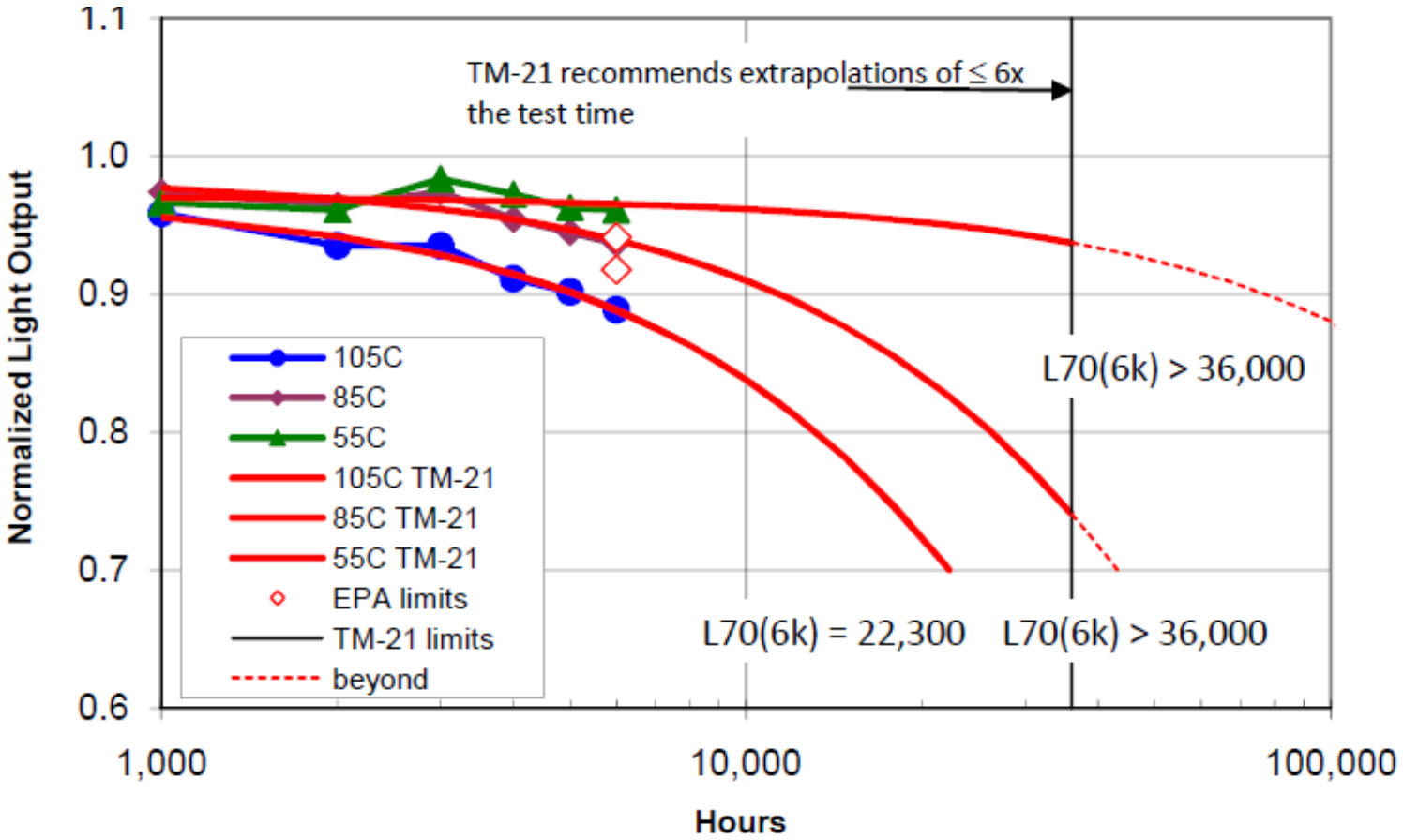
NVLAP Lab Code: 500065-0

TÜV SÜD America is accredited under the NVLAP EEL program.

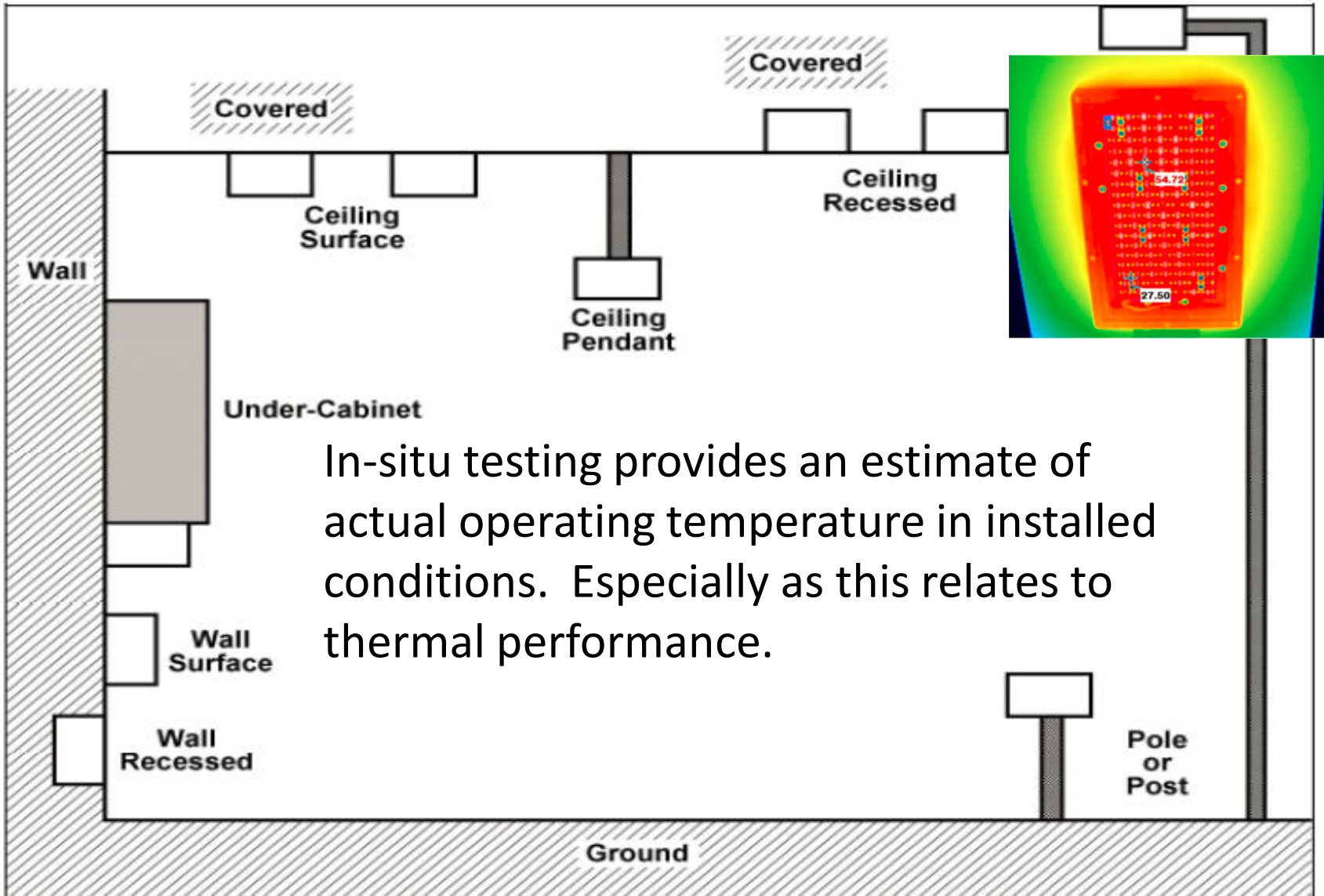
IES LM-80 / IES TM-21

IES LM-80 is an approved method for measuring the lumen maintenance (L70), of LED packages arrays, and modules at various temperatures.

IES TM-21 recommends a method for projecting the lumen maintenance of LED light sources from the data obtained by the procedures in IES LM-80-08



In-situ Testing



In-situ testing provides an estimate of actual operating temperature in installed conditions. Especially as this relates to thermal performance.

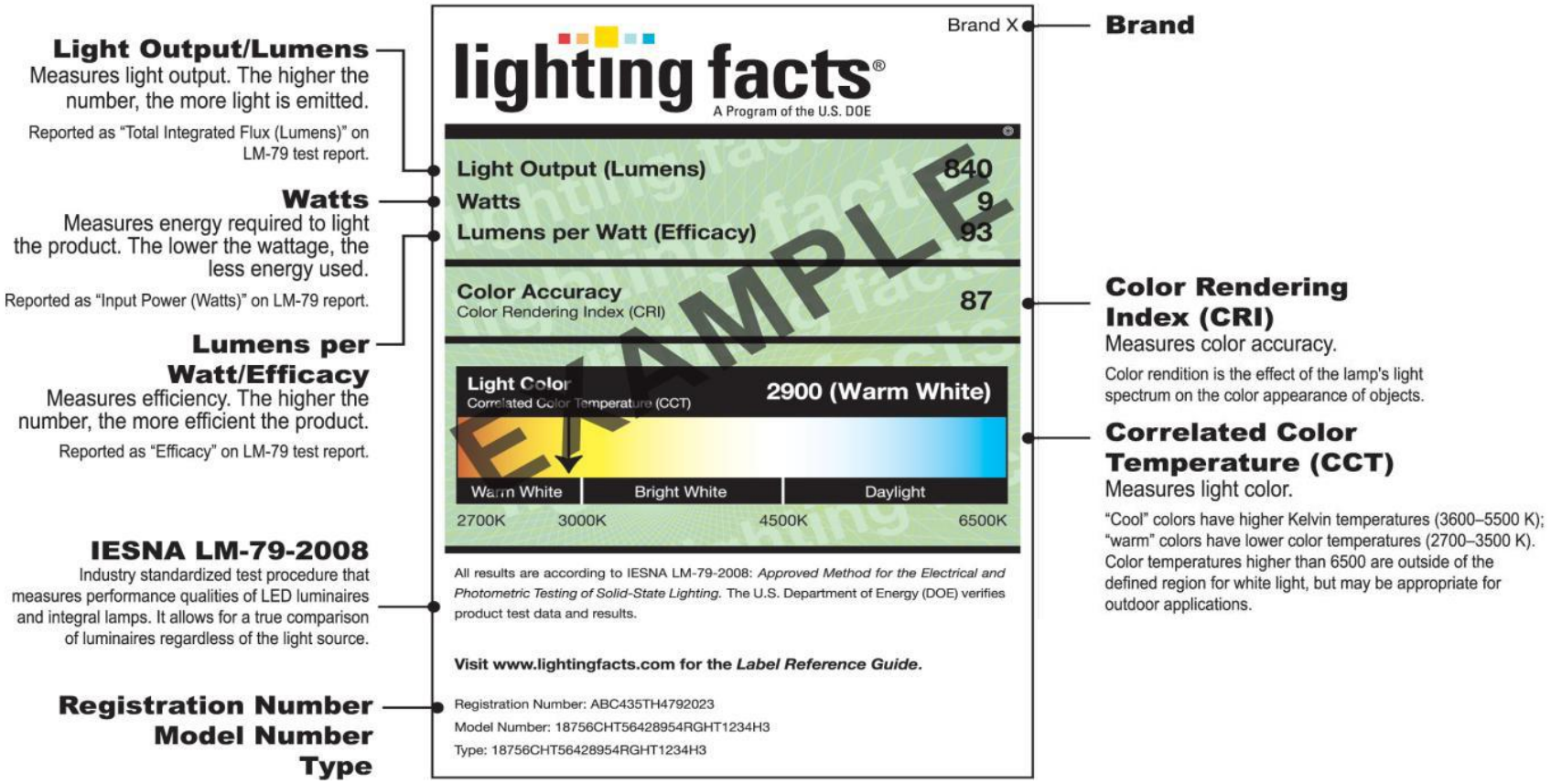
What's Missing?

Currently are no standards or testing protocols for:

- LED Driver
- Dimming systems
- Occupancy sensors
- Daylighting sensors

LED - Lighting Facts (DOE Program)

Comprehensive LED labeling listing critical lighting information for accurate comparisons.

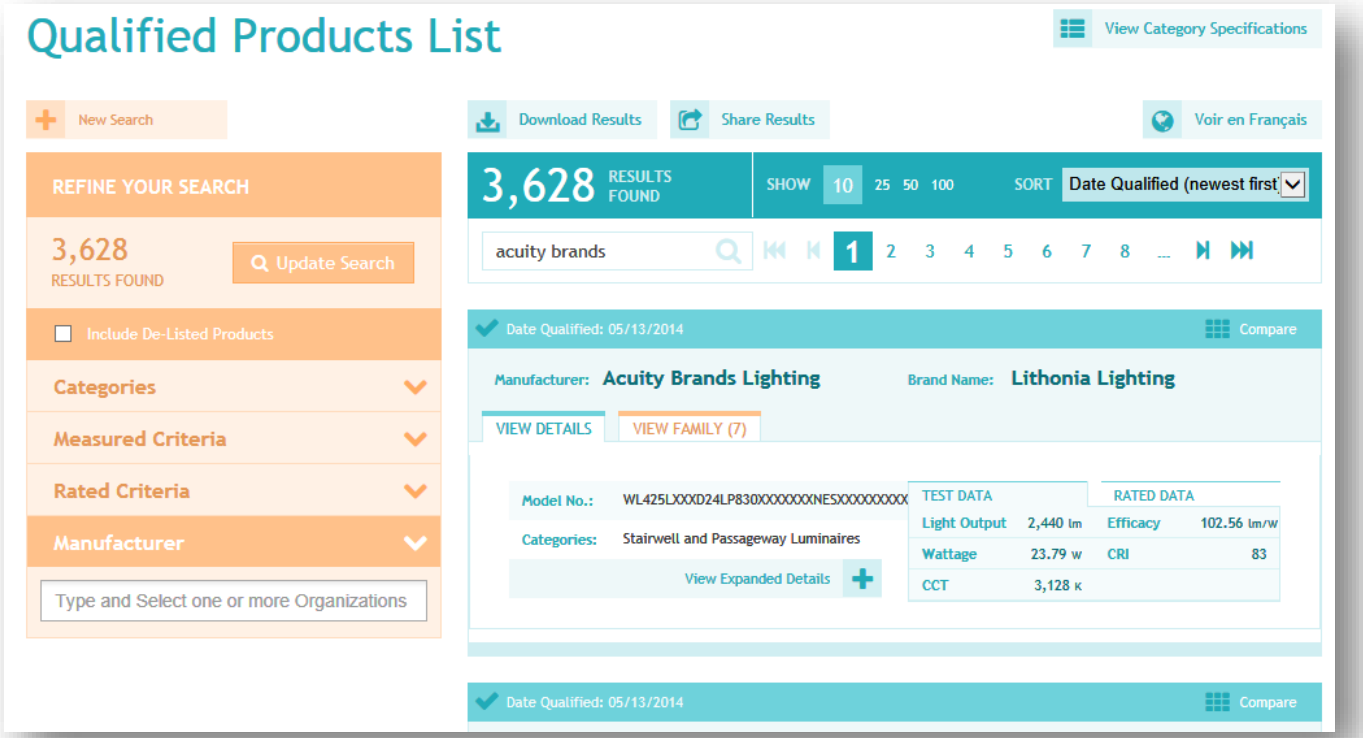


DESIGNLIGHTS CONSORTIUM® (DLC)

- The DesignLights Consortium® promotes **quality**, **performance** and **energy efficient commercial sector lighting solutions** through collaboration among its federal, regional, state, utility, and energy efficiency program members, luminaire manufacturers, lighting designers, and other industry stakeholders throughout the US and Canada.
- The DLC is a project of Northeast Energy Efficiency Partnerships (NEEP), a regional non-profit which has been bringing stakeholders together since 1996 to accelerate efficiency solutions to create lasting change in the marketplace.

DLC Qualified Products List

- Resource that distinguishes quality, high efficiency LED products for the commercial sector
- Currently **75,905** products



ENERGY STAR® – U.S. EPA

- Has qualified energy efficient lighting fixtures since 1992; LED's since 2007
- Rigorous qualifications process utilizing industry standards

LEARN MORE AT energystar.gov

ENERGY STAR® PERFORMANCE METRICS

- Luminous efficacy
- Minimum light output
- Light distribution (zonal lumen density)
- Color quality and consistency
  - CCT, CRI, color over angle, color maintenance
- Rated life (lumen maintenance)
- **Reliability – Rapid Cycle Stress**
- **Dimming**
- **Start time**
- Power factor
- **Noise**
- **Transient Protection**
- Warranty
- **Toxics reduction**

LEARN MORE AT energystar.gov

UNDERSTANDING THE TOOLS

Specification Grade versus Commercial Grade

Specification Grade fixtures are a designation promoted by lighting manufacturers to distinguish well constructed "higher value" lighting fixtures from commodity grade (or residential grade) lighting fixtures. Due to the fact that Architects and Designers request Specification Grade fixtures because of concerns about fixture construction, architectural integration and durability.

TECHNOLOGY CHALLENGES & SOLUTIONS

"To cut global emissions in half over the next 40 years, as scientists recommend, clean technologies must be rolled out on a vast scale. "

"Can Technology Really Save Us from Climate Change?"

-Alex Rau, Rob Toker, Joanne Howard

Cheap and Easy Energy Savings vs. Long-term Comprehensive Savings

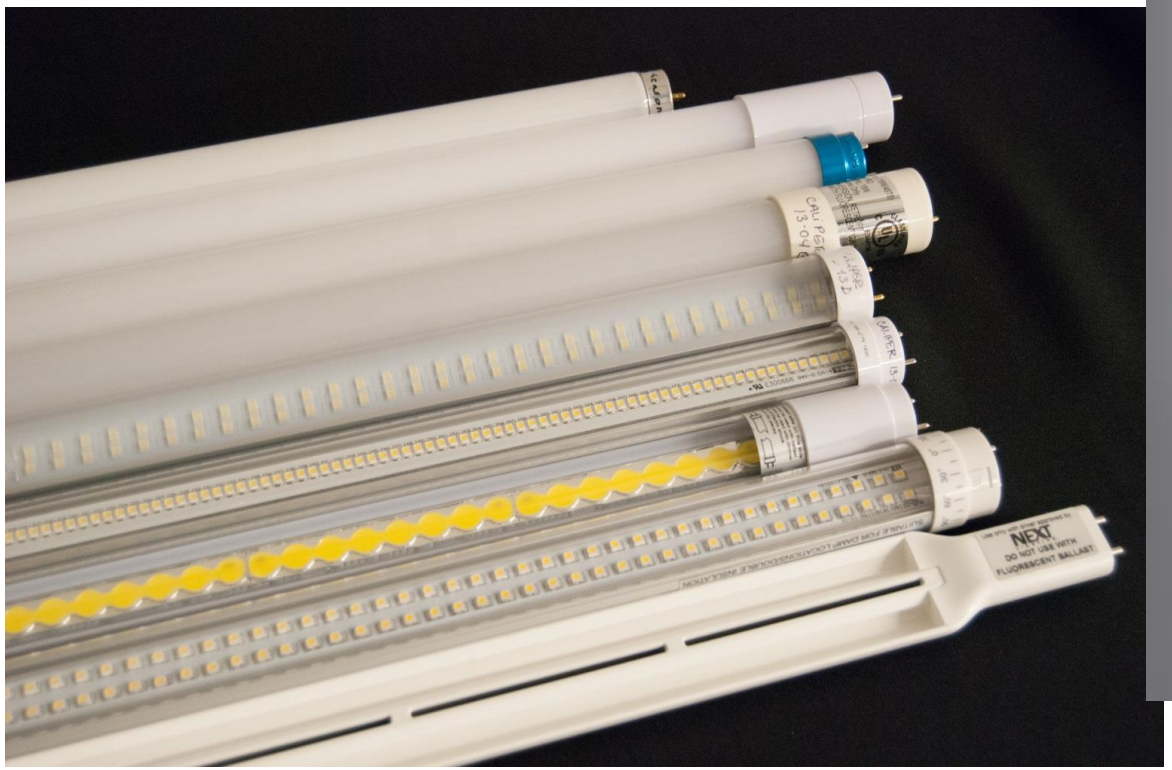
- Rewards long term kWh savings over simple kW savings
- Encourages comprehensive design through the interaction of high-performance building systems.
- Supports long term energy savings, beyond 5 yrs
- Promotes cost-effective solutions that pay for themselves within 5-7 years through reduced annual energy costs
- Supports long-term market transformation

	Solution	Per Fixture Savings Est.
meh	TLED's (LED T8 replacement tubes using existing FL ballast and sockets –No Rewiring Required)	5W-15W
Good	LED Tube retrofit kits with drivers (not using FL ballast or sockets)	10W-25W
Better	LED full retrofit kits with drivers and lens	25W-40W
Best	LED replacement fixtures	40W-55W
Excellent	LED Adaptable fixtures with embedded controls	55W-75W
Awesome	Redesign of space with reduced LPD, controls and LED fixtures.	> 75W

TLED's (LED Tube T8 Replacement Lamps)
CFLED'S (LED CFL Replacement Lamps)

- Immediate kW savings
- Licensed electrician not required

meh



TLED's (LED Tube T8 Replacement Lamps)
CFLED's (LED CFL Replacement Lamps)

meh

- –Reduced light output
- –Retains existing fixtures and ballasts
- –Incompatible to some FL & CFL ballasts
- –Cited fire hazards, flicker and failures
- –Thermal Issues, limiting lamp life
- –"Snap-Back" to FL T8 & CFL lamps possible, eliminating savings
- –Impacts power quality (PF, THD)
- –Not dimmable

LED Tube Retrofit Kits

Good & Better

- LED Tube retrofit kits with drivers (not using FL ballast or sockets)
- Immediate kW savings
- Thermal issues reduced
- No “Snap-Back” to FLT8

- Reduced light output
- Retains existing fixtures
- Limited controllability

LED Full Retrofit Kits

Good & Better

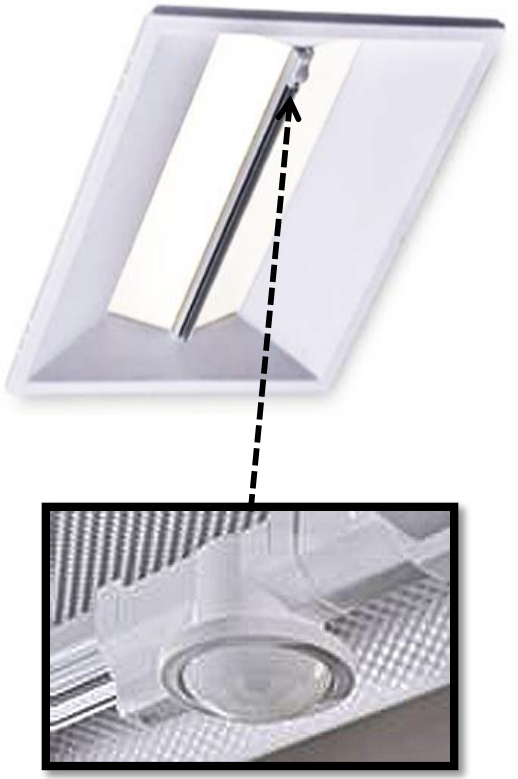
- LED full retrofit kits with drivers and lens
- Immediate kW savings
- Thermal issues reduced further
- Works with controls

- Imprecise compatibility with existing fixtures and structure
- Retains same location and number of existing fixtures

LED Adaptive Troffers

Best & Excellent

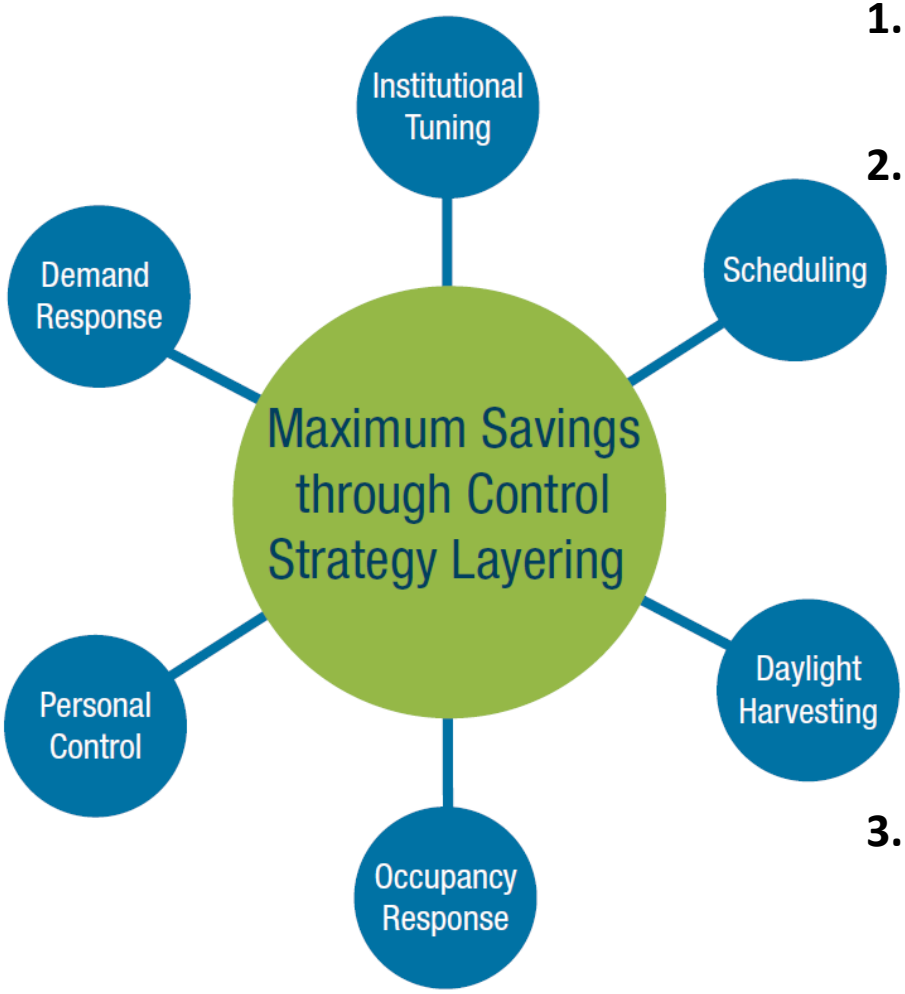
- Adaptive LED Interior 1x4, 2x2, 2x4 Fixtures compatible with integral occupancy, daylight sensors and network controls
- Integral Fixture Mounted Dual Sensors and Controllers.



Office Lighting	Code LPD		Real LPD
CA T24	0.80	Code Controls	**0.27**
iLED	0.80	iLED Controls	**0.14**
Energy Savings		**47%**	**Below Code**

LED Adaptive Troffer –Attributes

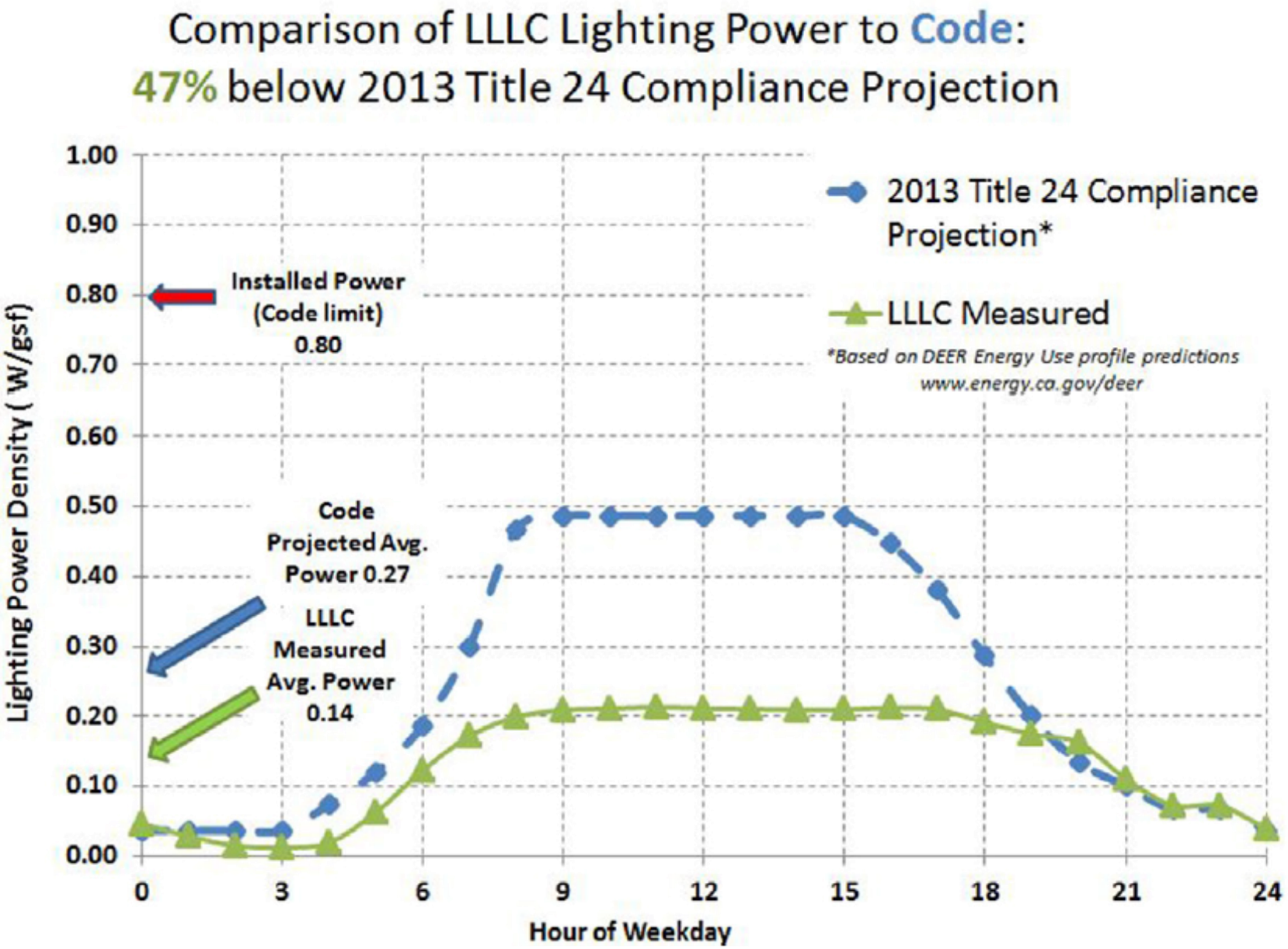
Best & Excellent



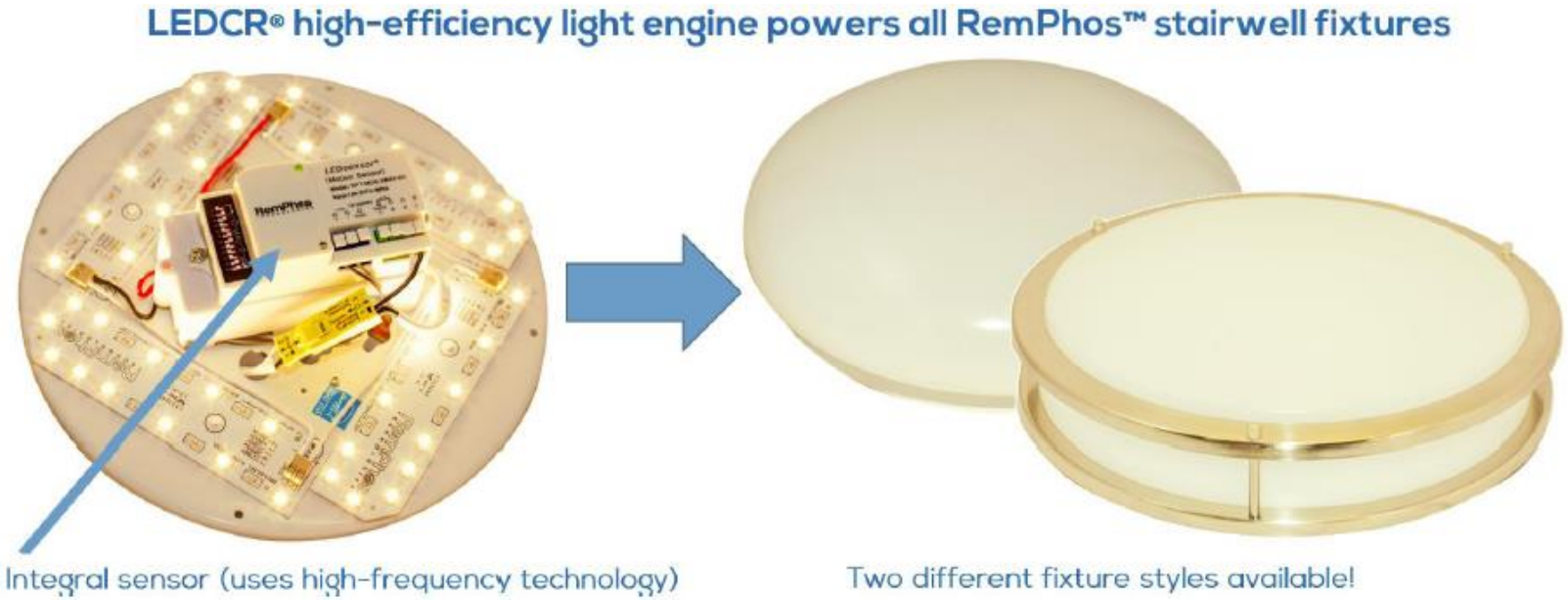
1. **Granularity** - control at the smallest increment
2. **Flexibility** - to modify luminaire output: Limitless grouping, zone control with pre-set auto-response
   - **Tuning** the light level (and resulting energy use) to match occupant needs at each fixture
   - **Adjusting** to new employee/user/older occupant with individualized adjustment
   - **Reconfigure** to space reuse (all or part)
3. **Demand response** zoning

LED Adaptive Troffer (LLLC)

Best & Excellent



Case Study: LED Corridor Lighting with Integral Sensors



Built-in microwave motion sensor integral to LED drum.

Case Study: LED Corridor Lighting with Integral Sensors

Example Installation Lawrence Housing Authority

Elegant RemPhos DESIGNERDRUM housings used

Old (ugly!) CFL housings shown for reference

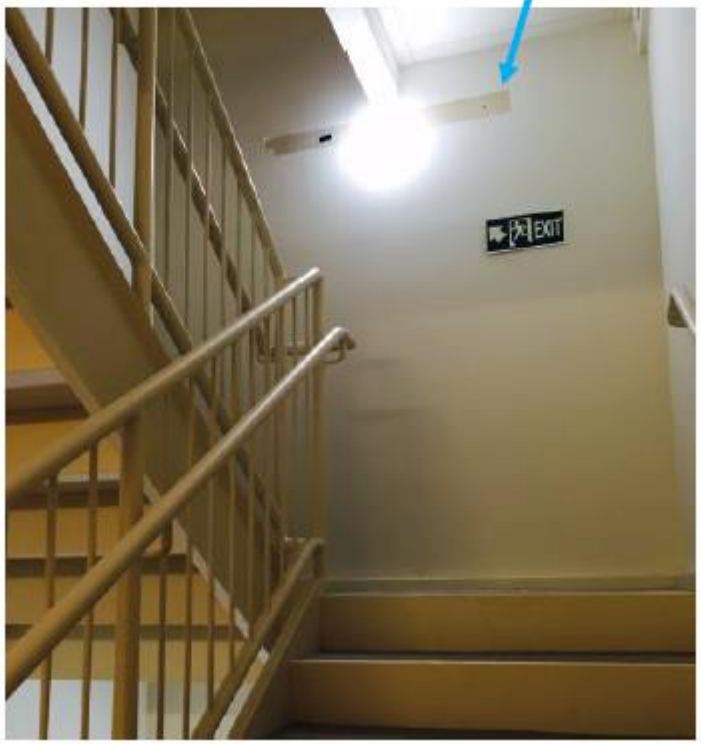
Fixtures were both ceiling and wall mounted

Case Study: LED Corridor Lighting with Integral Sensors

Example Installation **Harvard University**

RemPhos
UTILITY DRUM
housings used

Old footprint from 2x32W fluorescent T8 fixtures has not yet been repainted



Case Study: LED Corridor Lighting with Integral Sensors

Location	Environment	Total kWh w/ Controls	Total kWh No Controls	kWh Savings	Age group
Lawrence Housing	Hallway	36.2	174.7	**79%**	20-60
Andover Housing	Hallway	18.8	122.3	**85%**	50-60
Salem Home for Elderly	Hallway	30.7	78.6	**61%**	60-100
	Total:	**85.7**		**75%**	
Lawrence Housing	Stairwell	22.2	174.7	**87%**	20-60
Andover Housing	Stairwell	25.3	122.3	**79%**	50-60
Salem Home for Elderly	Stairwell	15.7	78.6	**80%**	60-100
	Total:	**63.2**		**82%**	
Harvard University	Hallway	92.4	174.7	**47%**	18-24
Tufts University	Hallway	51.5	122.3	**58%**	18-24
Brown University	Hallway	30.7	78.6	**61%**	18-24
	Total:	**174.6**		**55%**	
Harvard University	Stairwell	22.2	174.7	**87%**	18-24
Tufts University	Stairwell	25.3	122.3	**79%**	18-24
Brown University	Stairwell	15.7	78.6	**80%**	18-24
	Total:	**63.2**		**82%**	

Data from metering integral occupancy sensor fixtures

Lighting Redesign

Awesome

- Immediate kW and kWh savings
- Designed to fit space use
- Controls fit space type
- Reduced fixture count

- Requires qualified lighting designer/engineer
- Extra design work often not compensated

LIGHTING PROJECT QUALITY

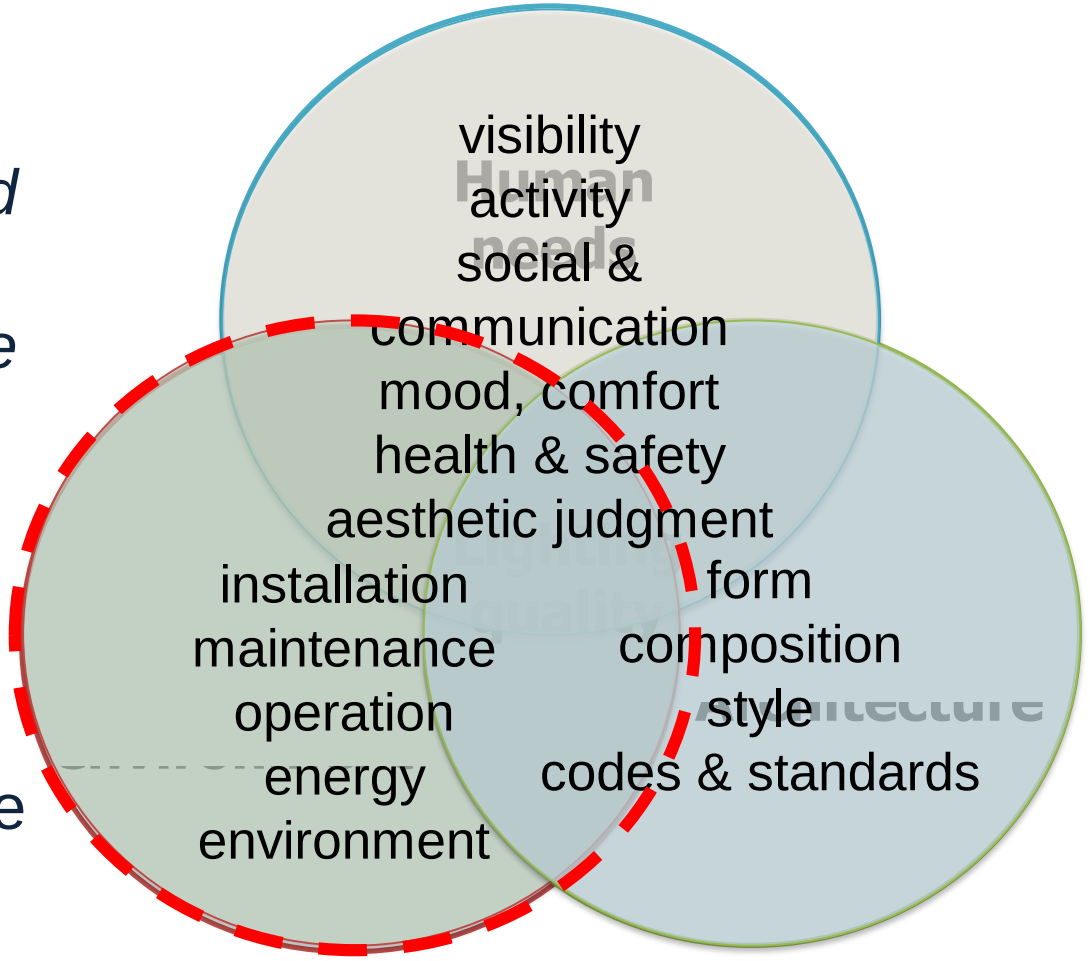
"Lighting quality is a sustainable design attribute"

IALD Sustainability Committee, 2001

Lighting Quality

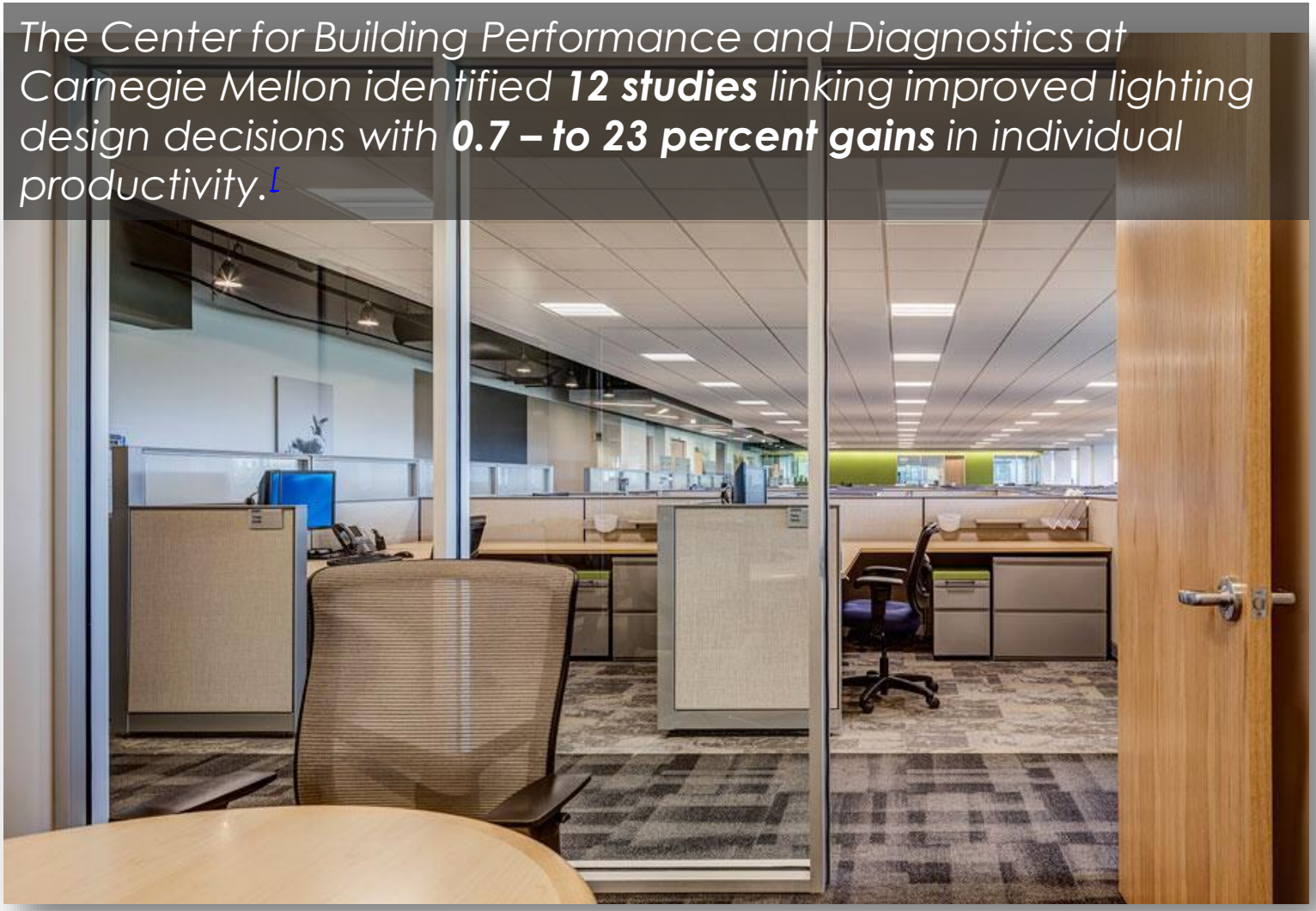
"Lighting quality is the degree of excellence in a lighting installation, as judged against context-specific goals in three domains; individual (end-user) well-being, architecture, and economics."

-Dr. Peter Boyce



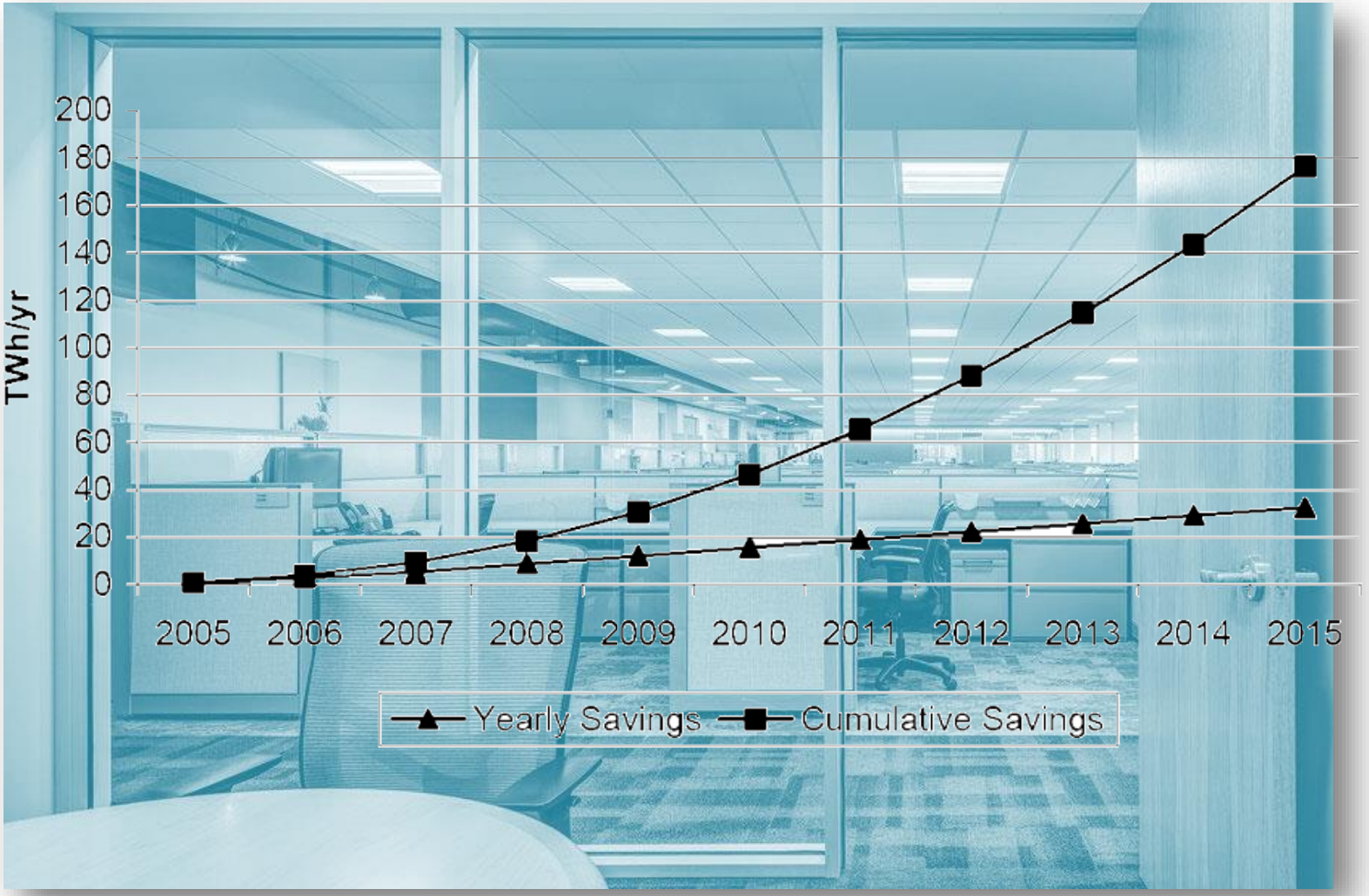
Quality Lighting Design: Enhances Employee Productivity

*The Center for Building Performance and Diagnostics at Carnegie Mellon identified **12 studies** linking improved lighting design decisions with **0.7 – to 23 percent gains** in individual productivity.*[1]



Light Right Consortium, 2010

Quality Lighting Design: Energy Efficiency Potential



Total Potential Task/ambient + controls Energy Savings in US Offices
Pacific Northwest National Laboratory 2004

Lighting Quality and Sustainability

"Light is a strategic environmental resource"

-Mark Loeffler,
Architectural Lighting Magazine, 2007

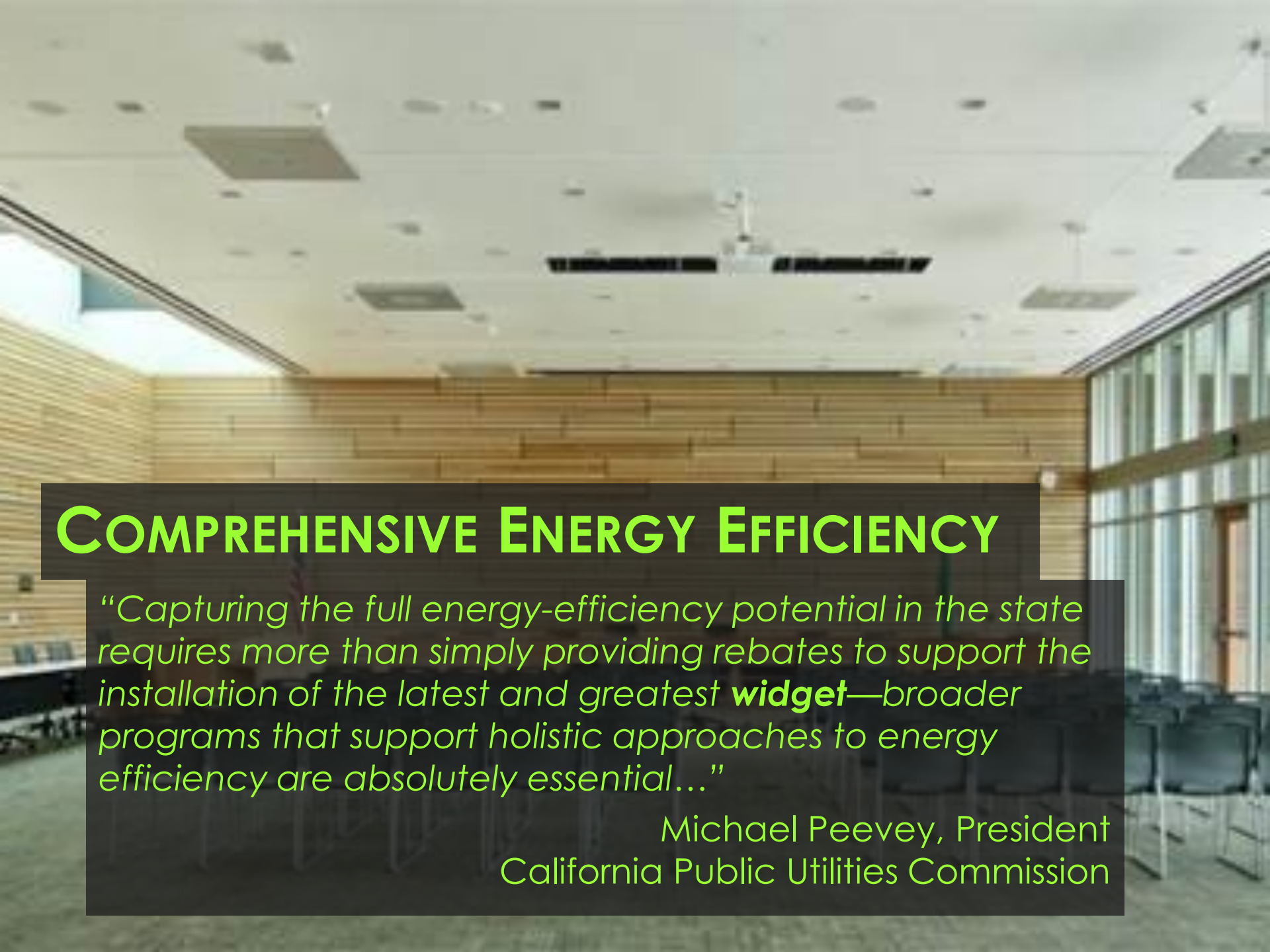
"Sustainable lighting meets the qualitative needs of the visual environment with the least impact on the natural environment."

IESNA Sustainability Committee, 2007

LEED BD+C v4

Up to **36** Lighting Related Points

- Energy & Atmosphere: Credit 2 -Optimize Energy Performance
  1-25 Points: Option 1 Reduced lighting energy per overall energy savings
  1-6 Points: Option 2 Interior Lighting Power/Interior Lighting Controls
- Indoor Environmental Quality: Credit 6 -Interior Lighting Control & Quality
  1-2-Points: Option 1 Control
  Option 2 Quality
- Indoor Environmental Quality: Credit 7- Daylighting
  3-Points: Option 1 Simulation: Spatial Daylight Autonomy
  Option 2 Daylit Floor Area,
  Option 3 Site Measured Results



COMPREHENSIVE ENERGY EFFICIENCY

*"Capturing the full energy-efficiency potential in the state requires more than simply providing rebates to support the installation of the latest and greatest **widget**—broader programs that support holistic approaches to energy efficiency are absolutely essential…"*

Michael Peevey, President
California Public Utilities Commission

PERFORMANCE LIGHTING -NC

- A tiered lighting energy saving program targeting new construction projects.
- **Tier one** is an incentive for lighting designs that exceed the code required lighting power lighting power density of a project by **15%**
  $0.60 per watt saved
- **Tier two** is for projects that exceed lighting power density of a project by **25%.**
  $1.20 per watt saved
- These generous incentives challenge the design team to achieve energy savings while using their creativity to address the lighting needs of their client.

Performance Lighting
Code Based Incentives

- New Construction or Major Renovation
- Based on savings beyond State or local energy code. Verified by COMcheck

Incentive =
($0.40 or $1.20) x (W/Sq.Ft. saved over code) x (Sq.Ft. of space)

Based on:
Lighting Power Density -LPD
Watts Allowed Per sq. ft
(W/Sq.Ft.)

Performance Lighting -Retrofit & New Construction

Incentive Process –

Identify the energy code LPD for the space or building type

Design lighting to exceed code by 15% or 25%
Specify DLC or Energy Star qualified fixtures.

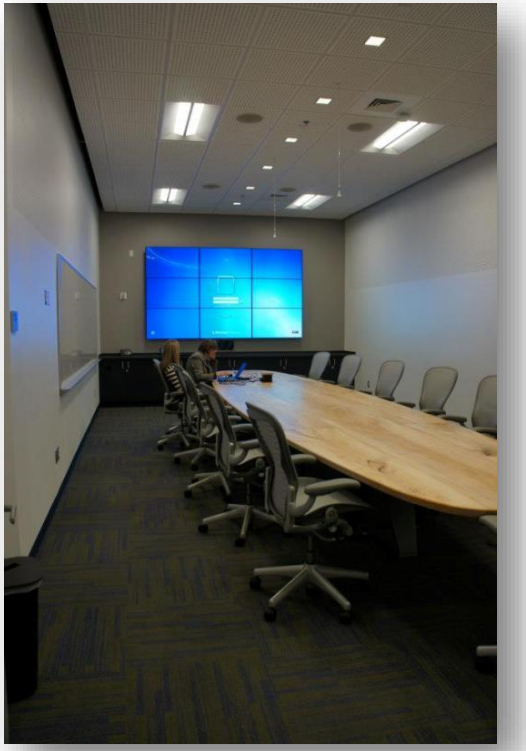
Fill out the application. Submit to EE sales person with cut sheets for each fixture type

EE sales person verifies your information and processes your application.
A pre-approval letter will be sent to you.

An incentive check will be issued to the building owner. A post installation inspection will verify that what was designed was installed.

Network Lighting Controls

- NLC goals are to obtain substantial lighting kWh savings by using the full capabilities of digitally programmed and networked lighting controls and sensors.
- NLC strives to improve the long-term duration and accuracy of energy savings through improved training, commissioning, and verification.
- NLC takes advantage of networked digital lighting control systems that are programmed to suit the needs of each individual space and its use over time.



Networked Lighting Controls

Project Incentives

- >Qualifying projects will receive incentive of **$0.50 per sq/ft** .
  - Project incentives are subject to Custom Application guidelines:
  - Up to a maximum of $200,000 per project
- **80%** initial payment,
  20% after commissioning (3 months)

Networked Lighting Controls

Project Qualifications

- **>25,000 sq/ft** or greater
- New construction, major renovation and retrofit projects are eligible
- Pre-Qualified Lighting Control Systems required.
- Controls system must achieve **40% kWh savings** below IECC 2012 (ComCheck)
- Requires the involvement of qualified lighting or engineering professional -PE., Lighting Certified LC or IALD

Network Lighting Controls -Retrofit & New Construction

Incentive Process –

Design lighting controls to exceed code by 40% determined through energy modeling

Specify NLC approved controls system

Model the designed controls system, must exceed energy code performance by 40%

Fill out the application. Submit along with controls system cut sheets, layout and controls schedule

Submit to EE sales person who verifies your information and processes your application. A pre-approval letter will be sent to you.

An incentive check covering 80% will be issued to the building owner. 3 mos. after system commissioning is verified the remaining 20% incentive will be issued.

Sustainable Office Design -Program

What:

- New Initiative co-sponsored by NU and National Grid in MA and RI
- Focus is : Tenant Fit-out “Office” Spaces
- Measures: High performance lighting & controls
- Participants must meet specified design criteria in order to collect incentive

Why:

- Missed opportunity in this market segment in past due to quick turn-around time
- Focus on reducing owner-tenant division of costs/benefits

How:

- Builds around prescriptive efficiency package that allows **for quick review and turnaround**, consistent for use with rapid projects such as tenant fit-outs

Sustainable Office Design -Requirements

- Minimum Space Requirement
  7,500 sf
- Open Office Component
  >40%
- Partition Heights
  < 48 inches
- Lighting Power Density
  < 0.675 w/sf
- Control Density
  < 290 sq/ft per control point

Note: These requirements both meet and exceed the IECC 2012 code (Update pending in July, 2014).

Application Process (Target Timing: 1 month)

Role: Identify projects, support application delivery	**Role:** Review applications/ Address eligibility questions / Check required documents	**Role:** Verify project eligibility/Approve incentive	**Role:** Process pre-approval letter for incentive payment upon occupancy	**Role:** Verify compliance with program post-project

LIGHTING DESIGNER INCENTIVE -LDI

The LDI program will also increase lighting designer participation in retrofit projects. LDI projects will have greater persistence because they are designed by professionals who are qualified to balance the human needs of the project with the performance requirements of the lighting, ***creating quality lighting designs that are "right-sized" for the project .***

LDI – Criteria

- LDI incentive goes directly to the lighting design team to fund their design and modeling efforts to achieve deep lighting energy savings.
- The lighting designer receives a sum equal to 20% of the total utility lighting incentives achieved for this project, up to $15,000.00
- 80% of the LDI payment will be paid upon confirmation of the project's lighting installation and controls initialization. The remaining 20% will be paid three months after lighting system initiation and commissioning.
  This incentive may also be divided to allow for a phased project schedule.
- The lighting designer must be qualified to perform lighting design only, and not profit from the sell of product. This is ensure that lighting design decisions are based on effectiveness and not profit.

LDI – Criteria

- Lighting power density must be at least 15% below the allowance determined according to section C405.5.2 of IECC 2012
- Projects must have advanced controls that exceed code mandated lighting controls, or must participate in the Mass Save Network Lighting Controls (NLC) initiative.
- The design team must produce lighting specifications that follows the guidance of the IALD “Guidelines for Specification Integrity”.
- Specified lighting fixtures must be either Energy Star or DesignLights Consortium- DLC listed, or meet the Energy Star or DLC Technical Requirements. All exceptions must be reviewed and approved by the utility program administrator.
- A signed approval letter from the project owners allowing this financial incentive to be paid to the lighting design firm or person who managed the design, specification, coordination and engineering of the lighting.

LDI – QUALIFICATIONS

- Lighting Designer, Architect or Engineer must have at least one of the following qualifications:
  - Lighting Certified -**LC** granted to those who successfully complete the NCQLP (National Council on the Qualifications of the Lighting Professions) Lighting Certification Examination
  - **CLEP** certification from the Association of Energy Engineers (AEE)
  - International Association of Lighting Designers (**IALD**) Professional Membership status.
  - **IALD Credential** (http://www.iald.org/about/IALDCertificationNews.asp)
- Lighting Designer may not receive compensation related to the sale of lighting products or work for an organization that receives revenue related to the sale of lighting products**, Lighting manufactures reps are not eligible for LDI.**
- Lighting Designer must have at least (5) years of experience designing lighting for architecture

LDI – Process

Schematic Design

Design Development

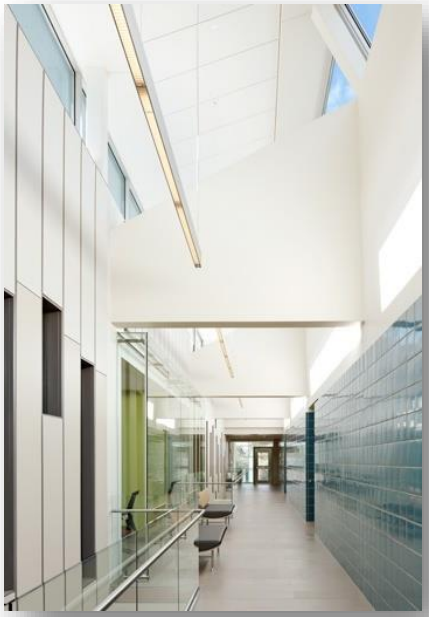
Construction Documents

Construction Administration

Post Occupancy

1. Lighting designer submits application indicating intent to participate in the LDI program and their qualifications as a professional lighting designer. They also indicate that they will design the lighting for this project to meet the LDI criteria.
2. Lighting designer submits authorization form to owner who signs it directing the LDI incentive to be paid to the lighting designer.
3. Lighting designer designs the most energy efficient, quality lighting design and controls system that exceeds local energy code. They work with our energy efficiency sales team to identify project incentives.
4. Lighting designer submits lighting incentive program applications for this project to the utility energy efficiency sales person to process.
5. Lighting design is submitted for LDI incentive for project. The lighting designer receives 80% of the initial payment upon approval.
6. Three months after lighting system is initiated, the lighting designer submits documentation verifying lighting controls system performance
7. After project is post inspected verifying lighting system performance and energy savings. Lighting designer receives final 20% of LDI incentive payment.
8. Project will have substantial M&V for one year to verify energy savings, this will include an occupant satisfaction questionnaire.

DAYLIGHTING DESIGN INITIATIVE (PROPOSED)



- Based on the **LEED BD+C v4 Daylight** credit along with robust **Daylighting Controls**
- Three tiered incentives based on the number of Daylighting points obtained –possible 1-3
- Requires daylight computer simulations and energy modeling.
- Modeling must demonstrate an annual decrease in total daytime lighting energy use of **>50%**
- This incentive includes glare and solar heat gain reduction strategies that limits the number of occupied hours of excessive direct sunlight.
- Incentivized daylighting technologies include: light-pipes, skylights, automated shades & louvers.

The Future?
What would **you** like to see?

- Dimming added to Technical Requirements
- Lighting Design not being constrained by program QPL
- "Future Proofing" LED fixtures through Zhaga Standards
- Tiered DLC. Based on which criteria?


Thank you
Presenter:
Edward Bartholomew, LC, LEED AP, IES
Commercial Lighting – Program Manager | National Grid
Photo Credit: Integrated Design Lab Puget Soun

LOCATING QUALIFIED PRODUCT INFORMATION

- http://www.energystar.gov/productfinder/product/certified-light-bulbs/results
- http://www.energystar.gov/productfinder/product/certified-light-fixtures/results
- http://www.designlights.org/QPL