Maryland
Energy
Administration

LED Streetlight Conversion Toolkit for Local Governments

Frequently Asked Questions (FAQs)

The LED Streetlight Conversion Toolkit for Local Governments is a work of the Maryland Energy Administration and Clean Energy Solutions, Inc. to guide municipalities through the process of designing, procuring, and implementing LED Steetlight conversion projects. Guidance published in this toolkit should not be construed as legal advice. Municipalities should consult legal counsel before issuance of procurement or contract-related documents.

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Introduction

Light-emitting diodes (LEDs) are emerging as the technology of choice for street lighting, due to their efficiency, improved quality of light, dimmability, and minimal maintenance requirements. The cost of LEDs has significantly declined in recent years, with some jurisdictions realizing payback periods of less than 5 years. By late 2013, approximately 8% of municipalities in the U.S. had converted a majority of their streetlights to LEDS, according to a survey of 240 communities conducted by the U.S. Department of Energy's (DOE) Municipal Solid-State Lighting Consortium. In mid-2016, approximately 10% of existing U.S. street lighting was converted to LEDs.

In February 2019, the Maryland Energy Administration (MEA), with a competitive grant award from US Department of Energy (DOE) has engaged Clean Energy Solutions, Inc. (CESI) as principal consultant and the Virginia Department of Mines, Minerals and Energy (DMME), the Northern Virginia Regional Commission (NOVA). The Metropolitan Washington Council of Government (MWCOG), and the National Association of State Energy Officials (NASEO) as outreach and education partners to facilitate the adoption of LED streetlights by local governments.

In 2014, CESI worked with the Tennessee Department of Environment and Conservation's Office of Energy Programs (TDEC OEP) on another competitive award from U.S. DOE to assist local governments in design, procurement, and implementation of energy efficiency projects. This project team interacted with many local governments across the state, and quickly realized that LED streetlights were drawing significant interest and generating a lot of questions.

Throughout the course of the project, the project team provided in-depth technical assistance to three local governments that were either entertaining or undergoing the process of converting their streetlights to LEDs. The technical assistance provided consisted of answering questions and issuing guidance regarding equipment specifications, utility tariff negotiations, project procurement, and energy services contracts, among other subjects. The following document is a catalog of most common questions encountered by the project team and an attempt to provide thorough answers, in hopes that local jurisdictions across the state can use this document to successfully implement LED streetlight projects.

Many of the questions and answers below address how to negotiate components of a new LED lighting tariff with a local utility, and since the vast majority of streetlights are owned and operated by the local utility, how to purchase back the streetlights in cases where this is necessary.

Contents

I. LED Streetlight Terms to Know

Lumens: Measures light output. The higher the number of lumens, the more light is emitted.

Watts: Energy required to produce light.

Lumens per Watt: Measures the bulb's efficiency. The higher the number, the more efficient the bulb and the less energy used.

Correlated color temperature (CCT): Measures the color of the light in kelvins (K), e.g. warm yellow or cool blue. LEDs range from 2600K (warmest) to 6000K (coolest). Nominal CCT measurements (e.g. 2600K) represent a range often ±200K.

Color Rendering Index (CRI): Describes how the light renders the color of objects. A new standard test that can be used to determine the CRI, as well as other indicators, is the TM-30-15. CRI is the industry standard, though some manufacturers use the TM-30-15.

IESNA LM-79-2008: This is the standard test that measures the performance of LEDs.

L_{70}: The measure used to determine the lifetime of an LED. Unlike conventional lighting sources that diminish over time and eventually burn out altogether, LEDs gradually lose lumen output. Their lifetimes are measured in terms of when the lumen output has fallen to 70% of initial levels. This is determined using the IES LM-80-08.

BUG: Backlight, Uplight, and Glare rating. This is used to measure how much light is diffused away from the bulb into surrounding areas.

LED Streetlight Components:

- Solid-state LED Module
- Driver (similar to a ballast)
- Surge protection
- Heat sink (cooling system)
- Photo control
- Bracket arm
- Feeder wire
- Housing/cover/lens (as applicable)

II. Understanding the Benefits of LEDs

Q: What are the benefits of converting streetlights to LEDs?

The primary benefit of LEDs is reduced energy (kW) use and, consequently, lower utility bills. LEDs use approximately 50-70% less energy than high-pressure sodium (HPS) or mercury vapor (MV) bulbs. LEDs also have longer useful lifetimes (10+ years) and require minimal maintenance, thereby further reducing utility costs. Other benefits are "instant-on" performance, dimmability, and "directional" lighting, which minimizes light loss, diffusion, and light pollution. LEDs also generate little to no infrared or ultraviolet emissions and at the end of their useful life, can be disposed of without producing hazardous waste.

Due to their directionality and superior light quality, LEDs have also been attributed with improved safety and greater security against vandalism and crime.

Q: Is the performance of LEDs inconsistent in terms of light quality, failure rates, and other characteristics?

As with any emerging technology, LEDs underwent a host of issues when they were first applied to scale. Now that LED streetlights have been performing on the global market for about 10 years, these issues have been virtually eliminated. Of course, procuring equipment from a reputable provider is important to secure guarantees of performance and quality. U.S. DOE's Lighting Facts hosts a list of approved equipment and service providers.

Q: Where can I get accurate, disinterested information about LED streetlight performance, costs, benefits, and concerns?

U.S. DOE hosts two websites dedicated to providing information for local governments interested in LEDs: Municipal Solid-State Street Lighting Consortium (MSSLC) and the Better Buildings Outdoor Lighting Accelerator. These sites host technical information regarding equipment specifications and performance, case studies from successful projects, and sample contract documents.

Q: So, why aren't more local governments converting today?

The three main reasons that local governments are not ready to commit to converting their streetlights are high upfront costs, unfavorable utility tariffs, and uncertainty surrounding performance. LEDs can cost 4-6x as much as conventional streetlights (HPS or MV). To recuperate costs, utilities may structure lighting tariffs with high fixed rate components (investment or capital charges) to cover expected maintenance costs and the cost of "stranded" investments in old fixtures. The last barrier is simply that many local governments are not sufficiently confident in the performance claims of LEDs, largely due to issues publicized a decade ago when LEDs were a nascent technology. All of these barriers can be overcome, as we will discuss in the following sections.

III. Project Steps: Planning to Implementation

Q: What path should a local government take to undertake a feasibility study for LED streetlights?

First and foremost, a local government should begin to engage with their local utility to determine the utility's interest in facilitating a LED conversion and/or their flexibility in terms of tariff modifications to accommodate LEDs' reduced energy use and lower maintenance requirements. A utility's flexibility and willingness to participate in this process can determine much of the economic value a locality will derive from converting to LEDs.

As a local government moves forward, there are several questions to consider:

- Are your streetlights locality/county-owned or utility-owned?
    - If utility-owned, is your local utility willing to finance and own the new fixtures?

- Would the locality/county prefer to own the new fixtures? If so, the locality/county would need to purchase streetlights (lamps, fixtures, and poles) back from the utility at an agreed-upon price.

- How much are you paying now for streetlights, and what does that payment cover?
  - Can you break this down into energy, "investment," and maintenance charges?
  - Are your lights metered or unmetered?
  - Do you have a good sense of how many streetlights you actually have and what their value is?
  - If you answered no to any of these questions, request a recent streetlight bill and a simple inventory of your existing system from your local utility.
  - You can also request a preliminary estimate of the remaining value of the existing fixtures, if you believe you might have to purchase the streetlights back from the utility in the future.
- Does the locality/county want to take the major responsibility for maintaining the new lights?
  - The cost of maintaining LEDs is significantly less than the cost of maintaining conventional lights (HPS and MV), but local governments should either have the capacity to maintain the lights themselves or negotiate a maintenance contract with their local utility. Most local governments already pay a maintenance contract with the utility, but it may be bundled into a fixed "investment" charge.
- Conduct a preliminary financial analysis of the costs and benefits of conversion, given assumptions about the existing inventory, financing costs, LED replacements, maintenance savings, utility tariffs and other factors?
  - TDEC OEP and CESI created a streetlight inventory tool *(Insert link to streetlight inventory tool, when up on web)* to assist communities in cataloging existing streetlights and estimating costs and savings of converting to LED.
- Is the local utility willing to negotiate on tariff modifications and maintenance charges? If the locality/county is purchasing the light fixtures back from the utility, is the utility willing to negotiate on buy-back value and future considerations, like joint-use of poles?

These issues will be discussed more thoroughly in Sections V & VI.

Q: What should be included in an "inventory" of the existing streetlight system?

- The GPS of every pole.
- The style of luminaire(s) on each pole: cobra-head, decorative acorn, decorative teardrop, etc.
- The type of bulb and wattage of each luminaire (Ex: 100W HPS)
- Identification of responsibility for ownership and maintenance of each luminaire (city or utility).
- Typical light levels and uniformity provided by each type of luminaire on each type of roadway.

Q: If the feasibility analysis produces a commitment to go forward with the conversion, what are the next steps to project implementation?

1) Complete LED fixture specifications to replace each existing luminaire type with the appropriate LED equivalent (a good resource for this is DOE's LED Lighting Facts);

This task may require the assistance of a lighting engineer, depending upon the resources and expertise of the local government. The key to successfully completing this task is the accuracy of the lighting inventory: number, type, and wattage of each fixture of the existing inventory (example: 525 100W HPS).

2) Undertake a rate negotiation with the local utility to establish the cost of stranded assets (existing fixtures), projected maintenance fees (if the utility will continue with that responsibility), and any other issues regarding a change in fixture ownership, if your organization intends to assume ownership of the fixtures.

   For a discussion of non-tariff issues that might arise with a utility provider, see page 10.

3) Draft and release a Request-for-Qualifications (RFQ) or a Request-for-Proposals (RFP) to solicit responses from reputable LED lighting providers.

The RFQ or RFP should require that the selected contractor perform an investment grade audit to ensure the accuracy of the existing inventory. The audit should feature on-site inspections of existing fixtures and a review of the local government's proposed specifications of equivalent LED replacements. The selected contractor will typically verify the utility inventory, review and modify the specifications and lighting design, dismantle the old fixtures and install new LED fixtures, and commission the completed work.

How long will it take to conduct a preliminary inventory and financial analysis? How long does it take to see a project from planning through implementation?

The time it takes to conduct a preliminary inventory and financial analysis, which includes discussion with your local utility, can take three or four months assuming a key decision-maker is able to devote sustained attention to the process.

Project procurement (drafting an RFQ/RFP and selecting a contractor) and project implementation can take between eight and fifteen months, depending upon the number of streetlights to be converted and the amount of staff resources (on the part of the locality, utility, and contractor) available to dedicate to project management. Localities may also choose to phase a project over several years for logistical or financial reasons.

Localities with a project "champion" or single project manager that can devote significant resources to this process can accelerate the timeline. For some localities, the time between project inception and implementation has been more than two years. In these situations, the locality has usually experienced barriers related to losing key staff members, running into opposition from key decision-makers, or juggling competing priorities.

Who at the local government level should be centrally involved?

The person(s) responsible for maintaining the locality's streetlight system (Transportation Director, Streets Division Director, or Public Works Director), the Chief Financial Officer, and the Director of Procurement or Purchasing are critical to involve in the process from early on. In jurisdictions with these offices, the Director of Sustainability or Energy Manager can be instrumental for ushering a project to completion. In addition to these key decision-makers, the City Manager or Administrator and City Council generally must make the final decision for a capital outlay that exceeds $500,000.

Where can one go to get expert help in guiding a local government through this process?

A lighting engineer can be valuable to assist with conducting an inventory and assessing ideal project design. There are also a handful of consultants that are familiar with the technical aspects of LEDs and the procurement process. MEA, with the technical expertise of CESI, is offering resources and technical assistance to municipalities in Maryland and Virginia. Contact Steve Morgan: smorgan@cleanenergysol.com for additional information.

Localities may also contact DOE's Municipal Solid-State Street Lighting Consortium for more guidance on consultants in this space. At the Consortium, the person to contact is Crystal McDonald: crystal.mcdonald@ee.doe.gov.

IV. Performance and Technical Issues

What can we expect from manufacturers and installers for warranties on the life of the luminaires?

Ten-year warranties are now the industry standard, a dramatic increase from just a few years ago. While the latest technologies have not been on the market that long, laboratory testing by DOE's Lighting Facts indicates that those timeframes are warranted. The full warranty is typically broken down, for instance, into 10 years for the luminaire, 12 years for the photocell, and 2 years for labor. These durations will vary by manufacturer.

What level of laboratory testing and certification must LED luminaires pass?

IES LM-79-08 is one of the standard testing protocols for LEDs. IES stands for the Illuminating Electrical Society and LM stands for Luminaire Measurement. The protocol specifically details a standardized testing procedure that a product must follow in order to report its performance on a variety of dimensions. There is no minimum level of performance required or implied by LM-79. However, its value is in assuring that products can be compared on an "apples-to-apples" basis. Rensselaer Polytechnic Institute provides a good overview on LED testing standards.

Why can we anticipate considerably lower maintenance costs with LEDs?

LED technology has evolved to the point that issues of lighting level erosion and failure are much improved over standards HPS and MV technologies. Lower maintenance costs are a result of the fact that LED luminaires last two to five times longer than conventional luminaires. Maintenance costs for replacements in the early years of the recent technologies are now on the order of 70-80% lower than the older technology experience.

We have heard that the brighter, bluer color of LEDs can cause sleeping problems and other biological disruptions. Can you explain?

The light color of LEDs is measured by Kelvin temperature and is referred to as the "correlated color temperature" (CCT). LEDs can range from 2600K (warmest, yellow light) to 6000K (coolest, blue light). Most outdoor lighting applications are between 3000K-4500K.

LEDs in the cooler temperature range (4000K-5000K) are generally 10 to 15 percent more energy efficient than warmer LEDS, which has led many cities to opt for these bulbs. Unfortunately, the American Medical Association discovered that these higher temperature LEDs contribute to melatonin suppression in humans and can interfere with the migratory patterns of birds and other wildlife. Melatonin is a hormone secreted at night by the pineal gland that helps balance the reproductive, thyroid, and adrenal hormones and regulates the body's circadian rhythm of sleeping and waking. Lower melatonin levels disrupt sleep patterns and have been tenuously linked to increased risk of cancer.

The American Medical Association recommends that local governments undertake a "proper conversion to community based LED lighting" and "encourages minimizing and controlling blue-rich environmental lighting by using the lowest emission of blue light possible to reduce glare" by using "**3000K** or lower lighting for outdoor installations such as roadways." Furthermore, the AMA suggests that "all LED lighting be properly shielded to minimize glare and detrimental human and environmental effects, and consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods."

For more information, see a webinar Pacific Northwest National Laboratory hosted in partnership with DOE to discuss the AMA's findings.

For a better understanding of the complexities of defining blue light and information to help address any adverse health claims of LEDs, see Street Lighting and Blue Light Frequently Asked Questions.

Can we install LEDs on an existing two-wire system?

Yes, most LEDs are being installed on existing two-wire systems. Three-wire requirements, or "grounding" requirements, are not generally required by LED manufacturers relative to their 10-year warranty. Most manufacturers are building the necessary surge protection and volt drivers into their fixtures so that they tolerate variances in line voltage. As a best practice, all installation agreements should include a clause requiring the selected installer to comply with all federal, state, and local ANSI and electrical codes.

What add-on or additional features can be attached to LED streetlights?

Many jurisdictions opt to include dimmers to have greater control over light levels at dawn and dusk and some include GPS locators linked to an online system that can pinpoint luminaire failures in real time. These features can add considerable cost to the project but can add value by further reducing energy use (via dimmers) and eliminating some maintenance costs related to locating an outage.

Though not yet common additions, some large jurisdictions like New York City, San Diego and Jacksonville, FL have demonstrated smart city technologies through streetlights that can collect, analyze, and communicate data to centralized control centers and to passersby. Cameras, real-time sensors, and digital screens have been installed on some streetlights and collectively, these features could eventually serve as a digital help desk for citizens and law enforcement, informing citizens on air quality, traffic patterns, and open parking spaces, and law enforcement on the locations of gunfire.

Can you provide an example of a luminaire specification?

The following is an excerpt from Leotek, a manufacturer of LEDs. MEA does not endorse Leotek or its products.

"Below is a sample of a basic, twelve item specification that would normally eliminate most of the very poor quality products and unreliable suppliers. All major U.S. manufacturers that have any significant experience with LED street lighting should have no difficulty in meeting this specification.

LED "Cobra-Head" Style Luminaire Preliminary Specification

I. Luminaire shall mount to a 1¼" to 2" (1⅝ " to 2⅜" O.D.) diameter mast arm.

II. Luminaires shall have an Effective Projective Area (EPA) not to exceed the EPA rating of the luminaire being replaced.

III. EMI meets or exceeds FCC 47 CFR Part 15. Transient voltage complies with ANSI C62.41 Cat. C High.

IV. Luminaires shall pass the 3G vibration test per ANSI C136.31-2001

IV. Paint finish shall equal or exceed a rating of six per ATSM D1654 after 1000 hours of salt spray testing per ASTM B117. VI.

V. LEDs shall have a CCT of 4000K ± 300K VII. Luminaires shall produce 0 light at or above 90°. "

VIII. Luminaires shall be listed by Lighting Facts.

IX. Luminaires shall be qualified by the Design Lights Consortium

X. Luminaires shall be listed by a Nationally Recognized Testing Laboratory as suitable for wet location applications.

XI. Manufacturer shall provide a minimum five-year limited warranty."

For a thorough example of a luminaire specification, see DOE's Model Specification for LED Roadway Luminaires.

V. Utility Tariff Issues and Resulting Cost Savings

Can you explain the components in a typical utility tariff when the utility owns and maintains the streetlight system?

There are three components:

- Energy (kWh) charge: the monthly consumption of kWh multiplied by the rate per kWh. For many streetlight customers, consumption is typically unmetered and based on a formula using a fixed number of monthly "on" hours multiplied by the fixture wattage.
- Investment or facilities charge: typically, a fixed charge per month intended to recuperate the costs of the utility's investment in the original fixtures. This is also called the "stranded cost" of the assets: the depreciated value of the fixtures, wires, and poles constituting the streetlight.
- Maintenance charge: can be a separate fixed charge or bundled into the investment charge. This charge is intended to cover the costs of bulb replacement in the case of failure or repairs to damaged equipment.

Investment and maintenance charges are generally fixed charges per pole and are often bundled, making it difficult to determine the contribution of each to the total bill. Frequently these components constitute two-thirds of the entire streetlight bill each month.

What is the impact of a LED streetlight conversion on the costs for each of these components?

The answer depends upon several factors: 1) who is paying for the installation of new LED fixtures; 2) the relative age of the existing luminaires being replaced; and 3) who is responsible for the maintenance of the new fixtures.

If the utility is paying for the installation of the LED fixtures, the investment charge per pole will increase significantly. However, this increase could be less significant depending upon the age and remaining value of the existing luminaires. Localities with older fixtures that have been mostly paid for will see lower investment charges.

Since LEDs use between 50% and 70% less energy than conventional luminaires, the energy charge should be reduced accordingly. The maintenance charge should also be reduced to account for actual costs, but unfortunately, many utilities do not accurately account for the reduced maintenance costs associated with LEDs and charge a similar rate as they would for HPS or MV.

If the locality is financing or otherwise paying for the costs of the conversion, the investment and maintenance charges should both decline significantly. Again, the depreciated net value of the stranded costs to be retired has a major impact on that cost. If the locality takes responsibility for standard maintenance (usually by contracting to a third party), maintenance costs can drop by 60-80%.

All of these rates are subject to a satisfactory negotiation between the utility and the locality. A satisfactory rate negotiation can enable cost savings for BOTH the utility and the locality.

If the locality pays for the conversions and assumes the maintenance obligation, what range of paybacks can we expect?

Most localities will see paybacks of ten years or less, with some localities seeing paybacks of less than 5 years. Locality-specific variables that can determine the final payback are:

- The stranded costs of the old luminaires to be replaced,
- The per kWh energy rate,
- The configuration (wattage, type, existing technology) of the system to be replaced, and
- The interest rate of the locality's financing.

The recent trend of declining fixture prices each year should plateau soon, so anticipating significantly cheaper luminaires two to three years from now may be an erroneous assumption.

What other non-tariff issues may arise with the local utility?

The cost allocation for the shared use of a pole (e.g. telecommunications), emergency response issues (e.g. vehicular accidents, floods), and the aforementioned underground wiring example all argue for additional memorandums-of-understanding (MOUs) or cost agreements. Typically, the pole-owner (electric utility or phone company) enters into license agreements with other parties to allow attachment of third-party streetlights and describe the roles and responsibilities including the importance of coordinated communication among the parties (for example, when a pole is damaged).

Do most local utilities negotiate tariff modifications fairly and willingly?

Yes, but there are two complications that make some negotiations more difficult than others. The first is that streetlights are frequently a profit center for many utilities, generating more revenues than commensurate costs. The second is that many utilities do not have a firm grasp of their inventory or the true value of the existing fixtures, and therefore are not able to accurately calculate the appropriate stranded costs of investment. In some cases, the utility also might not thoroughly document the maintenance costs that are tied solely to streetlights.

Even so, most negotiations between a locality and the local utility are fair and equitable with both parties striving to make the conversion work for everyone.

VI. Procurement and Contracting

How many contracts and/or Memos of Understanding should we be considering?

There may be four or five in total:

- A purchase and sale agreement between the locality and utility to address stranded investment costs;
- An MOU between the locality and utility around such issues as emergency response and shared use of poles;
- A contract to design, purchase and install the LED streetlights by vendor;
- A financing contract, if third party desired (can also be responsibility of installation vendor);
- A maintenance contract with third party if locality assumes that responsibility.

These do not include any special situations that may be encountered between the locality and utility, such as underground wiring.

Do you have template documents we can see for purchase and sale agreements with the utility, and for RFQs/RFPs on the design and installation of the LEDs?

Yes, see Sample RFQ.

Do you advise a pilot or demonstration of the product before full installation takes place?

Yes, either invite several manufacturers to do demonstrations, or once an award is made, ask for a small sample of lights to be installed before formal project implementation takes place. Such a demonstration can be invaluable going forward. Localities should look for the following:

a. Compliance with the specifications;
b. Visual product quality;
c. Apparent ease of installation and maintenance.

Are there alternatives to a standard design/bid approach that may be more cost-effective in managing streetlight conversions?

Yes, to the extent that you are comfortable with an accurate inventory and the specifications of the replacement fixture, you can save money on the design stage of the contract.

The following excerpt from the Massachusetts Inspector General website describes an alternative approach called the Construction Manager (CM) at risk method, which may reduce some costs:

> "Under the CM at risk method, the owner typically selects the CM at risk firm, which will later serve as the project general contractor, at the outset of or early in the design stage. After conducting a selection process that focuses on qualifications and fees, the owner executes an initial CM at risk contract with the selected CM at risk firm. As the design progresses, the CM at risk firm provides construction management services, such as constructability reviews of the design, construction scheduling, and project cost estimates, to the owner. At some point during the design stage, the owner and the CM at risk firm negotiate a guaranteed maximum price (GMP) for the project. When the contract is amended to include the GMP, the CM at risk contract becomes a cost-plus contract with a GMP, and the CM at risk firm assumes responsibility for the performance of the work, including the work performed by project subcontractors. The owner pays the CM at risk firm the actual cost of the work plus the agreed-upon CM at risk fee up to the GMP; change orders resulting from scope changes and unanticipated site conditions encountered during construction may increase the final contract cost."

How do we treat more complicated issues whose costs may be unknown, such as underground wiring?

There are two options: (1) maintain an agreement with the utility to address and price that issue accordingly; or (2) have bidders price it separately on an hourly basis, or some other unit cost that can be applied to the situation, when known in the future.

What range of costs can we expect on a per streetlight basis for a citywide purchase and installation of LEDs?

Where actual costs land in that range is a function of how many luminaires will be replaced, the wattages and types of the existing luminaires, any special circumstances (e.g. underground wiring or an excess of decorative lamps), and labor rates. Joint-procurement with a neighboring community can achieve economies of scale and lower costs for very small localities.

VII. Maintenance Issues

What are the options and trade-offs for handling LED maintenance?

There are three major options, although combinations of these options are also possible to handle exceptional situations:

1) Negotiate a maintenance charge with the local utility;
2) Have the locality's staff take on the responsibility; or
3) Pursue a maintenance contract with a third party.

The first option affords continuity and evades any potential layoff issues for the utility, but will likely be the most expensive option. Very few localities have the resources and skills to assume the second option (taking the responsibility in-house), but a few may be able to do so, or wish to do so. In this case, there should be considerable cost advantages. Third party contracting is perhaps the most cost-effective and straightforward option. If selected, localities may consider including a provision that the selected contractor offer positions to existing utility streetlight maintenance staff. Quotes for these services should be obtained prior to installation, based on the anticipated work scope and fixture types.

How much can a locality expect to save on maintenance, based on actual cost savings?

The extended lifetime and durability of LEDs should afford savings in the 70%-80% range. Whether that level of savings is realized depends upon the maintenance option selected and the baseline utility maintenance charge for existing fixtures.