NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting

for Municipal Elected/Appointed Officials

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New York State Energy Research and Development Authority

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i. Introduction

Street lighting is an integral part of the municipal environment, serving communities and local businesses, promoting economic development, and enhancing safety, security, and the aesthetic appeal of surrounding property. However, many municipalities are not aware of all the available choices in technology and design. While municipalities may have certain goals in mind, they might not know how to begin the process or what questions to ask when researching opportunities. New York State municipalities have expressed interest in a publication that defines effective street lighting and provides guidance for municipal officials and planners in implementing effective energy-efficient street lighting projects.

Purpose of this Guide

The *NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Elected/Appointed Officials* (the Guide) helps officials understand the issues surrounding street lighting and the benefits of an effective energy-efficient design. Section I provides the necessary information to understand what effective energy-efficient street lighting is and what its benefits are for municipalities and the public. Section II outlines several steps that should be followed to help clarify the street lighting project goal, and identify design issues and constraints. In addition, the Guide provides information to help communicate effective energy-efficient street lighting principles with vendors, utilities and design professionals, and to explain the benefits to city/town officials, boards, municipal staff, local businesses and the general community.

This Guide can also be used:

- To educate procurement staff about effective energy-efficient street lighting options.
- To understand the important issues of effective energy-efficient street lighting, and gain the knowledge to make informed street lighting procurement decisions.
- To promote effective energy-efficient street lighting options to commissioners, city/town/county officials and the general public.
- As a reference source of effective energy-efficient street lighting installations within New York State.

The NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting is comprised of two companion guides:

- ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Elected/Appointed Officials***
- ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers***

The *NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Elected/Appointed Officials* offers general information for decision makers at the city/town level. The companion to this Guide, the *NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers*, provides specific technical information for the design and evaluation of the project. For your convenience, both guides are included in this packet along with a list of existing effective energy-efficient street lighting installations in New York State.

The *NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting* is a valuable resource to help make informed street lighting decisions. This Guide promotes current accepted practices and is not intended to replace existing industry design specifications.

I. Effective Street Lighting Principals and Opportunities

Why Do We Use Streetlights?

Municipalities generally install street lighting for practical reasons, and sometimes simply for aesthetics. A municipal elected/appointed official should understand the reasons for street lighting in order to convey the important needs of the project to budget committees, other officials and the public. Several reasons for installing street lighting are:

- To increase perception of safety and security.
- To reduce vehicular accidents.
- To improve pedestrian visibility.
- To increase commerce.
- To help create a particular architectural "look" or style.
- To illuminate building facades and enhance surrounding architectural details.
- To respond to public demand.

It is also worth noting that in some instances, in particular when issues of glare, light trespass, or light pollution are of significant importance, it can be appropriate ***not*** to install street lighting at all. This can be true particularly in some rural or suburban areas where vehicular traffic is light and where residents' quality of life is enhanced by a relatively dark environment that maximizes the view of the nighttime sky. Similarly, some street lighting projects might consist of eliminating or reducing the use of lighting in certain areas.

What is Effective Energy-Efficient Street Lighting?

> Effective energy-efficient street lighting uses a balance of proper energy-efficient technologies and design layout to meet performance, aesthetic and energy criteria required by pedestrians, motorists, community residents, municipalities and utilities.

Today, most street lighting is selected based solely on providing a recommended amount of light to a roadway, or as is the case with many business district improvement projects, selected based on the general style of the pole and fixture to meet architectural requirements. Effective energy-efficient street lighting design integrates efficient lamp technologies, optimum pole placement, efficient fixture photometrics (light distribution), and aesthetics while using the least amount of energy and meeting various visual performance requirements in addition to light levels.

Table 1 shows four street lighting options that provide similar illumination, but the lighting quality and costs differ. Consider the following:

- The Mercury Cobrahead option is a typical initial low cost inefficient light source. Notice it uses a 400W bulb (consuming more energy) compared to the other lower wattage options, plus its total annualized cost is high.

- The Metal Halide Cobrahead and Metal Halide Cutoff options are more efficient and have a lower annual cost. The Cuttoff option better controls the light and reduces light trespass (extraneous light on adjacent property).
- The most energy-efficient *and* highest quality option (in terms of light control, distribution and color rendering) is the Metal Halide Cutoff. Note, pulse-start metal halide (PSMH) lamps provide even greater energy efficiency compared to standard metal halide.
- The Metal Halide Post Top option is a more decorative option with a lower mounting height that requires more posts, thus the higher costs. Because it uses lower lamp wattage it may help meet design needs, such as reduced glare.
- The High Pressure Sodium Cutoff system is the most energy-efficient and will often require fewer poles, thus resulting in lower energy and maintenance costs. However, the color properties of high pressure sodium are only fair and should only be used when color rendering is not critical.

Table 1

Economic Analysis Comparing Several Street Lighting Systems





	Mercury Cobrahead	**Metal Halide Cobrahead**	**Metal Halide Cutoff**	**Metal Halide Post Top**	**High Pressure Sodium Cutoff**
Luminaire name	Cobrahead	Cobrahead	Type III Cutoff	Decorative Posttop	Type III Cutoff
Lamp type	400W MV	250W MH	250W MH	150W MH	250W HPS
Number of luminaries	12	12	12	24	11***
Installed cost	$36672	$36240	$38880	$35904	$35618
Annual energy cost	$2391	$1551	$1551	$1997	$1419
Annual operating cost*	$2536	$1677	$1677	$2509	$1601
Total annualized cost**	$6271	$5368	$5637	$6166	$5229

* Includes energy and maintenance costs

** Includes initial, energy and maintenance annualized over 20 years

***Assumes a 10% reduction in the number of poles needed because of higher luminous efficacy of high pressure sodium. Color characteristics will be fair.

Technology Advances

The science of street lighting design has dramatically improved in recent years. In addition to better light sources and optical systems to effectively deliver light to the road surface, researchers have conducted numerous studies to better understand the human visual response to different types of electric lighting at nighttime. Below are several common characteristics of well-designed, effective energy-efficient street lighting systems.

Color Rendering Quality. Current metal halide lamps have better color properties than older mercury vapor lamps and high pressure sodium lamps. They render objects more colorful, pleasing and distinguishable[1,2] to motorists, pedestrians and business owners. Color rendering is very important in business districts where pedestrians, business owners and shoppers want colors to look natural. Furthermore, current research indicates that motorists have better peripheral visibility under metal halide compared to high pressure sodium lamps, at the same light level.[3,4,5]

Energy Efficiency. Many lamps (light bulbs) available today are much more energy-efficient than their predecessors. However, street lighting departments still commonly use lamps and technologies originally designed and installed 30 or more years ago.

Optical Control. Over the past couple decades, optical materials, design and manufacturing processes have made high-quality fixtures possible. Using computer-aided design, the optics of a fixture can be designed to maximize light reaching the road surface while minimizing unwanted and sometimes troublesome glare, light trespass, and light pollution.

For purposes of this Guide, glare, light trespass, and light pollution are defined as:

Glare: Excessive bright light shining directly into a person's field of view that either reduces visibility or causes annoyance.

Light Trespass: Excessive and unwanted light that shines directly on property beyond the intended target.

Light Pollution: Unwanted light in the atmosphere that contributes to sky glow.

Non-cycling Lamps. Many older lamps (bulbs) will not simply burn out, they will cycle on and off. This cycling often results in several maintenance calls because the failing bulb cannot readily be identified if it happens to be lit when the crew visits the street. Today, non-cycling lamps that extinguish when they have reached the end of their useful life are available. This results in fewer maintenance calls and cost savings.

Long Life Lamps. There are more lamp options available today, many with longer life than commonly available lamps. Current state-of-the-art technology such as electrodeless lamps offer lamp life up to 60,000 hours (12 yrs). Thus, maintenance savings can be substantial.

Cost Savings. Municipalities can save on energy, utility lease, installation, and maintenance costs by selecting the right street lighting technology and properly designing the layout.

Benefits of Effective Energy-Efficient Street Lighting

Almost all municipalities can benefit from effective energy-efficient street lighting. Existing street lighting installations can often be upgraded or improved; however, upgrades to existing systems generally do not take place until a larger capital improvement project is planned. Still, with some ineffective systems, such as those using mercury vapor lamps, upgrading to more energy-efficient technologies can often pay back through energy savings (see example box). New, renovated or relocated street lighting installations offer the greatest opportunities given that effective energy-efficient designs and technologies can easily be integrated into the plan.

Street Lighting Upgrade and Payback

Suppose a town whose lighting equipment, as well as, electrical service is provided by the utility wishes to replace 24 post top luminaires each containing a 175 watt mercury lamp and ballast. The new luminaires contain 100 watt high pressure sodium lamps and ballasts. Utility tariffs generally take into account the overall useful life of equipment, so the town might have to pay a fraction of the cost of the older luminaires if they want to upgrade luminaires before their useful life is completed. This is assumed to be half the original cost of the luminaires for this example, with a resulting up-front project cost $2,040. However, the reduction in energy use will save the town about $570 each year in reduced electricity charges, with a payback period of a little more than 3½ years:

- Depreciated cost of old luminaires: $85/luminaire × 24 luminaires = **$2,040**
- Reduction in energy costs: $2,573 (original system) - $2,002 (new system) = **$571**
- *Simple payback: $2,040/$571 =* ***3.6 years***

Suppose the town was going to switch to a system with luminaires containing 100 watt metal halide lamp/ballast systems, which provide better color rendering. This system would have slightly different operating costs and result in a slightly longer payback period:

- Depreciated cost of old luminaires: $85/luminaire × 24 luminaires = **$2,040**
- Reduction in energy costs: $2,573 (original system) - $2,139 (new system) = **$434**

Simple payback: $2,040/$434 = **4.7 years**

Effective energy-efficient street lighting installations offer the following benefits to the municipality, motorists, pedestrians and taxpayers.

Energy savings – Through the use of effective and energy-efficient technologies and design practices, excess energy usage can be avoided. Table 1 above shows how converting from mercury vapor to more energy-efficient lamps such as metal halide, or using fixtures that are efficient and spaced properly, can reduce energy costs.

Capital cost savings – Using the proper fixture spacing and placement can reduce capital costs because more efficient systems can use fewer poles and luminaires (fixture heads).

Maintenance cost savings – Using lamps with longer lives and layouts with proper spacing and placement can mean reduced costs for fixing 'burnouts' and painting or replacing damaged poles, resulting in lower annualized costs.

Improved sense of security – Selection of efficient equipment and proper layout design[6] can make an area appear safer and more secure, and in some cases can assist in reducing crime[7,8] without increasing light levels. In fact, light levels that are too high will ***not*** make an area seem safer.[2] Direct glare and high light levels can reduce perceptions of safety by making visibility more difficult.[9] Attention to uniformity[10] (even light distribution on the horizontal surface) and vertical illuminance[11] (light distribution on the vertical surface of buildings and people) can add to an person's sense of security.

Evenly lit roads and sidewalks – Using good design can improve visibility by avoiding overly bright and dark patches on roads and walkways.[12]

Reduced glare and improved visibility – Overly high light levels can create unwanted glare that decreases visibility. Careful selection of fixtures and lamps to enhance visibility could improve detection of pedestrians by motorists[3-5,13,14] and increase seeing distances beyond those provided by automotive headlights alone.[15]

Aesthetically pleasing – Fixtures with historic or stylized appearance can be combined with good optical control[16] to provide quality performance and attractive daytime appearance.

Economic development – Communities throughout the State and country see street lighting as an important part of improving economic development efforts in downtowns.[17-20]

NYSERDA has compiled a list, titled ***New York State Effective Energy-Efficient Street Lighting Installations***, of street lighting sites using advanced technologies, effective energy-efficient design techniques that have realized benefits as described above. This is located in Appendix B.

II. Project Steps

The previous sections have provided an overview of the basics of effective energy-efficient street lighting, why it is needed and the benefits. This section builds on that information and outlines several steps to help municipal elected/appointed officials move towards the selection, approval and installation of effective energy-efficient street lighting,

The steps below are not intended to cover all specific technical or design issues; rather, they provide municipal elected/appointed officials with a systematic approach to identifying the overall project goal based on individual municipal and public "drivers" for the project. The steps also outline design issues and constraints municipal officials should address with design professionals to assure street lighting needs are met with an effective and efficient quality design.

STEP 1: Identify the Overall Project Goal

Street lighting is often considered with only one specific "driver" in mind but there are other drivers that must be included and rolled together into one overall project goal. For example, an advocate for the street lighting may mention the project is being driven by "the need for lighting at an intersection and roadway so motorists can see," or "the local businesses want to increase the perception that the downtown district is safe and secure for nighttime patrons," or "the poles and fixtures are old and falling over, new stylish fixtures are needed that match local architecture." Because only one driver is usually mentioned, other real drivers (or needs) are often forgotten. Although these secondary drivers may not be considered as important, they need to be included to some degree in the overall project goal.

This section helps identify the overall project goal and the various individual drivers that are, or should be part of, that goal. Read the information for each driver listed below; then rate the importance of each relative to the others. After rating all the individual drivers, use that information to determine how the overall project goal should be stated. For example, an overall project goal could then be written as "The overall goal of the street lighting project is to upgrade the existing lighting in the downtown shopping district with energy-efficient stylish architectural fixtures, while maintaining or improving motorist visibility and pedestrian safety and security, and keeping operations and maintenance costs low."

Importance Least Most	**Individual Drivers**
1 ← → 4	Rate the drivers below accordingly on a scale of 1 to 4.

- ❑ ***Reduce Utility Costs*** – Because some street lighting installations in New York State still use older, inefficient mercury vapor (MV) or incandescent lamps, municipalities should consider retrofitting the lighting to pulse-start metal halide (PSMH) or high pressure sodium lamps (HPS). The retrofit can dramatically improve energy efficiency and in some cases, lighting quality.

  Use readily available energy-efficient streetlight lamps (bulbs) to reduce energy costs.

- ❑ ***Meet Public Desire for or against Street Lighting*** – Residents might prefer to have street lighting installed, or might prefer little or no street lighting. Residents who do not want street lighting (or very little street lighting) may agree to provide post-top lanterns or landscape lighting on their own property to meet any necessary safety and security needs.

  Street lighting projects should also meet public and resident needs, which may include the desired absence of street lighting.

- ❑ ***Replace Old Dilapidated Streetlights*** – Dilapidated poles and fixtures can be an aesthetic concern and potentially pose a safety issue. Replacing decades-old streetlights provides an opportunity to install a modern effective energy-efficient street lighting system that best suits the needs of the community.

  Although often costly, replacing streetlights is sometimes necessary and if carefully planned will yield energy savings and better lighting.

- ❑ ***Meet Security Requirements*** – Whether street lighting will help reduce crime is a complex question with few hard and fast answers. Extensive research and reviews of street lighting projects have shown that lighting can result in reduced incidence of some types of crimes in some areas while having no apparent impact in others.[7,8,10] Still, lighting impacts peoples' perceptions of an area. Research by the Lighting Research Center at Rensselaer Polytechnic Institute shows, for example, that with sufficient light levels (around an average of 3 foot-candles), people will rate an outdoor lighting installation as appearing to provide good security.[1,2] But simply increasing light levels might not deter crime.

  People perceive areas with <u>well-designed</u> street lighting systems as being more secure. However, increasing light levels may not deter crime.

- ❑ ***Meet Traffic and Pedestrian Safety Requirements*** – Many existing street lighting installations fall short of

  When safety issues are of prime importance, consult the recommendations of the Illuminating and Engineering Society of North America.

light level and other recommendations by the Illuminating Engineering Society of North America (IESNA). Of course, vehicles are equipped with headlights designed to illuminate the roadway surface, but well planned street lighting can help increase visibility of people and objects on the curb. Proper uniformity and light levels will minimize dark areas and shadows that otherwise could make it difficult to see pedestrians and objects along the sides of the road.

- ***Minimize Glare*** – Glare caused by streetlights can be uncomfortable and/or dangerous for motorists and pedestrians. A well-designed street lighting system directs light to the road surface and pedestrian areas, not into the eyes of motorists and pedestrians.

  Proper selection of technologies, placement and design can limit glare, which can be a nuisance and negatively affect safety and aesthetics.

- ***Limit Light Trespass*** – Unwanted trespass of light falling onto adjacent properties can be a nuisance and serious concern for citizens. An effective energy-efficient system limits streetlights from shining light where it is unwanted such as into windows, on private property, or on buildings. Light trespass can affect the quality of life among residents and lead to complaints. As concern grows for lighting trespass, municipalities need to be aware of any outdoor lighting laws, and the technologies and design options that place light only where it is needed.

  Proper selection of technologies, placement *and* design can help limit light trespass.

- ***Reduce Light Pollution*** – Light pollution has become a serious concern for many citizens. Many localities and states have passed laws to minimize light pollution and many more are pending. Full cutoff fixtures that only direct line down to the ground have become popular. However the design and layout of the street lighting is equally important to minimize light pollution.

  Full cutoff fixtures will help keep light from shining directly into the sky, *and* properly selecting lamp wattage and pole spacing will help minimize the amount of light reflected off the ground and into the sky.

- ***Support and Spur Economic Development*** – The appearance of an area (during nighttime as well as daytime) is an important consideration for economic development purposes. In historic areas and business districts, for example, streetlights not only illuminate roadways and sidewalks, but also highlight architectural and other aesthetic features such as storefronts, parks, statues and other public areas. This can attract people to business districts during the evening. In addition, the quality of the light source and how well it brings out colors of buildings, trees, pedestrians and automobiles is important. These factors are often of greater importance for urban areas rather than suburban or rural areas where pedestrian commerce is less prevalent.

  Lighting is often one element considered for economic development improvement projects. But poor quality fixtures and design can be counterproductive if the lighting produces glare, causes shadows, or is not visibly pleasing.

- ***Improve Aesthetics*** – Aesthetics are an important consideration to attract customers and businesses to an area, as well as for people who live in the community. Many municipalities are installing "historic-style" streetlights for architectural reasons.

  "Historic-style" luminaries should be selected not only based on their aesthetics but also on their ability to properly distribute and control the light, and provide lamps with good color and light quality.

Although popular due to low operating cost, many communities are removing high pressure sodium streetlights (because of the poor color rendering qualities and yellowish light it produces) and installing light sources that produce light with better color characteristics, such as metal halide. However, proper design and layout is critical to avoid excessive energy use, glare and poor light distribution.

Shopping district "architectural" street lighting meeting aesthetic and cutoff requirements

STEP 2: Identifying Design Issues and Constraints

Step 1 established a complete and clear overall project goal and identified the importance of individual drivers that make up the goal. Now, specific design issues and constraints need to be identified. (These design issues and constraints are common elements that need to be addressed and are described here to show how they impact the design regardless of the goal.) The box to the right lists the design issues and constraints that should be carefully considered and periodically revisited to:

Design Issues and Constraints

Retrofit/Replace vs New Construction
Project Funding and Cost Savings
Glare
Light Trespass and Light Pollution
Safety and Security
Businesses and Economic Development
Aesthetic Requirements
Lighting Environmental Zones

(1) help municipal officials understand common street lighting design issues and constraints,

(2) make certain the project progresses towards meeting the overall street lighting goal and addresses individual issues, and

(3) build a solid rationale for the proposed street lighting design, which can be used to publicize and gain support for the project.

Retrofit/Replace versus New Construction — This is the first design issue to consider, because it will impact all other design constraints and the project as a whole.

- Retrofit/Replace – Retrofitting street lighting generally means the location of the poles will remain the same, but one or more of the following will be replaced: lamps (bulbs), ballasts (the transformer-like devices that power the lamps), luminaire (fixture head), or poles. Retrofitting is generally considered for energy and maintenance savings; however, sometimes a luminaire or pole needs to retrofitted/replaced because it does not distribute the light correctly or has been damaged.

  Because pole locations do not change, the retrofit options need to be carefully evaluated and selected to achieve the desired performance. Several options may achieve the desired result but may have different costs. For example, if residents are complaining about street lighting shining in their windows, adding a house-side shield to the luminaire or replacing it with an entirely new luminaire with proper cutoff and distribution may solve the problem. Working with the design professional, municipal officials need to determine if the retrofit/replacement meets the overall goal.

- New Construction – New construction involves either removing all the existing street lighting poles, bases and wiring, and installing a completely new system, or installing a new system where street lighting did not previously exist. Existing systems are generally removed when streets are widened or a major capital improvement project is undertaken to give an area (generally in urban areas) a "face lift."

  New construction impacts the design with greater flexibility for location and number of poles. If a capital street improvement is planned, new poles and lighting fixtures are usually the best option for effective energy-efficient design.

Project Funding and Cost Savings — Project funding should be identified and established early in the process. It will impact the type, location and number of fixtures that can be purchased. Officials must simultaneously consider municipal funding, state/federal funding, utility funding, as the energy and maintenance savings from a well-designed project. An economic analysis should be conducted to identify capital, operations, and maintenance costs. Optional funding sources should also be identified, and may include capital budget, municipal bond, or leasing from the utility, lender, or an energy services company (ESCO). Refer to Section IV below for additional funding information.

Projects should be designed to avoid excessive number of poles, wiring, and trenching (digging) that would tighten the funding design constraint. New systems tend to offer the greatest opportunity for operations and maintenance savings through the selection and proper placement of energy-efficient lamps, ballasts and luminaries.

Streetlights with five fixture heads per pole

Glare — Glare can be a safety concern if lights are too bright and impede a motorist's or pedestrian's visibility. Excessive number of fixtures and bulbs (lamps) per pole, inadequate shielding, and unnecessary lamp size (wattage and lumens) can all lead to glare problems. Municipal officials need to be aware that a greater number of lamps, fixtures or wattage does not necessarily improve the lighting performance, but can have negative and dangerous impacts.

Glare can be minimized through proper fixture selection, pole placement, and selection of proper light source size (lumen output). Although pole placement is fixed with retrofit projects, proper luminaire selection and pole height needs to be established to minimize glare. The best option is always using new luminaries, but added shielding to existing luminaries might be more cost effective, meet performance needs, and eliminate glare.

Light Trespass and Light Pollution — Light trespass and light pollution design issues need to be carefully addressed, especially given the growing public concern. This issue may limit pole height, placement, and luminaire and lamp selection.

New construction projects must be designed to control light trespass and light pollution through proper pole placement, fixture height and specification of full-cutoff fixtures if practical. Although pole placement is fixed with retrofit projects, proper luminaire selection and pole height needs to be established. Shielding will also help curb this problem.

Safety and Security — Safety and security concerns impact businesses, pedestrians and vehicular traffic as well as all aspects of the lighting design -- light levels, distribution, pole placement and height, lighting uniformity and glare. Proper technology selection and design will help limit the number of poles and fixtures required while providing an adequate sense of security; however, in some cases, additional poles and fixtures might be required. A municipal official should be aware that lighting can help increase the perception of safety and security but does not provide a guarantee of increased safety. Furthermore, simply increasing light levels beyond a certain point will not even increase perceptions of safety.

Whether a retrofit or new construction project, light levels, distribution, uniformity, and glare all need to be addressed and balanced for the area to be perceived as safe and secure. Officials

should ask planners how these lighting parameters address safety and security needs. There is no one answer, but quality design that includes Illuminating Engineering Society of North America recommendations will help avoid "blind spots" and dark areas, and provide the right lighting level and distribution without causing glare.

Business and Economic Development — Proper placement and quality of light can have a significant impact on businesses. In some cases adding more light might have a negative impact, such as creating glare. Lighting should meet the functional purposes for vehicular traffic and pedestrians, while meeting the aesthetic requirements needed to attract people. For example, lighting can illuminate storefronts, points of interest and building facades to make people feel comfortable and secure.

New construction again provides the greatest flexibility because the poles can be located in various locations, while retrofit projects need to use the existing pole locations. However, the real key to lighting the roads, sidewalks and storefronts is proper luminaire selection and pole height. Municipal offices should work with local businesses and residents to evaluate the existing lighting. Consider the following:

- ❑ Ask local businesses and residents if they are pleased with the existing streetlights.
- ❑ Ask about weaknesses in the existing street lighting system and how they could be improved.
- ❑ Are existing poles in locations where it is possible to perform secondary functions such as illuminating architectural features?
- ❑ Visit a nearby community, preferably at night, to see a quality streetlight installation. (Refer to the enclosed list of ***New York State Effective Energy-Efficient Street Lighting Installations***.)

Aesthetic Requirements — The aesthetic requirements of the poles and fixtures (luminaires) will be determined by the geographic location (e.g., rural, urban, suburban) and street lighting purpose. Aesthetic requirements impact the style of pole and the type of luminaire. For example, a pole can be a basic round or square mast, or very decorative; the luminaire can be a basic square "shoe box" similar to those found in mall parking lots, or a decorative historic style post-top. The type of pole selected will primarily impact the budget, but the luminaire selected primarily impacts the lighting performance.

Luminaire aesthetics always need to be balanced with performance – energy efficiency, light distribution, light levels, uniformity, and glare. This is very important during a retrofit/ replacement project when pole locations are fixed. However, a luminaire should not be selected on aesthetics alone. It is best to select several options that meet aesthetic requirements, and then select the one with the best photometric performance and energy efficiency. This is also true with new construction. Even though pole locations are not fixed, avoid fixtures with inadequate performance that might result in too many poles, excessive wiring and trenching that ultimately results in higher costs.

Note that sometimes it is not possible to combine aesthetics and function into one street lighting pole and luminaire system. Some communities install or retain historic fixtures, but use low-

output lamps for a decorative appearance. Functional lighting is provided by a second system, usually on taller poles with modern efficient equipment to meet performance requirements.

Lighting Environmental Zones — Lighting environmental zones are becoming more popular with some municipalities. These zones set certain performance requirements depending on the specific area's lighting needs – similar to land-use zoning for residential, commercial and industrial areas. These zones will impact all aspects of the lighting from number of poles to luminaire cutoff limits (the amount of light allowed to shine above the horizontal plane). Requirements among zones will vary, for example a rural zone might require full-cutoff fixtures to eliminate any light from shining above the horizontal, while an urban zone might allow a small amount of light above the horizontal to illuminate building facades.

New construction and retrofit/replacement projects should meet the zoning requirements when they apply. If a zone is not already established, municipalities might meet with the public and local businesses to determine the lighting needs and concerns of the project area and set a lighting environmental zone for the project and adjacent areas. This will help assure aesthetic and lighting performance uniformity.

STEP 3: Communicate with Project Implementers (Designers/Engineers/Planners)

Steps 1 and 2 above help establish the street lighting goal, and list the various design issues and constraints. Carrying the project through requires care and attention in order to avoid unwanted equipment costs, change orders, complaints about poor visibility, glare, light pollution and trespass, inadequate light levels and uniformity, unnecessary use of energy, and excessive maintenance costs. After identifying the designer - either in-house, a manufacturer representative, utility representative, lighting designer, or engineer - municipal officials should meet frequently with the designer and ask questions to:

(1) make sure both parties clearly understand the project goal, and

(2) communicate how design issues and constraints are being addressed.

The feedback from the designer will help municipal officials understand whether the goals are understood and what technologies and design plans are being used to address issues and constraints. Below are discussion items that need to be addressed during these municipal official/designer meetings.

Planning — Before developing recommendations for the lighting installation, be sure that the designer knows the lighting goals and the characteristics of the project site.

- Project Goal – Be certain the designer is aware of the overall project goal that was identified in Step 1. Municipal officials need to not only communicate the primary driver for the street lighting (such as a downtown improvement project), but what secondary drivers (such as energy efficiency) need to be included. No designer can promise to reduce crime or improve safety with lighting, so beware of such promises. Share with the designer the companion to this guide – ***NYSERDA How-to Guide to Effective Energy-***

Efficient Street Lighting for Municipal Planners and Engineers, and the list of design and technical resources in Appendix A.

- ❑ Existing Conditions – Make sure the designer is aware of existing conditions, such as type of street, traffic density, prevailing driving speeds, pedestrian traffic, and types of buildings. Also provide any comments and input from businesses, from police officials, and the general public, and note any future municipal plans for adjacent areas.

Lighting Criteria — Municipal elected/appointed officials are not expected to be familiar with each of the technical criteria that make a lighting installation successful. The role of the designer is to identify the correct technologies and plan that meet the overall goal and design issues identified in Steps 1 and 2. However, municipal officials need to understand the methods for achieving the project goal.

- ❑ Technologies – There is no "magic bullet" technology for street lighting, but the designer should be aware of the relative benefits and drawbacks of different types of lamps and luminaires. For example, mercury vapor lamps are common in street lighting installations but are inefficient and should not be used. Ask designers to explain the energy-efficiency of the lamps and ballasts being used. Even the most energy-efficient lamp and ballast can be made very inefficient by using luminaires that trap light inside. A fixture that emits less than 50 percent of the light generated by the lamp should be avoided. Specific recommendations for lamps can be found in the ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers***.
- ❑ Pole Height – In different locations, different pole heights can be appropriate for the desired appearance and required lighting. The cobra head type of fixture seen on many streets and roadways is often found on a 30 to 35 foot pole. Architectural or decorative types of fixtures might have a scale that requires shorter pole heights. Manufacturers provide recommended pole heights for their fixtures. Be sure these recommendations are followed. At the same time, the use of high-wattage light sources on lower poles could possibly lead to unwanted glare and brightness. These factors must be balanced.
- ❑ Pole Spacing – Pole spacing will impact light levels and light uniformity in the street and surrounding area. Visibility can sometimes be reduced if lighter and darker areas have large differences in light level. Ask the designer whether the combination of fixtures and pole heights will result in sufficient uniformity. This issue can be especially important in a retrofit installation where existing pole mounting locations are used. Changes in fixture type and pole height can change the uniformity (sometimes resulting in more uniformity, sometimes in less).
- ❑ Light Trespass and Light Pollution – Light pollution and light trespass are growing concerns among citizens throughout New York State. Your municipality might even have ordinances regarding how much light fixtures can emit in the upward direction, or onto adjacent properties. Be sure your lighting designer is aware of and understands these ordinances. In some areas, some light emitted in the upward and near-horizontal directions might be acceptable, e.g., in a downtown, where low wattage sources are used on relatively shorter poles, and where it is desirable to have some light on adjacent building facades to highlight architectural features or reduce shadows in pedestrian areas.

However, it is always a waste of light and electricity to use fixtures that emit large amounts of light directly upward or beyond property lines.

Economics — Determining the economic impact of new street lighting can be complex. Utility rate structures, design costs, retrofit costs, and labor all factor into the initial cost. Of course, ongoing energy and maintenance costs are also important. In some cases, lower initial equipment costs to save money can result in higher installation, operations and maintenance costs if selections are not made with long term planning.

- Life Cycle Cost – Ask the designer to lay out all life cycle costs before embarking on the project – poles, fixture, installation, underground and overhead electrical systems, lamps and ballasts, lamp life, maintenance, energy, and disposal of old poles and fixtures should all be accounted for when determining life cycle costs. Quite possibly, a more expensive but better-performing fixture could result in overall reduced costs in the long term. Compare the life cycle cost of the proposed systems to the existing system to understand future savings.

> Purchasing cheap equipment to save money on initial cost can result in higher installation, operating and maintenance costs.

- Maintenance Costs – Maintenance (replacement of burned-out lamps, repair of poles and fixtures as required) might be performed by the local utility, or by municipal employees. In some cases, contracts with energy service companies (ESCOs) are utilized. Regular maintenance intervals for checking, relamping and cleaning fixtures can help maintain a system's performance and might cost less in the long run. Longer life lamps will help reduce maintenance costs, but be sure they meet other quality criteria such as proper color rendering. Check to be sure maintenance providers have a good understanding of lighting technologies and troubleshooting.
- Utility Costs – If possible, find out from your utility what the monthly operation cost will be. Does the fee cover any maintenance operations, including possible replacement of equipment, or if the fee is simply for electricity. Know if the new fixtures are to be leased from the utility or owned, and what impact that will have on your long term costs. Obviously, when maintenance costs are included, the utility cost is increased, but so are the services provided.

Maintenance

- Maintaining the System – Find out if special tools or equipment will be needed for relamping and maintenance. Some fixtures have easy mechanisms for opening, removing lamps and ballasts, and cleaning; others do not. A high maintenance system can often be expensive to operate and maintain. Also, make sure the designer has addressed protocols to quickly respond to burned out lamps.
- Long-Life Components – The environment in which a street lighting installation is located may require specific street lighting equipment, such as long-life lamps, lamps with stable light output over a long period of time, corrosion-resistant materials, and vandal-proof fixtures. In addition, different pole materials also have different properties that might lend some poles to be more attractive in certain areas.

Summary of Steps 1, 2 and 3

Steps 1-3 are not intended to turn a municipal official into a street lighting expert, but rather, they help officials understand "higher-level" issues and know what items to address (and questions to ask) with the designers and planners to make certain the design will meet the overall project goal.

- Step 1 identifies individual drivers that may be included in the overall project goal. The drivers should be rated in terms of importance and a written overall project goal established.
- Step 2 lists design issues and constraints that need to be addressed by the street lighting project. Municipal officials should read and develop a "higher level" understanding of what the issues are and how they impact the project.
- Step 3 lists discussion items municipal officials need to address with the designer. The designer should demonstrate how each discussion item addresses the design issues and constraints from Step 2 and how each contributes to the overall project goal.

III. Knowing Your Utility Service

Utilities often provide street lighting equipment and maintenance services in addition to providing electricity. Knowing your utility service offerings and cost structures is a must when considering street lighting options. A municipality needs to thoroughly investigate and understand the limitations of the following utility offerings and structures.

Available Technologies

Utilities often have a limited number of pole, fixture and lamp types available to municipalities. However, this is not a complete selection, and more suitable options to meet your street lighting needs might be available directly from manufacturers. The project designers and engineers should fully understand the performance characteristics of utility-supplied technologies to determine if they meet the project's street lighting goal. In addition, low (initial) cost fixtures may not properly distribute and control the light, which may lead to increased number of poles, energy use, light trespass and glare. Consider all options before making a final decision. Table 2 below briefly describes common lamps types; however, not all of these options are always available from utilities. For more technical details on lamp types, refer to the ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers***.

Table 2

Overview of Common Street Lighting Lamp Types

Incandescent	Very inefficient and short life. Streetlights should be retrofitted for more energy-efficient options.
Mercury Vapor (MV)	Streetlights should be retrofitted for more energy-efficient options.
High Pressure Sodium (HPS)	Energy-efficient but poor color rendering quality. Do not use HPS if color rendering is important.
Low Pressure Sodium (LPS)	Very energy-efficient but very poor color quality. Consider high pressure sodium or metal halide.
Metal Halide (MH)	Energy-efficient and provides good color rendering. Also consider pulse-start or ceramic metal halide for additional energy efficiency and improved color rendering.
Fluorescent	Energy-efficient and good color quality, but poor optical control. Consider MH or HPS for street lighting.
Induction	Efficient, good color and very long life, but limited availability and less optical control. At present there are few fixture options for these lamps.

A utility might provide only a limited number of luminaire types, so if a municipality believes that the project goals cannot be met with existing offerings, it can contact fixture manufacturers to evaluate various options. The ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers*** describes some of the common luminaire types. Luminaires should be evaluated during the day (for aesthetics) and at night (for performance). Check for distribution of light between poles, glare and light output.

Free Upgrades

Several New York State utilities, such as New York State Electric and Gas and Niagara Mohawk, offer street lighting equipment upgrades or alterations paid for by the utility[1] if the streetlights are utility-owned and maintained. Generally, equipment needs to be 15 or more years old and utilities will only replace a certain percentage per year. If the equipment is less than 15 years old, utilities might require the municipality to pay for the remaining depreciation costs of the street lighting. Check with your utility for more information.

Leasing versus Owning

A thorough economic analysis needs to be completed to determine if a municipality should own their street lighting or lease it from the utility.

[1] Current information at time of publication.

- Leasing: Utilities will lease street lighting equipment, but the utilities will often have a limited pole, luminaire and lamp selections. Municipalities that lease streetlights often pay a flat monthly fee to the utility, which includes operating and maintenance costs. Utilities will sometimes pay for the installation cost, but if removed by the municipality, the municipality is responsible for the undepreciated portion of the equipment costs.
- Owning: Municipalities can purchase street lighting equipment directly from manufacturers, thus offering municipalities a wide selection of technologies. Generally a purchase option makes sense when the utility cannot provide the desired fixture, and the municipality can cost effectively maintain the system with in-house or contract staff.

Utility Tariff Structure

Utility street lighting tariff structures (billing structures that include equipment, energy, operations and maintenance costs) will vary among utilities, and within a utility depending on various parameters such as leasing versus owning, lamp type and pole type. New York State Electric and Gas for instance, currently has two street lighting service classifications: 1) municipalities can lease utility-owned and maintained streetlights, or 2) the municipality can own and maintain their streetlights and have the utility simply provide power and limited maintenance. If municipalities decide to lease streetlights, the pricing will vary within each utility tariff depending upon the streetlight wattage, lamp type, pole type, whether it is an overhead or underground service, and other factors.

Maintenance Provider

Independent lighting maintenance companies provide routine replacement of lamps and ballasts, and photocells. As above, a thorough economic analysis needs to be considered, but it is usually more cost-effective to hire a contractor to maintain streetlights than to pay the utility. This may in part be due to the cost for highly skilled utility line workers and heavier equipment than a lighting maintenance company would use. In-house staff can also be considered and are generally less expensive because company profit fees are not a factor. However, in-house staff are often stretched thin and in some cases may need to work overtime to replace burned out lamps at night in "critical" fixtures, which could increase costs.

IV. Funding Opportunities

There are a variety of state and federal programs providing monies for qualifying street lighting projects within New York State municipalities. This section contains information on programs available at the time of printing this Guide. Municipal officials can contact program administrators listed below to determine if their municipality is eligible. Please note, certain Metropolitan Planning Organizations may offer additional programs.

NYSERDA Programs

The New York State Energy Research and Development Authority (NYSERDA), a pubic benefit corporation established by law in 1975, administers **New York Energy $mart^{SM}** programs funded by system benefits charge (SBC) funds paid by electric distribution customers of the following participating utilities: Central Hudson Electric and Gas, New York State Electric and

Gas, Niagara Mohawk Power Corporation, Orange and Rockland Utilities and Rochester Gas and Electric. NYSERDA offers several programs that municipalities can use to obtain funding for street lighting projects. For additional information visit the NYSERDA Web site at www.nyserda.org.

- **New York Energy $mart[SM] Loan Fund** – The Loan Fund provides interest rate reductions of 450 basis points or 4.5 percent[2] on loans for qualifying energy efficiency projects. Municipalities must have a loan commitment from a participating lender. Lenders can apply to the program by completing NYSERDA's two-page application.
- **New York Energy $mart[SM] Technical Assistance Program** – Municipalities can use the Technical Assistance Program to determine street lighting project economics as well as other capital improvements. Municipalities can either hire one of NYSERDA's 36 pre-selected FlexTech engineering firms to provide customized assistance in identifying cost-effective energy-efficiency measures, or select their own consultants. Additionally, this program provides rate analysis and aggregation assistance for municipalities that are negotiating energy prices and services with independent marketers.
- **NYSERDA Commercial/Industrial Performance Program** – For qualifying measures, this program provides financial incentives on a per kilowatt-hour (kWh) saved basis to energy services companies (ESCOs). Municipalities, although not directly a part of the agreement between NYSERDA and the ESCO, often benefit from the lower project costs created by NYSERDA incentives paid to the ESCO. ESCOs must guaranty the energy savings. Eligible projects must meet a minimum threshold for energy savings of 50,000 kilowatt-hours (kWh) per year or a reduction in connected power of 20 kilowatts (kW).
- **NYSERDA Smart Equipment Choices Program** – When the customer owns the entire streetlight fixture (the luminaire, not including the pole, conduits, or wire), per unit incentives are available for replacing or retrofitting streetlights with qualifying equipment. For example, a municipality that installs a 250-watt pulse-start metal halide fixture with a mean efficacy of 85 lumens per watt could receive an incentive of $140 per fixture. Incentives for this program are limited to a maximum of $25,000 per applicant per program year.

Federally Funded Programs

Municipalities throughout New York State can participate in several federally funded programs through New York State Department of Transportation (NYSDOT) and Metropolitan Planning Organizations (MPOs).

For More Information on Federally Funded Programs:

Contact your Regional NYSDOT Planning and Program Manager

For a listing of local NYSDOT Offices, visit http://www.dot.state.ny.us

[2] As of June 2001. Check with NYSERDA for current rate.

- **New York State Department of Transportation** provides the following programs to rural municipalities. NYSDOT recommends municipalities hire a consultant to assist them with applying for federal program funds.
  - **Transportation Improvement Program (TIP)** – This program is suited for major road reconstruction projects with a five year or longer time horizon, where street lighting might be included as part of the project. Municipalities are reimbursed 80 percent of the project cost. Progress payments can be made to the municipality at designated milestones. The tentative application deadline for this program is January 2003.
  - **Marchiseli Program** – Through this program, municipalities can apply for an additional funding of 15 percent of the project cost. This program is designed to help municipalities that have difficulty obtaining funds for the remaining 20 percent of the project cost that is not subsidized through the TIP or other federal programs. The remaining 5 percent of the project cost is the responsibility of the municipality, but often can be paid through in-kind services rather than cash.
- **Metropolitan Planning Organizations** facilitate many federally funded programs for urban municipalities. MPOs help build regional agreement on transportation plans and programs among local governments, state transportation agencies, and transit/transportation authorities. MPOs work to balance highway, mass transit and other transportation needs in ways that best serve people and businesses. Below is a list of New York State MPOs, and additional information can be found at www.nysmpos.org.
  - **Albany-Schenectady-Troy: Capital District Transportation Committee**
    Mr. John Poorman (518) 458-2161
  - **Binghamton: Binghamton Metropolitan Transportation Study**
    Mr. Steven Gayle (607) 778-2443
  - **Buffalo-Niagara Falls: Niagara Frontier Transportation Committee**
    Mr. Edward H. Small (716) 856-2026
  - **Elmira: Executive Transportation Committee of Chemung County**
    Mr. Jay Schissell (607) 237-5510
  - **Glens Falls: Glens Falls Urban Area Transportation Council c/o New York State Department of Transportation, Region I**
    Ms. Joanna Brunso (518) 474-6215
  - **Ithaca: (Newly-Defined 1990 Urbanized Area) Ithaca-Tompkins County Transportation Council**
    Mr. David Boyd (607) 274-5561
  - **Newburgh: Newburgh-Orange County Transportation Council c/o Orange County Department of Economic Development**
    Mr. R. Vincent Hammond (914) 294-5151, Ext. 1770
  - **New York, NY: New York Metropolitan Transportation Council**
    Mr. Raymond Ruggieri (212) 938-3390

- **Norwalk/Stamford, CT-NY: Southwestern Regional Planning Agency**
  Richard C. Carpenter (203) 866-5543
- **Poughkeepsie: Poughkeepsie-Dutchess County Transportation Council c/o Dutchess County Planning Department**
  Ms. M. Kealy Salomon (914) 485-9681
- **Rochester: Genesee Transportation Council**
  Mr. Neil Jaschik (716) 232-6240
- **Syracuse: Syracuse Metropolitan Transportation Council**
  Mr. David Landerkin (315) 422-5716
- **Utica-Rome: Herkimer-Oneida Counties Transportation Study**
  Mr. DeForrest Winfield (315) 798-5037

V. Promoting Effective Energy-Efficient Street Lighting Projects

There will sometimes be a need to explain, and defend, the costs of the proposed high-efficiency street lighting system to in-house decision makers and to the general public. When explaining the need for the proposed effective energy-efficient street lighting project, one must remember "why we light streets" – safety, security, reduce number of accidents, improved visibility, increased commerce, or aesthetic appeal (see Section 1 above). These goals, along with specific benefits, need to be conveyed to other municipal officials and decision makers, as well as to interested citizens. To assist with this effort NYSERDA provides the following:

- List of effective energy-efficient street lighting installations – titled ***New York State Effective Energy-Efficient Street Lighting Installations***. This list is found in Appendix B.
- Sample language, shown below, that can be used to convey the benefits of an effective energy-efficient street lighting design.

Effective Energy-Efficient Street Lighting: What are the Benefits?
for use by Municipal Officials in Press Releases, Media Interviews, Informational Newsletters

We do not often spend a lot of time thinking about street lighting, and because of this, much of our street lighting has not changed substantially for several decades. But advances in effective energy-efficient technologies and design practices can bring substantial benefits to the local municipality. Working together with the local electrical utility, with representatives from lighting manufacturers and/or with lighting design professionals, we can realize significant benefits by installing effective energy-efficient street lighting:

Reduced cost: Carefully selecting equipment will result in the fewest number of poles and fixtures required, ensuring that light goes *where it is needed* while minimizing equipment and electricity costs.

Increased safety: Seeing well is important in street lighting. Recent research has shown that using effective energy-efficient lamps with good color properties can improve peripheral visibility at night and make colors easier to distinguish. Sometimes*, improved, not necessarily increased,* street lighting results in reductions in crime.

Improved appearance: Downtowns and other pedestrian areas need to look safe and appealing in order to attract shoppers and diners. We know from recent studies that while light levels are related to perceptions of safety, using even higher light levels can sometimes detract from the appearance of safety. Proper light levels as well as distribution and uniformity are critical. Street lighting taking this into account will result in more attractive streets while minimizing energy and maintenance costs.

Reduced light pollution and trespass: We all want to see the stars at night, and nobody likes streetlights shining in their windows. Thoughtful design will help to ensure that streetlights illuminate roads and sidewalks rather than where light is unwanted.

These are just a few of the benefits that effective energy-efficient street lighting design can provide to the local municipality. Without a doubt, much of today's street lighting uses more energy and provides less benefit than it could. Working to improve our street lighting is an investment that can return direct and indirect benefits to the local municipality. Through the New York State Energy Research and Development Authority, we have access to information that can help us make the best decisions for the maximum return on this investment.

VI. Conclusion

A street lighting project is often considered for one primary purpose, such as lighting a street for vehicular traffic; however, street lighting impacts not only motorists and pedestrians but also residents, businesses, and visitors to the municipality. The various sections of this Guide provide general information a municipal elected/appointed official needs to know, understand, and consider in order to meet the street lighting needs of these groups.

Once the overall goal is established, the municipal elected/official should continue to use this Guide to make sure that the project design meets the overall goal, meets individual project drivers that make up that goal, and that it addresses the design issues and constraints surrounding the project. Municipal elected/appointed officials should also make sure the street lighting designer (planner or engineer) uses the more technical information presented in the ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers***. The additional resources provided in Appendix A should also be considered.

In reading through this Guide, it should become clear that the municipal official shares in the responsibility to bring together the various stakeholders of street lighting: including motorists, pedestrians, businesses, residents, police officials and others, in order to identify if and how street lighting can offer benefits to the municipality. If the consensus is that street lighting can provide significant benefits, the municipal official should work closely with planning and engineering staff, asking appropriate questions to ensure that the technologies proposed will realize these goals in the most effective energy-efficient manner possible.

Street lighting can provide a lively, safe and secure appearance to an area while meeting functional illumination requirements without causing glare, light pollution or trespass, and other problems often associated with street lighting installations. However, installing a system that balances the various design issues takes careful and thoughtful planning. NYSERDA believes that the ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Elected/Appointed Officials*** and the ***NYSERDA How-to Guide to Effective Energy-Efficient Street Lighting for Municipal Planners and Engineers***, can help with this necessary and critical planning stage.

APPENDIX A

Street Lighting Research and Technical References

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APPENDIX B

New York State Effective Energy-Efficient Street Lighting Installations

The New York State Energy Research and Development Authority (NYSERDA) provides the following list of New York State street lighting installations that show different ways of meeting various design objectives, including increasing energy efficiency, improving perceptions of safety, or enhancing aesthetic appearance. This list is intended as a reference for municipal officials, planners and engineers to use and visit the sites when considering street lighting projects.

Albany, Albany County — Several colleges and universities in Albany are located adjacent to a parcel of land (University Heights) that is shared for offices, classrooms and student housing. The complex includes pedestrian walkways as well as roadways and parking facilities. The lighting in this location was designed as a new installation. Post-top refractive globe fixtures and teardrop fixtures were used for roadway and pedestrian walkway lighting to complement the existing lighting in the adjacent Sage College campus. The lighting was part of the overall master plan for this campus-like area, and equipment selected for its daytime appearance as well as its nighttime performance. ***Contact: Mara Berman, University Heights Association, (518) 434-9603***

Amherst, Erie County — Over the past fifteen years, the town of Amherst has replaced many fixtures containing inefficient incandescent and mercury vapor lamps in its residential neighborhoods with fixtures using more efficient high pressure sodium lamps. The fixtures are performance post-top luminaires with 100 to 200 foot spacings, containing 70 to 100 watt lamps. Since the locations are suburban neighborhoods, color appearance was not critical and the high pressure sodium lamps provided sufficient color rendering. The fixtures are leased from the local electric utility. The energy use has dramatically been reduced by using the maximum pole spacing and reducing wattages. ***Contact: Scott Charleson, Town of Amherst, (716) 631-5990***

Buffalo, Erie County — The city of Buffalo has a large downtown commercial district containing a major sports arena, with heavy pedestrian traffic. Because of this, maintaining perceptions of security and safety was important. The city installed performance post-top fixtures, containing 175-watt metal halide lamps, spaced about 80 feet apart. The fixtures are shielded so that they limit upward light, while at the same time providing sufficient uniformity and vertical illumination for recognition of faces and other objects. ***Contact: James Zern, City of Buffalo, (716) 851-5621***

Cheektowaga, Erie County — The town of Cheektowaga is home to the Airborne Business Park, a business complex managed by Uniland Development Company. It is located on a privately-owned road, Airborne Parkway. The lighting for the road was designed to meet the town's standards for lighting, so that the road could be readily turned over to the town in the future. The fixtures are modern, cutoff-style luminaires containing 400 watt metal halide lamps. They are mounted along both sides of the road and are spaced approximately 250 feet apart on each side of the road in a staggered pattern. The spacing and layout results in effective lighting with modest energy use. ***Contact: Brian Cook, Uniland Development Company, (716) 834-5000***

Kingston, Ulster County — The city of Kingston recently installed new street lighting in its commercial downtown district. Historic-looking fixtures and relatively high light levels were desired to improve appearance and to increase the sense of security in this location. It was also recognized, however, that meeting these objectives would result in increased energy use. A combination of decorative post-top and teardrop fixtures were used to provide pedestrian and roadway illumination, respectively. The teardrop fixtures have cutoff optics to limit light from being directed upward. The post-tops contain 100 watt metal halide lamps, and the teardrops contain 250 watt metal halide lamps. ***Contact: John Kwak, City of Kingston, (845) 331-0080***

Tully, Onondaga County — To save energy, reduce light pollution and light trespass, the town of Tully retrofitted 24 lighting fixtures along Route 80. The previous fixtures, cobraheads containing 175 watt mercury vapor lamps, were replaced with flat-lens fixtures containing 100 watt high pressure sodium lamps. The primary purpose of the lighting in this installation is to aid driver and pedestrian visibility. ***Contact: William Lund, Town of Tully, (315) 696-4693***

New York State Energy Research and Development Authority
17 Columbia Circle
Albany, New York 12203
1-866-NYSERDA (1-866-697-3732)
www.NYSERDA.org

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by ICF Consulting, Inc. and the
Lighting Research Center,
Rensselaer Polytechnic Institute.