



# Market Transformation through Quality Lighting

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DOE SSL Market Development Workshop

# Consider this...

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## A LIGHTING PROGRAM...

- ▶ Is based on market transformation rather than resource acquisition
- ▶ Teaches designing better-than-code rather than one-for-one replacement
- ▶ Focused on lighting quality
- ▶ Encompasses the lighting project rather than just the energy efficient product
- ▶ Is technology neutral
- ▶ Pays trade allies – lighting decision makers

# Meet the...

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## COMMERCIAL LIGHTING BUSINESS PARTNERS PROGRAM

- ▶ Program Administrator (PA): New York State Research and Development Authority (NYSERDA)
- ▶ Developed in 2000 to transform hard-to-reach small commercial market through extensive training of mid-market players
- ▶ Continuously operating since initial release
  - Changes in technology
  - Changes in industry best practices

# Broad Flexible Definition

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## EFFECTIVE, ENERGY-EFFICIENT LIGHTING DESIGN

Lighting systems that are optimally designed to meet specific application and energy-efficiency needs. The systems are easy to use, aesthetically pleasing, and enhance the visual capability of people using the space.

# Defining...

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## EFFECTIVE, ENERGY-EFFICIENT LIGHTING



© David Sundberg / Esto  
FXFOWLE Architects LLP  
Lighting Design: Illumination Arts  
National Audubon Society Headquarters  
CLP-qualified (2007)

# Quality Metrics

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## THE LIGHTING CRITERIA

- ▶ Color Rendering Index (CRI)
- ▶ Luminous Intensity (Glare) or Advanced Lighting Distribution with Glare Control
- ▶ Mean Illuminance (Light Level)
- ▶ Illuminance Uniformity (Light Uniformity)
- ▶ Energy Use (Watts per square foot)

# Quality Metrics

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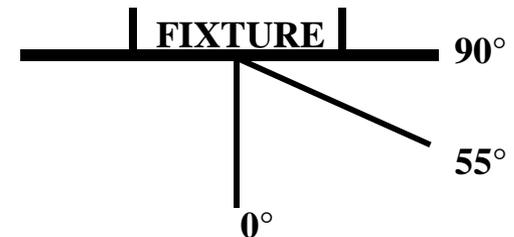
## COLOR RENDERING INDEX (CRI)

- ▶ A minimum of 80 CRI is required in most spaces except for:
  - Storage, electrical/mechanical areas, closets and parking garages are exempt from this criteria.
- ▶ Note: CRI is not a perfect metric
  - Illuminating Engineering Society (IES) formed a Color Metric Task Group in March 2013
  - Task group developing path to a new color metric
  - No other metric available yet

# Quality Metrics

## LUMINOUS INTENSITY (GLARE)

- ▶ Measurement of light emitted from the lighting fixture in a specific direction.
- ▶ Open offices – not to exceed 300 candela @ 55°.
- ▶ All other applications – not exceed 600 candela @ 65°.
- ▶ Fixtures mounted more than 15ft. above the floor are exempt.



## Candela Distribution

Vertical Angle	Horizontal Angle			Zonal Lumens
	0	45	90	
0	877	877	877	
5	868	876	884	84
15	843	860	868	242
25	792	794	785	364
35	713	672	658	424
45	592	528	536	418
55	420	386	424	359
65	239	266	352	280
75	102	183	254	188

# Quality Metrics

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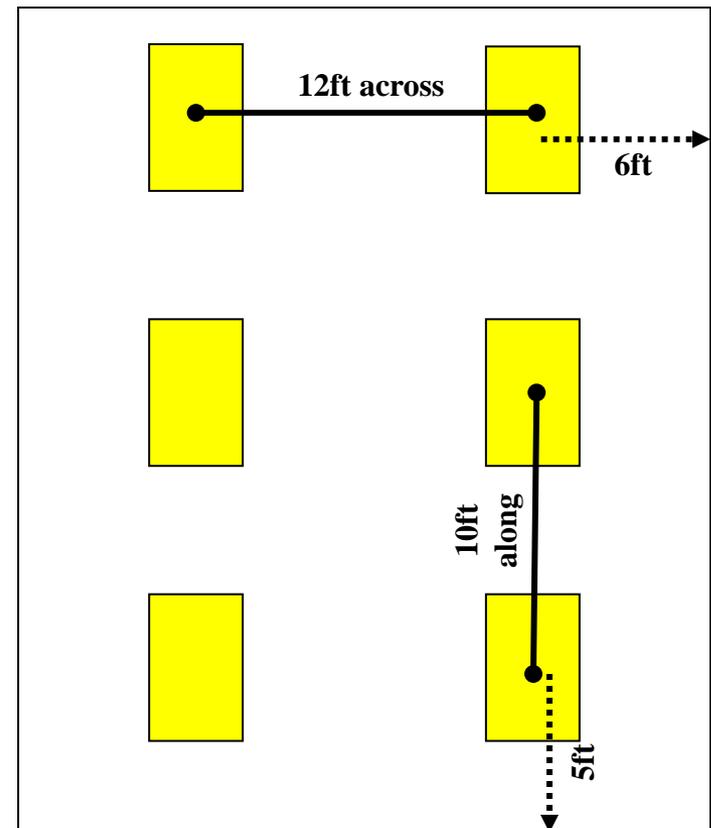
## HORIZONTAL MEAN ILLUMINANCE

- ▶ AVERAGE ambient light level (footcandles) in the space.
- ▶ Recommendations depend on the task, and are based on the Illuminating Engineering Society (IES) Handbook.
- ▶ The initial lamp lumens, fixture efficiency, and ballast factor all have an impact on the light level.

# Quality Metrics

## ILLUMINANCE UNIFORMITY - MAX TO MIN LIGHT LEVELS

- ▶ Horizontal and vertical
- ▶ Fixtures must be spaced within the spacing criteria (SC) listed on the fixture photometric/specification sheets
- ▶ SC may be different across and along
- ▶ This does not apply to accent fixtures



# Quality Metrics

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## ENERGY USE

- ▶ Based on the ASHRAE/IESNA Standard 90.1–2007 Lighting Power Allowances less at least 10%.
  - Example: if Standard 90.1 allows 1.0 Watt per square foot, then CLP-qualified projects can not exceed 0.9 W/sf
  - ASHRAE Standard version by state code
- ▶ Some spaces are allowed additional lighting power for decorative/accent lighting
- ▶ Changing with the NYS Energy Code on Jan. 1<sup>st</sup>

# Quality Metrics

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## CONTROLS – OCCUPANCY SENSORS

- ▶ Lighting controls that automatically turn off lights when the space is vacant are required:
  - Private Offices
  - Conference Rooms
  - Break Rooms
  - Warehouses
  - Restrooms
  - Classrooms

# Quality Metrics

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## SPECIFIC TECHNOLOGIES – MINIMUM REQUIREMENTS

- ▶ Fixtures using 4-foot linear fluorescent T8 lamps must include CEE Qualified High Performance T8 lamps and ballasts or Reduced Wattage T8 lamps and ballasts.
- ▶ LED luminaires must be listed on the ENERGY STAR® or DesignLights Consortium® Qualified Product Lists (QPLs).

# Program Evolution

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## SIZE & INCENTIVES SCALABLE - COST CONTROL

- ▶ Small Commercial Lighting Program projects
  - 1,000 to 10,000 square feet – Paid ~\$0.05/sf
  - 1,000 to 25,000 square feet – Paid ~\$0.04/sf
  - Incentives sliding scale based on size
- ▶ Commercial Lighting Program projects
  - 1,000 to 100,000 square feet – Paid ~ \$0.035/sf
  - Incentives sliding scale based on size
- ▶ Today: Commercial Lighting Program projects
  - 1,000 square feet to any size – Paid ~ \$0.03/sf
  - Incentive amounts capped ~ 200,000 square feet

# Program Results

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## IN NEW YORK STATE SINCE PROGRAM RELEASE

- ▶ Over 1,250 lighting practitioner companies have joined the program
- ▶ Over 2,850 individuals have been trained in the principles of effective, energy-efficient lighting design;
- ▶ Over 2,250 projects have been implemented or designs developed **totaling 23,811,366 sf**;
- ▶ Peak demand reduced by over 33,500 kW, with energy savings of over **162 GWh**.  
**(~6.8 kWh/sf)**

# Accomplishments

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- ▶ Recognized as an “Exemplary Program” by the American Council for an Energy-Efficient Economy (ACEEE) in 2007.
- ▶ Received an ACEEE Honorable Mention in 2010 for effective lighting design training assistance resulting in over 90 GWh in energy savings

# Program Variations

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## SIMILAR ELEMENTS USED IN OTHER PROGRAMS

- ▶ Bonus is paid to the customer (not to the trade ally) – higher \$\$ per kWh savings on a sliding scale based on how much better than code
- ▶ Limited to Trade Allies that have successfully completed 5 or more regular lighting projects
- ▶ Based on “better than code” for lighting power density
- ▶ Must address ALL areas of the building

# Summary

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- ▶ Programs based on designing “better than code” are feasible
- ▶ Quality lighting design advances programs beyond one-for-one replacement
- ▶ Quality metrics remain technology neutral