NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Lighting Research Center Rensselaer

LED Street Lighting Academy

Help is on the Way

September 10, 2019

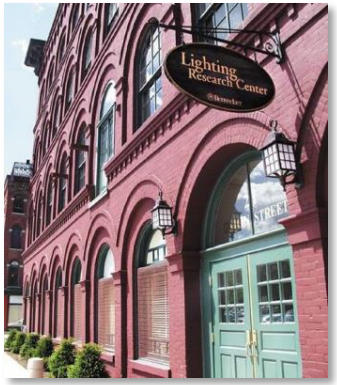
Introduction

About the Lighting Research Center

Advancing the effective use of light for society and the environment

30,000 sq. ft. research center and laboratory

Established in 1988 by the New York State Energy Research and Development Authority (NYSERDA)



40-60 concurrent projects in field and lab

Focus Areas: Energy, Technology Development, Human Health, Lighting Benefits, Transportation and Safety, Product Testing, Plant Health, Design

~30 full-time faculty and staff

15 graduate students

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Outline for Today's Webinar

- What are the purposes of street lighting?
- Determining if street lighting is needed
- Components of "good" lighting
- Opportunities for LED lighting technology
- Services offered by this program
- Questions and answers

Purposes of Street Lighting

Purposes of Street Lighting

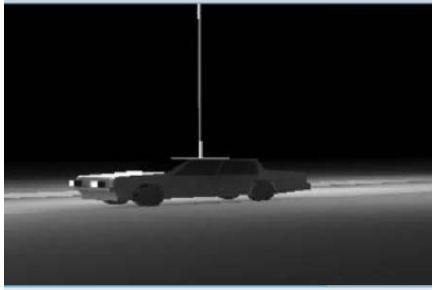
Lighting is installed for several reasons:

- **Visibility** – lighting helps us see at night
- **Nighttime crash reduction** – if visibility is improved, there should be fewer crashes
- **Driver comfort** – street lighting can help reduce glare for drivers and pedestrians
- **Perceptions of safety** – street lighting makes us feel safer at night
- **Crime reduction** – many people feel street lighting will reduce criminal activity

Improved Visibility

- Street lighting provides “quick, accurate and comfortable visibility at night” (*Illuminating Engineering Society*)
- Street lighting increases drivers’ visual range beyond their headlights
  - Low beam headlights provide safe visibility only up to 35-40 mph
- Street lighting provides figure-ground information needed for visual judgments

Roadway lighted by only car headlamps



Roadway lighted by car headlamps and fixed roadway lighting

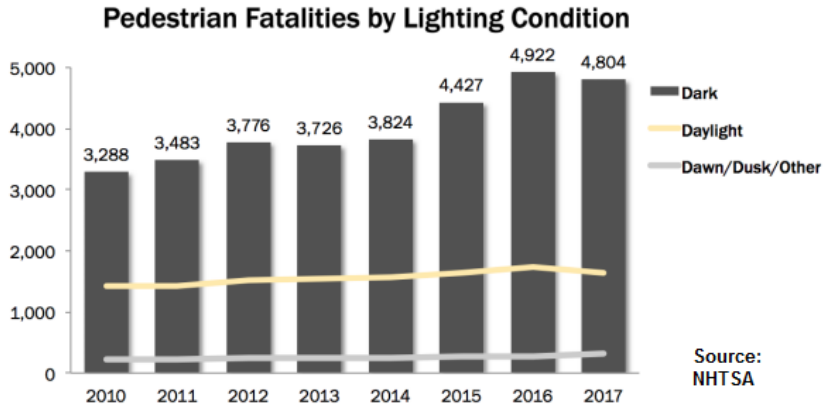
Nighttime Crash Reduction

- Improved visibility **should** reduce crashes
- Most reviews and studies of street and roadway lighting show a beneficial effect
- Amount of crash reduction is directly related to amount of nighttime traffic

Conditions		Effect	95 % conf.
All		-54 %	-56 %, -52 %
Weather conditions	Fine weather	-54 %	-56 %, -52 %
	Rainy weather	-45 %	-53 %, -37 %
	Foggy conditions	0 %	-15 %, +18 %
	Snowy weather	-26 %	-40 %, +8 %
Road surface conditions	Dry road surface	-56 %	-59 %, -54 %
	Wet road surface	-46 %	-50 %, -43 %
	Snow / ice covered	-22 %	-31 %, -11 %
Road user	Pedestrian	-70 %	-77 %, -61 %
	Bicycle	-60 %	-65 %, -54 %
	Moped	-61 %	-64 %, -56 %
	MC	-26 %	-42 %, -5 %
	Automobile	-50 %	-52 %, -47 %
Accident type	Hit fixed object	-54 %	-58 %, -49 %
	Frontal collisions	-50 %	-55 %, -43 %
	Flank collisions	-46 %	-51 %, -41 %
	Hit animal	-57 %	-63 %, -50 %
	Rear end collisions	-51 %	-54 %, -46 %

Pedestrian Safety at Night

- Pedestrians are at especially higher risk at night
- Pedestrian fatalities at night have increased in past 10 years after declining steadily
- Lighting can be a factor in helping cut through distraction

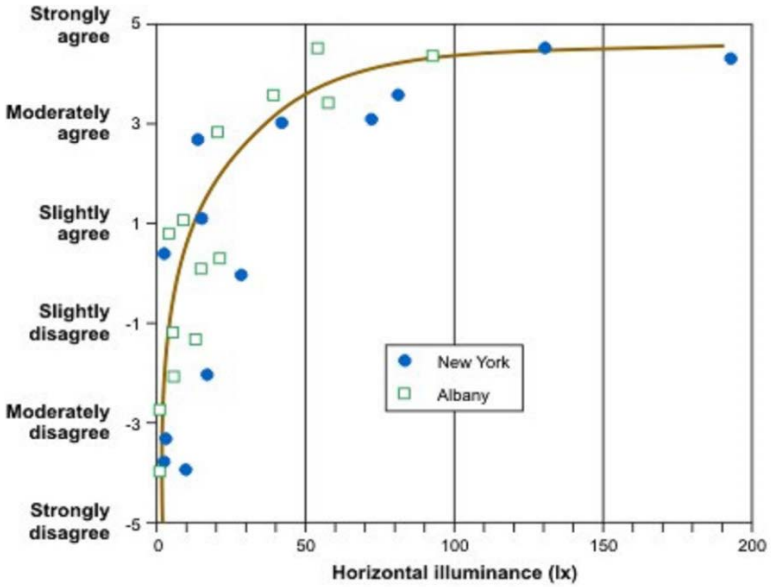


Improved Visual Comfort

- Glare from headlights and other bright lights is the main factor affecting comfort on streets at night
- Street lighting increases ambient brightness, reducing the difference between the street and bright lights, reducing glare

Improved Sense of Safety and Security

- Lighting at night can make a location feel safer
- The LRC has shown relationships between light levels and judgments of safety and security
  - Albany and NYC judged similarly!
- This approach has diminishing returns



Impacts of Lighting Color on Perceived Safety

- Perceptions of safety appear to be directly related to how bright a street appears
- “White” light sources such as light emitting diode (LED) street lights increase brightness perception over “yellow” sodium lights

Street Lighting and Crime Reduction

- It is widely believed that street lighting reduces crime
  - We feel safer
  - We can see faces and hiding spots more easily
- Studies of street lighting and crime have had mixed results
  - In one case lighting increased theft from vehicles
- Lighting alone will not prevent crime

Determining if Street Lighting is Needed

Factors to Consider in Decisions to Install Street Lighting

Traffic

- What is the traffic density in the location?
- What is the posted speed limit?
- What is the crash history in the location?

Pedestrians

- How heavy is pedestrian use?
- How does pedestrian use vary throughout the night?

Factors to Consider in Decisions to Install Street Lighting (cont'd.)

Type of neighborhood

- What is the type of area (commercial or residential, rural or urban)?
- What types of buildings are found in the area (homes, businesses, schools, offices)?

Safety

- Is the location perceived as safe or unsafe?

Factors to Consider in Decisions to Install Street Lighting (cont'd.)

Geometry

- Number of lanes on the street
- Street width
- Presence of sidewalks or shoulders
- Are there slopes or curves?
- Does the street have a median?

Characteristics of “Good” Street Lighting

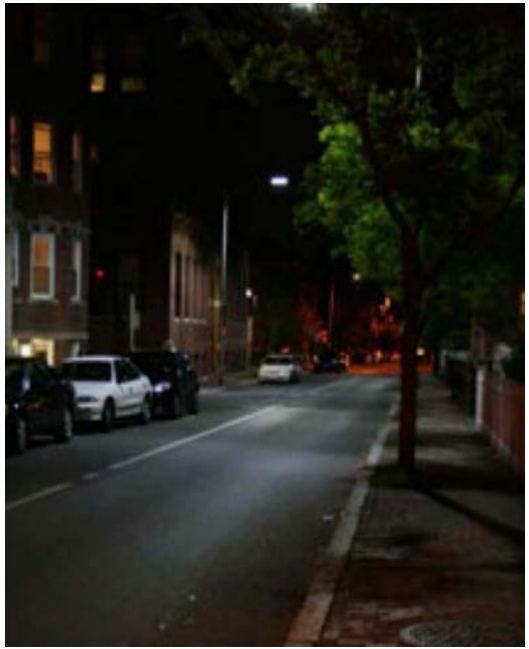
What Factors Contribute to Good Street Lighting?

Light level

- Depends upon specific situation
- Busy intersections need more illumination than straight, low-speed streets

Uniformity

- Avoid contrast between light and dark regions of the street and sidewalks



What Factors Contribute to Good Street Lighting?

Aesthetics and appearance

- Luminaires (light fixtures) should fit the character of an area

Cost

- Initial (purchasing and installation)
- Operating (energy and maintenance)

What Factors Contribute to Good Street Lighting (cont'd.)?

Glare control

- Avoid light fixtures that do not shield view of the light source
- Low mounting heights can be problematic

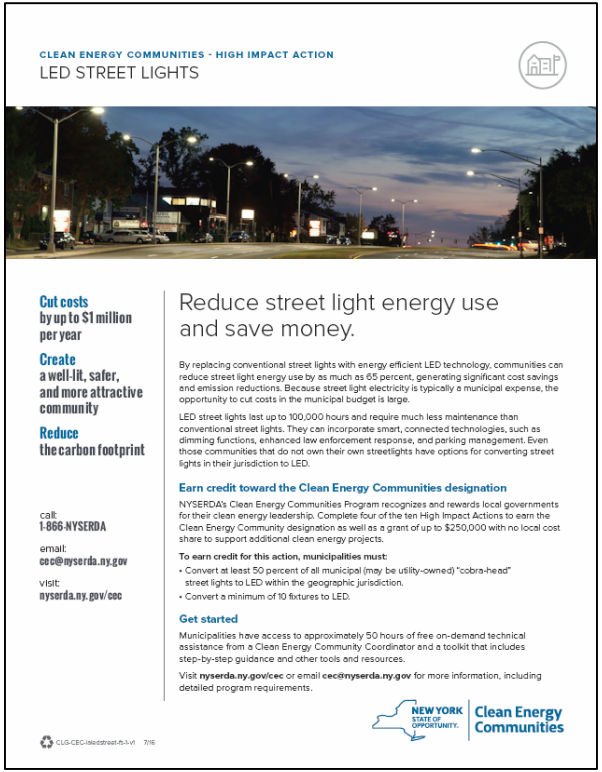
Light pollution control

- Sky glow
- Light trespass (shielded or properly located)

Opportunities for LED Lighting Technology

Status of LED Technology

- Light emitting diode (LED) technology is a cost-effective source for street lighting
- Economics of LED street lighting are favorable relative to high pressure sodium (HPS) lighting systems



CLEAN ENERGY COMMUNITIES - HIGH IMPACT ACTION

LED STREET LIGHTS

Cut costs by up to $1 million per year

Create a well-lit, safer, and more attractive community

Reduce the carbon footprint

call:
1-866-NYSERDA

email:
cec@nyserda.ny.gov

visit:
nyserda.ny.gov/cec

Reduce street light energy use and save money.

By replacing conventional street lights with energy efficient LED technology, communities can reduce street light energy use by as much as 65 percent, generating significant cost savings and emission reductions. Because street light electricity is typically a municipal expense, the opportunity to cut costs in the municipal budget is large.

LED street lights last up to 100,000 hours and require much less maintenance than conventional street lights. They can incorporate smart, connected technologies, such as dimming functions, enhanced law enforcement response, and parking management. Even those communities that do not own their own streetlights have options for converting street lights in their jurisdiction to LED.

Earn credit toward the Clean Energy Communities designation

NYSERDA's Clean Energy Communities Program recognizes and rewards local governments for their clean energy leadership. Complete four of the ten High Impact Actions to earn the Clean Energy Community designation as well as a grant of up to $250,000 with no local cost share to support additional clean energy projects.

To earn credit for this action, municipalities must:

- Convert at least 50 percent of all municipal (may be utility-owned) "cobra-head" street lights to LED within the geographic jurisdiction.
- Convert a minimum of 10 fixtures to LED.

Get started

Municipalities have access to approximately 50 hours of free on-demand technical assistance from a Clean Energy Community Coordinator and a toolkit that includes step-by-step guidance and other tools and resources.

Visit **nyserda.ny.gov/cec** or email **cec@nyserda.ny.gov** for more information, including detailed program requirements.

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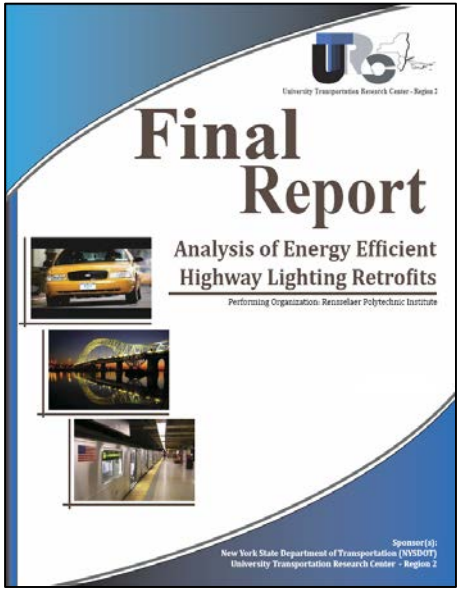
Economics of LED Lighting

- LED technology is still rapidly evolving (and improving)
- Higher efficacy and longer life than sodium street lighting
  - In Albany County, NY, replacement of sodium with LED streetlights along 3.5 miles of road could result in payback of 2-4 years based on energy/maintenance savings
  - Dependent upon utility/ownership model



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Services Offered by This Program

Additional Webinars (2nd Tuesdays @ 10am)

October 8th: Talking Tech – How LED Street Lights Compare

- LED technology and performance, selecting appropriate wattages

November 12th: Planning for Success with LED Street Lighting

- Developing new/retrofit layouts, anticipating costs and savings

December 10th: Understanding Impacts on the Public

- Selecting color characteristics, benefits of adaptive control strategies

Technical Assistance is Available

NYSERDA offers limited technical assistance to municipalities looking to convert street lighting to LED technology

- Assistance with product selection
- Technical analysis of light levels/distributions
- Evaluation of existing/replacement lighting

Contact your Clean Energy Communities coordinator to get started

Thank You!

Questions & Answers