Better Buildings®
U.S. DEPARTMENT OF ENERGY

The Outdoor Lighting Accelerator: Lighting the Way Forward

FINAL REPORT

U.S. DEPARTMENT OF ENERGY

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Introduction

The numerous advantages light emitting diode (LED) technology offer over incumbent street lighting technologies have been well documented. These include energy savings ,often exceeding 50%, long life, high durability / reliability, superior control of lumen distribution, and an inherent compatibility with controls that enables additional benefits like dimming or other means of adaptive lighting. Even the cost of LED products, which was initially high relative to its conventional counterparts, has over time continued to decrease until it has nearly reached parity, or otherwise offers such short simple payback periods that the corresponding investments have become widely perceived as "low-hanging fruit."

Favorable field experience around the country has inspired many public agencies to pursue their own conversions to LED. Numerous municipalities have already converted and their results are bearing out the technology's claimed advantages. However, while many others are similarly interested, a variety of barriers impede their moving forward.

Barriers occur for different reasons and from different sources. First and foremost is the collective cost facing a conversion. Replacing an entire inventory of working street lights can easily run into millions of dollars for larger systems containing thousands of street lights. Even when the investment is clearly cost-effective, the associated funding is frequently competing with other important needs, which for a public agency might include funding other essential services such as law enforcement and emergency responders, shelters and related care for the homeless, or repair or upgrades to other aging infrastructure. The primacy of these other needs, combined with tight fiscal budgets, often lead to a public agency having to continue to accept the shortcomings of an existing system and its associated excess operating and maintenance costs. These can be easier to deal with in the short term than the necessary (and extraordinary) budget approval, and represent business as usual.

A related barrier stems from the mismatch of incentives among the different parties involved. A significant percentage of public outdoor lighting is owned by investor-owned utilities, despite the public benefit nature of the service provided. A utility that owns and operates a working street lighting system generally does not have the same incentives for upgrading that system as does the public agency paying for its use. Many of the real-world situations described in this document illustrate a common consequence of such split incentives, namely in the form of a utility that is reluctant to pursue or even actively opposes an upgrade of the system to LED. Occasionally the contention between the relevant parties is sufficient to warrant judicial and/or regulatory intervention.

Another common barrier arises from a general lack of knowledge about the new technology and various related concerns about its performance and proper specification, etc., that stall its use.

To help address such concerns, in 2014 the Department of Energy established the Better Buildings Outdoor Lighting Accelerator (OLA) as a means of providing technical assistance to municipalities and other public agencies, in order to overcome the particular set of barriers each faced in upgrading their street lights to modern, high-performance systems. The OLA also included the development of tools and frameworks for broad deployment of high performance street and outdoor lighting upgrades. This document reports on the progress of these efforts to date.

This is How They Did It: Pathways to Energy Savings with Street Lights

Characteristics of your street lighting project environment	Municipally-owned, municipally-maintained	Utility-owned, utility-maintained
Evaluating economies of scale, project scope, and technical preferences	State of Tennessee, Garfield Clean Energy Collaborative (CO)	Southern California Regional Energy Network (SoCalREN)
Justifying "smart city" street light elements such as controls, adaptive lighting, and dimming	Los Angeles, CA	San Diego, CA
Managing multiple street light owners using LED controls		Anchorage, AK
Financing street light upgrades	Mid-America Regional Council (MARC), KS*	West Palm Beach, FL*
Acquiring ownership of your street lights	Huntington Beach, CA*	Portland, ME
Assessing a utility master sales agreement		Takoma Park, MD
Designing a regional bonding authority or joint purchasing program	Delaware Valley Regional Planning Council (DVRPC), PA	Detroit, MI
Developing an RFP or bid package	Chicago, IL*	Albany, NY
Pursuing favorable utility tariffs	Southeast Michigan Regional Energy Office (SEMREO)	California Street Light Association (CALSLA)
Enabling legislation for street light purchases or buybacks		State of Rhode Island*
Collaborating with utilities on financing programs	State of Washington Transportation Improvement Board**	St. Petersburg, FL

Notes

* Partners may have a mix of street light ownership and maintenance scenarios within the city's purview.

** State agencies and regional energy networks represent mid to small size cities that are benefitting from aggregated procurement and implementation strategies.

Public Outdoor Lighting Systems

Public outdoor lighting includes street and roadway lighting, but also tunnel and bridge lighting and area lighting for parks, recreational areas, public parking lots, pedestrian pathways and more. Although the different applications differ in output and light distribution, and perhaps in hours of operation and other respects, from a public agency perspective they largely employ the same technologies and thus confront similar issues in costs of operation and maintenance, color quality and energy performance, and other practical elements of operation. The discussion throughout this document therefore includes all outdoor applications under the rubric of "street lighting," specifically mentioning other applications only as the unique characteristics of their respective situations dictate.

Ownership, operation, and maintenance

Electric utilities currently own a significant portion of the U.S. national inventory of street lighting. Outside of smaller systems serving municipalities and rural areas of lower population density, where utilities may in fact own all of the street lighting infrastructure, ownership is frequently mixed between the municipality and the utility (or utilities), and sometimes private ownership. In many cases the municipality began installing street lighting in its early history, but quickly turned this duty over to the serving utility so as to avoid the costs of having to maintain staff to design and install new systems, and maintain the existing inventory. These municipalities often still own these original lights, usually decorative post-top acorn or globe styles located in the historic district, while the utility owns the more standard cobra-head type street lighting throughout the suburbs and more recent expansions of downtown. Sometimes, for a variety of reasons, a municipality will begin installing street lighting in newer residential developments or will own other various components of the system.

Collectively, almost every combination exists somewhere with respect to care and maintenance of the existing system, i.e.:

- Municipally-owned, municipally-maintained by in-house staff
- Municipally-owned, municipally-maintained through third-party contract
- Municipally-owned, utility-maintained
- Utility-owned, utility-maintained by in-house staff
- Utility-owned, utility-maintained through third-party contract

The most common type of system is utility-owned and maintained. Usually the utility prefers to maintain its own equipment given that its staff are trained for servicing the system. Utilities frequently also insist on ownership of any poles that have other utility equipment (e.g., a transformer) mounted in order to prevent unauthorized access to that equipment. Likewise, the tunnels containing underground circuitry often include other utility equipment that the utility restricts access to in order to protect both the equipment and the safety of external parties.

Municipalities that own their lights may turn them over to a maintenance contractor or other third party according to the terms of a contract. An "Asset Management Contract" is an example where the city retains ownership of the street lighting system, or asset, but a third party is responsible for maintenance and perhaps upgrade of the system as well, during the established period of the contract.

Maintenance may employ a variety of methods. The simplest (but not cheapest) maintenance program provides a call-in number for residents or emergency responders to report failed lamps or other issues like knockdowns. The utility puts the report into a queue with a "trouble ticket" and sometimes assigns a service deadline that can be up to 30 days or more depending on relative priority. A crew and a truck then makes a dedicated service call to that pole to conduct repairs as needed, as its turn comes up in the queue. Each such dedicated, or "emergency" visit to an individual pole incurs the full associated travel, labor and equipment charges for the effort required to access that pole.

Alternatively, many municipalities or utilities employ a "group-relamping" approach, whereby groups of street lights in close proximity (e.g., throughout a neighborhood) are all serviced together at some interval shorter than the average expected lifetime of the typical components (lamps, photo controls) used, and these are all replaced simultaneously regardless of their current state of operation. In this method the costs of traveling to and from the site are shared among all the lights within that site, often resulting in substantial savings relative to the dedicated trip approach, particularly in areas located some distance from the nearest service facility. This approach does not completely avoid emergency replacement costs from the occasional early failure or knockdown, but overall these are in the minority as long as the group relamping schedule is well within the average service life of the equipment (a typical replacement schedule being 70% of the expected service life).

Replacement of burned-out lamps or failed photo controls represents the bulk of service required for maintaining the incumbent street lighting systems, although occasional pole, circuit wiring, or transformer replacements are also required. A basic level of vegetative control is usually also covered in a standard maintenance program. Sometimes residents or others call with complaints about light trespass or brightness that the maintenance crews will address with the use of shields attached to the fixture or through other means. At the same time the fixture is visited, particularly if opened for relamping, many service providers also perform some measure of cleaning the lens by wiping it out, emptying dead insects, etc. Such lens cleaning during maintenance can be an important contributor to helping maintain lighting output from the fixture; dirt depreciation losses can sometimes be as high as 25% in particularly dirty (e.g., high smoke particulate or dusty) areas.

Billing

The two primary methods of billing for street lighting electricity usage involve either metered or unmetered monthly charges. Metered usage is more common in area lighting applications like parking lots and city parks than in street lighting, probably due to greater variability in area lighting. Parking lots may be turned off after partial-night operation and may not operate 365 days per year, for example, whereas street lighting more reliably operates on a near dusk-to-dawn basis every night of the year. Metered usage is billed on a per kilowatt-hour basis similar to residential or commercial usage, and may be billed at similar rates as those other sectors. Direct monitoring of the lighting electricity use requires it to be on its own metered circuit, isolated from other electricity users (though it can also be billed as part of the bulk use at a site).

Unmetered billing, in contrast, reflects the more predictable monthly energy use of fixtures that operate on a fixed astronomical schedule every night of the year. Their billing is based on a monthly rate calculated using the nominal lamp wattage plus an assumed energy use of the typical ballast[1] used in the fixture, for the near dusk to dawn operation required in a given month. The utility lumps monthly rates into tiers that are usually based on the nominal wattage of the fixture, and any given street light may be using slightly more or slightly less than the assumed average. Moreover, as these fixtures are not metered, there is no way to tell if an individual unit has failed until it is reported by either a utility crew or member of the public. The utility thereby bills for a light's assumed energy use regardless of its actual operating status.

Utilities that provide maintenance services on either their own lights or on lights owned by the municipality or other public agency typically cover the basic needs under a separate monthly maintenance fee charged on a per pole basis. Fees vary based on nominal wattage and fixture type (decorative generally being higher than standard cobra head due to their higher first cost) and cover most standard work requirements. Extraordinary maintenance (e.g., the number of knockdowns exceeding a set threshold within an established period of time, or more than basic vegetation control) may incur additional costs.

Third-party maintenance contracts more often involve a nominal retaining fee and then are billed on a per-job basis. This approach is generally more cost-competitive than a flat monthly fee that is paid whether or not maintenance is (ever) required, and becomes even more competitive as the actual maintenance needs decrease.

The third component of utility billing, where the utility owns the street lights, is a cost-recovery fee that the utility charges to pay for the lights the public agency is using. Typically this is based on the capital cost of the equipment in use, spread out over an assumed lifetime with an additional profit margin applied. This component of the billing is never eliminated, regardless of the actual age of the equipment in use. Notably, a 2012 street lighting inventory by the Municipal Solid-State Street Lighting Consortium indicated that the average age of street lighting equipment in the sample responses was 15.3 years, with some systems exceeding 30 years in age.[2]

LED Conversion

Benefits

LED products represent a fundamental shift from analog to digital technology in the lighting realm. Similar to other digital conversions that have occurred in areas like photography, music, and communications, this transition in lighting introduces numerous new capabilities and efficiencies that were not practical, if even possible with the analog form of the technology.

The most immediate benefit is the potential significant reduction in energy use that can be achieved while still supplying the necessary illumination for a given application. A number of LED characteristics contribute to this end, but in the case of street lighting a 50% reduction in energy use has become almost a standard starting point, with many installations achieving higher savings, 60-70% or even more when controls are included.

The solid-state nature of the technology also leads to much greater robustness and reliability of products, and associated increases in expected lifetimes. A major factor in lifetime is the lack of a filament to burn out, meaning that most products will not reach their end of service life by catastrophic failure. Rather, the design end of life is the calculated point that the LEDs will have faded in output to the extent of no longer providing the illumination needed for the application. Being relatively predictable in this regard means that budgeting and other preparations for replacement can be done in a more orderly fashion, like other infrastructure investments where catastrophic failures are usually avoided altogether.

As noted, LEDs are highly compatible with controls. This is largely due to their silicon chip design and related characteristics like not suffering from rapid switching between on and off states, nor any warm-up or necessary "restrike" time delay that characterized the previous high-intensity discharge technologies. LEDs are inherently dimmable, and being small point sources that emit in only one hemispherical direction also offer significantly better control over the distribution of their lumens compared to lamp-based products.

LEDs also offer a wide range of color temperatures/spectral contents, from single-color emitters to the range of "white light" color temperatures, from incandescent-like 2700K to metal halide 4200K to fluorescent "cool white" of 5500K or higher. Current state of the art products are even becoming color-adjustable for use at different times of the day or for other applications where this capability is desired. One method of enabling such capability is including multi-color chips in a single array, whose output can be individually adjusted to tune the color of light output (Figure 1).

Figure 1. *PC Amber-Cyan-Violet Flat Lens chip array (ledengin.com).*

Incentives

As noted, the incentives for replacing an operating street lighting system from the perspective of a utility deriving revenue from it differ from that of a public agency on the paying end. The initial investment may tie up several millions of dollars and months or years of attention, depending on the size of the system, after which the utility can expect significantly reduced electricity sales. Street lighting has been a reliable revenue generator for utilities for more than a century and occurs during a period when most other electricity uses are at their relative minimums. Maintenance staff are furthermore well acquainted with the incumbent technologies, with decades of direct experience behind them. LED conversions can appear somewhat disruptive from this standpoint.

From a municipal perspective, street lighting is a service that a public agency is committed to providing in order to support safety and security for its citizenry, but to date has come at high cost. Street lighting often comprises 40% or more of a municipality's energy budget. Municipalities often view street lighting upgrades as "win-win" investments. Not only do they save money and contribute to meeting emissions reduction goals, etc., but they provide better illumination valued by the residents as well as police and emergency responders, and present many fewer safety issues stemming from unexpected outages. Street and outdoor lighting upgrades are commonly at or near the top of the list for municipal near-term action plans (Figure 2).

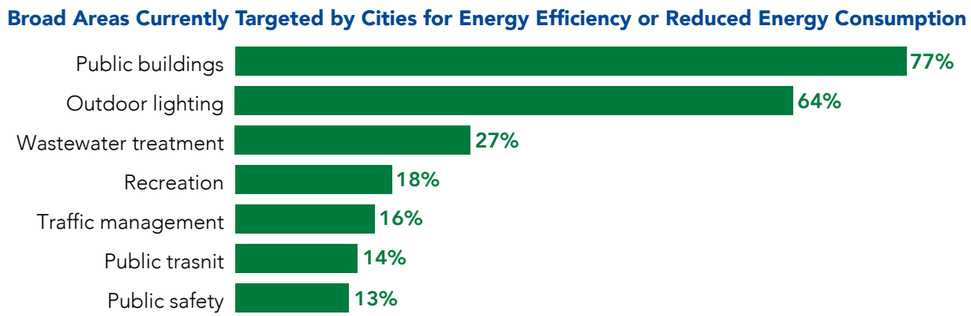

Figure 2. *Mayoral priorities reported in January 2016. Source: United States Conference of Mayors, 2016.*

Municipalities who own their lights are better positioned to begin the process of transitioning them to LED. Even these likely rely on the willingness of the utility to support the conversion, however, in the form of applicable rate tariffs that give credit for the lower electricity usage. LEDs are often so much lower in use than the HID products they are replacing that the utility does not initially have a corresponding wattage category in which to bin them. In the absence of such a rate tariff, a municipality will see little or none of the return generated in the form of lower electricity payments, thus eliminating this primary incentive to convert. Fortunately, the number of utilities that do not offer appropriate rate tariffs to match the energy usage of LED products is shrinking, though still not uncommon.

An even more widespread hurdle applies where the utility owns the street lights and simply bills the municipality for operations, maintenance, and cost-recovery. In this case the utility is providing street lighting as a package service to the municipality, and has considerable authority in the decision to undergo conversion of its own equipment. The utility must offer rate tariffs for the upgraded product options that are hospitable to a conversion, or else the financial incentive to the municipality is eliminated. Many examples exist of utilities that not only do not yet offer LEDs as an option, but numerous others that actually charge higher rates for them despite the savings that have been widely demonstrated elsewhere around the country.[3]

These split incentives sometimes impede progress in street lighting conversions to the point that public agencies turn to the legislative or judicial process to force the issue. Smaller municipalities in particular often have no other leverage against a large utility other than combining forces with their neighbors, and even then outcomes vary widely. Numerous current examples of this situation exist, including several that pertain to OLA partners and are discussed later in this document.

Different combinations of these multiple elements means that while many commonalities can be found among public agencies, the particular situation in which each finds themselves and the corresponding "best" approach to encourage progress makes each situation distinct.

Process

Most endeavors to convert street lights do tend to follow a general path, spending more or less time navigating each of its associated individual elements as the particular situation dictates. A conceptualization of this path, along with supporting resources and examples, was developed during the course of the OLA activity and is displayed in Figure 3.[4]

The varying circumstances and parties involved in any given situation impact the time required to progress through individual steps of the procedure rather than altering the procedure itself, and as a result different municipalities can be found at every stage of this process throughout the United States.

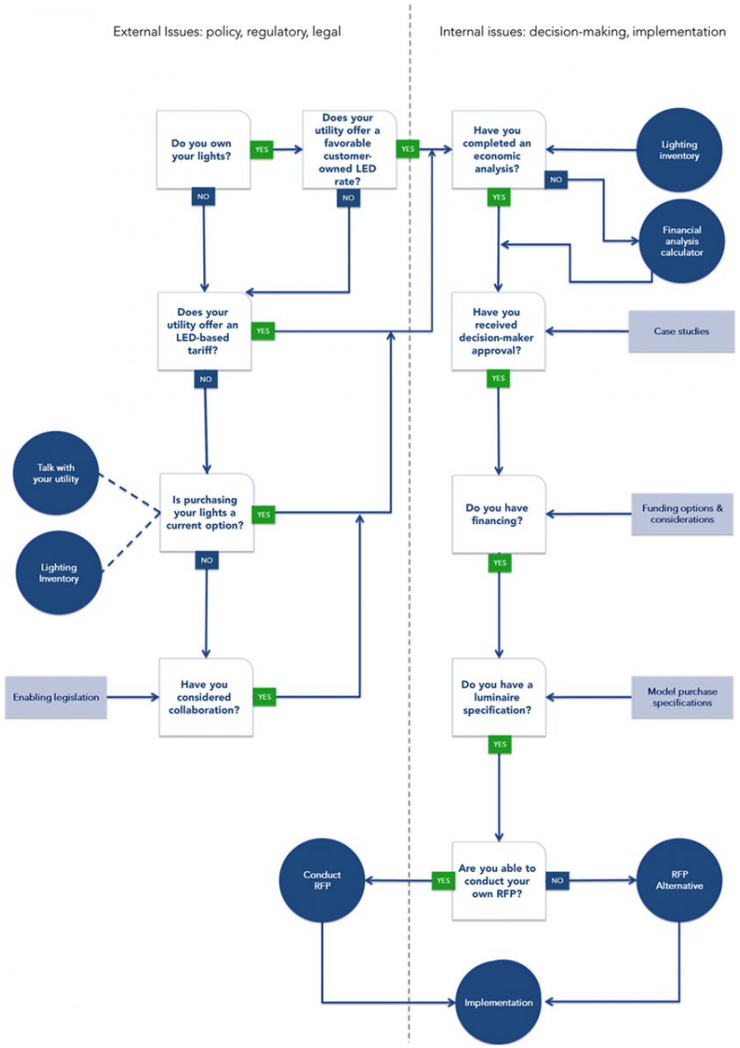

Figure 3. *The general process of street light conversion, displayed by The Decision Tree Tool.*

OLA Partner Status

The OLA was initiated in May 2014 with a goal of identifying partners around the nation that would commit to converting a combined total of 500,000 street lights over the ensuing two-year period. In January 2015, this effort was raised to a Presidential Challenge, with an increased goal of 1.5 million street lights committed.

Since the kickoff, the OLA has signed 25 partners, including three states, six regional energy networks and 16 cities as listed in Figure 4.

This section provides a description of each of these OLA partners, a sample of the various issues each has encountered and corresponding resolution steps taken to date, and current status of their respective conversion programs. The estimated energy benefits achieved from a complete conversion are based on the following assumptions: a) average size of the existing street light is 100 watts; b) electricity savings from converting to LED is 50%; c) emission factor used to estimate carbon dioxide emissions reduction is 7.03E-04 metric tons CO2 / kWh; and d) average U.S. commercial electricity price is $0.107/kWh.

3 STATES

- Rhode Island
- Tennessee
- Washington

6 REGIONAL ENERGY NETWORKS

- California Street Light Association
- Delaware Valley Regional Planning Comission (Philadelphia metro)
- Garfield Clean Energy Collaborative (Colorado)
- Mid-America Regional Council (Kansas City metro)
- Southeast Michigan Regional Energy Office (Detroit metro)
- Southern California Regional Energy Network (Los Angeles metro)

16 CITIES

- Albany, NY
- Anchorage, AK
- Chicago, IL
- Dearborn, MI
- Deerfield Beach, FL
- Detroit, MI
- Flint, MI
- Huntington Beach, CA
- Little Rock, AR
- Los Angeles, CA
- Portland, ME
- Racine, WI
- San Diego, CA
- St. Petersburg, FL
- Takoma Park, MD
- West Palm Beach, FL

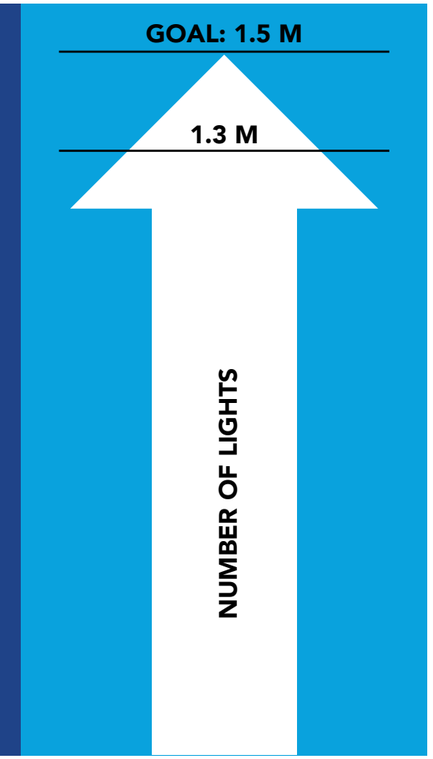

Figure 4. *Outdoor Lighting Accelerator partners as of April 2016.*

State Partners:

- Rhode Island
- Tennessee
- Washington

PARTNER: RHODE ISLAND

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
102,000	35,547,000	$3,803,529	24,990

Program Description

The Rhode Island Office of Energy Resources (OER) developed a state-level program supporting the conversion of street lighting throughout its region, with enhanced incentives in addition to any applicable utility-administered (National Grid) incentives. Municipalities that retrofitted their existing streetlights to energy efficient LED technologies were eligible for $0.40 per watt reduced for qualified LED fixtures and $20.00 for each remotely-programmable dimming control installed.

Service Area

Municipal and roadway lights throughout the state.

Situation Highlights

In 2014, the Rhode Island Municipal Streetlight Investment Act enabled municipalities to purchase their street lights from their utilities, and approximately 75% of National Grid customers in turn requested that the utility provide them with an inventory and total cost of purchasing their respective systems. It is expected that all municipal street lights in the state will be converted by 2020. As of 2016, 35,000 street lights had been converted to LED.

The RI Department of Transportation has always owned their roadway lights and already pursued conversion to LED. All of these lights are to have a control system added that offers dimming control along with monitored operation. Rhode Island is also considering addition of monitoring capabilities to traffic signals through use of the roadway controls system. In roadway lighting, maintenance has traditionally presented about 2/3 of the cost, while energy comprises only 1/3.

National Grid has requested a pilot program to investigate the accuracy of a metering system contained within customer-owned property (i.e., the street lighting luminaire), and to determine its suitability for basing its billing. The state's public utility commission has suggested that National Grid pursue this investigation using luminaires already installed on the roadways that have the embedded controls.

Additional Information

Municipal Street Light Investment Act

OER Street Light Program

PARTNER: TENNESSEE

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
42,336	14,754,096	$1,578,688	10,372

Program Description

In 2013, the Tennessee Department of Environment and Conservation's Office of Energy Programs (TDEC OEP) received an award under the U.S. DOE's State Energy Program Competitive Funding Opportunity Announcement, to stimulate energy investment in local jurisdictions, K-12 public schools, and public housing authorities. As part of this award, TDEC OEP and subrecipient Clean Energy Solutions, Inc. stimulated demand for light-emitting diode (LED) streetlight conversion projects by providing education, outreach, and no-cost technical assistance to local governments. To facilitate conversions, the State developed replicable ownership, tariff, and maintenance structures that produce beneficial economic outcomes for both local governments and local utilities.

Service Area

TDEC OEP provides support and technical assistance to State agencies, public higher education institutions, and local jurisdictions throughout the entire State of Tennessee.

Situation Highlights

- At the time of the project, tariffs imposed by municipal utilities did not acknowledge or capture the cost reduction benefits of LED technology, and often, complex ownership arrangements made it difficult for local governments to predict the financial impacts of an LED street light conversion.
- The project team found that one of the most effective ways to support local governments was to assist with pulling together an initial lighting inventory and financial analysis, based on a typical use estimate for each wattage type at the utility per kWh rate. The result of the financial analysis provided a preliminary estimate of energy and cost savings (based on reduced kWh use and reduced maintenance charges) and project cost, based on a 1-to-1 replacement of existing lights with LED equivalents. Any available rebates or other incentives are included within the calculations to determine a simple payback, which can be used by the local government's representative in discussions with other decision-makers.
- Examples of financing selected by local governments include: Montgomery County's streetlight retrofit is part of a larger ESPC project, the City of Clarksville has utilized Qualified Energy Conservation Bonds (QECBs) to finance its streetlight conversion, and the City of Knoxville identified self-finance as likely the best option.
- The project team also found that incorporating insight from experienced local governments in Tennessee that had already gone through the streetlight retrofit process was invaluable in demonstrating to other local governments the feasibility of such a conversion as well as incorporating into the dialogue a very fact-based consideration of localized challenges and potential solutions, as well as lessons learned.

PARTNER: TENNESSEE (continued)

Situation Highlights (continued)

- Price quotes in individual locations were wide ranging, initially resulting in estimated paybacks from less than 2 years to 7 years. At least four variables explain these differences:
  1. Timing of the quotes - Costs dropped for LED streetlights, as much as 40-50% in three years
  2. Differences in scopes of work - Some quotes factored in maintenance and replacement costs in their bids, while others did not; some reflect material costs only and not installation;
  3. Differences in configuration of lights by wattage distribution - The 100-150 wattage fixtures in 2016 cost about $200, while the 300+ wattage replacements could be as high as $600.
  4. Quantity of fixtures / economies of scale - A large city like Knoxville has about 7 times the number of poles as does a city like Lebanon.

Additional Information

TDEC OEP Webinar on LED Street Lighting Conversions for Local Jurisdictions: Working with Local Utilities to Facilitate Best Case Scenarios Financial Analysis Tool

LED Streetlight Conversion Simple Payback Calculator

PowerPoint Presentation on City of Knoxville LED Project

PARTNER: WASHINGTON STATE TRANSPORTATION IMPROVEMENT BOARD (TIB)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
80,000	27,880,000	$2,983,160	19,600

Program Description

The TIB, a state-funded grant agency, has coordinated with a number of its large investor owned utility (IOU) companies to relight small and low tax base cities in their respective service areas. This program started in summer 2015 and will affect about 80 cities. Grants became available to other cities outside the initial targete service areas beginning in 2016. The program has an estimated cost of $28 million over the targeted ten year timeframe.

Service Area

Small and low tax base cities across the state of Washington.

Situation Highlights

The current trend towards upgrading older street lighting technology with LED appears to be less available to smaller communities, despite the fact that they are among those who would benefit most from the additional savings generated. TIB convinced the state government to establish this program to ensure smaller communities are not left behind in the state's ongoing transition of its public lighting.

In 2016 discussions were underway with at least 8 Public Utility Districts who expressed interest in the program, following an announcement issued by the Bonneville Power Association regarding the availability of the TIB funding.

All municipally-owned (vs. utility-owned) lighting systems are in the process of being converted or are completed already. The original implementation schedule was designed to take place over a ten-year timeline but it is likely that 75% will be completed at the five-year mark.

A number of contractors across the state were hired (and hired additional staff) to carry out the conversions. Public responses to the new lights were overwhelmingly positive. Most energy savings averaged between 50-66%.

Additional Information

Relight Washington LED Streetlight Program

TIB Funding Program for Small City Customers

Regional Energy Network Partners:

- California Street Light Association
- Delaware Valley Regional Planning Comission (Philadelphia metro)
- Garfield Clean Energy Collaborative (Colorado)
- Mid-America Regional Council (Kansas City metro)
- Southeast Michigan Regional Energy Office (Detroit metro)
- Southern California Regional Energy Network (Los Angeles metro)

PARTNER: CALIFORNIA STREET LIGHTING ASSOCIATION (CALSLA)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
180,000	62,730,000	$6,712,110	44,099

Program Description

The California Street Light Association (CALSLA) works on behalf of cities and counties throughout the State of California to reduce electric rates and facilities charges for street lights and traffic signals.

Service Area

Southern California, covering the utility territories of Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric.

Situation Highlights

CALSLA successfully negotiated a settlement in the 2014 General Rate Case (GRC) with PG&E, which was approved, and became effective on January 1, 2016. Terms included significant reductions in costs for the LED tariff and an extension of the dimmable/adaptable street light program.

Two key issues were pending in the SCE service area in 2016– new rates for LEDs reflecting the California Public Utility Commission's (CPUC) final decision in the 2015 GRC and resolution of AB 719 legislation obligating California IOUs to develop a program and accompanying rate structure to convert utility owned (LS-1) street lights to LED.

CALSLA, the City of San Diego and other local jurisdictions were seeking a tariff solution with SDG&E for metered street lights for communities to take advantage of the investments they have already made in adaptive controls and LED retrofits. Advanced metering infrastructure for street lights allows cities to track the exact point of energy use and control light levels and other communication services. The existing utility tariff for customer-owned metered streetlight service has been closed since 1979.

Workforce issues have been raised by the Los Angeles International Brotherhood of Electrical Workers regarding concerns over the transition to LED street lights and other energy efficient technologies and CALSLA will continue to monitor/identify solutions. One issue is to ensure proper training and electrical safety for LED installation requirements, which may differ from incumbent technologies.

Additional Information

CALSLA Information Sheet

PARTNER: DELAWARE VALLEY REGIONAL PLANNING COMMISSION (DVRPC)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
26,000	7,282,834	$1,463,405.76	3,759.70

Program Description

Regardless of size, fiscal or staffing capacity, each municipality participating in the Regional Streetlight Procurement Program is able to leverage economies of scale and confidently access energy performance contracting and low-interest finance to convert their entire outdoor lighting systems to more energy efficient LED at no upfront cost. DVRPC issued a single RFP on behalf of 45 municipalities in southeastern PA to identify an energy services company (ESCO) that would execute energy performance contracts for street and exterior lighting upgrades. 35 of the 45 municipalities ultimately proceeded with a performance contract.

Service Area

DVRPC serves nine counties in the greater Philadelphia region: Bucks, Chester, Delaware, Montgomery and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester and Mercer in New Jersey. This project took place in the four suburban counties of southeastern PA: Bucks, Chester, Delaware, and Montgomery counties.

Situation Highlights

The RFP leveraged the MSSLC specification for equipment, and also locked in pricing on labor and equipment – economies of scale were achieved due to the pooled buying power. The ESCO conducted an inventory, design, procurement and installation for each participant. The specification within the RFP allowed the program to provide transparency and lock in products and pricing for the majority of cobrahead equipment procurement through the program, and provided the ability to negotiate the the pricing and specification for the remaining equipment, labor, and service costs. DVRPC's program-wide "owners agent", (Keystone Lighting Solutions) provided the program with the technical capacity to successfully negotiate pricing and oversee quality control on ESCO products and design. Financing, legal and technical assistance on the energy performance contracting was provided across the program by the Pennsylvania Sustainable Energy Finance Program (PennSEF). 24 municipalities used financing, and 11 paid for the project out of their own budgets. Individual project costs ranges from $40K to $2.2 Million. There was no minimum project size for municipalities to be eligible for financing. Three municipalities purchased their lights from the utility at favorable rates (PECO (Exelon)) as part of their performance contract. Construction is expected to begin April 2017-June 2018.

Additional Information

Regional Streetlight Procurement Program
RSLPP RFP on behalf of 45 municipalities in southeastern PA
Keystone Lighting Solutions – Program Technical Advisor
Pennsylvania Sustainable Energy Finance Program (PennSEF)

PARTNER: GARFIELD CLEAN ENERGY COLLABORATIVE

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
4,500	1,568,250	$167,803	1,102

Program Description

The Garfield Clean Energy Collaborative has taken the initial steps to assist member communities with assessing the cost-saving opportunities of street light conversions to LED technology.

Service Area

Garfield Clean Energy Collaborative members include Parachute, Rifle, Silt, New Castle, Glenwood Springs, Carbondale, Garfield County, Colorado Mountain College, and the Roaring Fork Transportation Authority.

Situation Highlights

The Garfield Clean Energy Collaborative assists residents, businesses and governments throughout Garfield County to become more energy efficient and tap clean energy as a means to creating a stronger, more resilient economy. The Collaborative uses state legislation that allows governments to cooperate with one another to provide a service or function that is most efficiently provided on a regional basis rather than by single governments. The Collaborative sees street lighting as an opportunity for participating communities to save money while improving the quality of street and roadway lighting. A focus is to develop a scope of work beginning with the initial inventory of existing lighting technology and utility tariffs, along with exploring airport runway lighting on behalf of local governments.

Additional Information

Rifle lighting up downtown with efficient LED street lights

PARTNER: MID-AMERICA REGIONAL COUNCIL (MARC)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
25,000	8,712,500	$932,238	6,125

Program Description

The Smart Lights initiative was designed to help local governments in the Kansas City area install high-efficiency street lighting technologies. The initiative has engaged communities in the region through a partnership called the Smart Lights Coalition, consisting of 25 cities with populations under 35,000, MARC and local utility providers. Larger cities have followed suit and started to retrofit their streetlights with LED technology.

Service Area

MARC serves 119 cities and 9 counties in the in the Kansas City, MO metropolitan region.

Situation Highlights

MARC assisted member communities with LED pilot programs funded by the US DOE's Energy Efficiency and Conservation Block Grant Program under the American Reinvestment and Recovery Act (ARRA). The majority of participating cities did not own streetlights, which were leased through utility companies. The Public Service Commission (PSC) approved a pilot LED tariff that did not yield the significant cost savings communities expected. MARC was able to determine that cities need to purchase streetlights from utilities to fully benefit for LED project. The alternative was to negotiate a tariff in favor of communities receiving more cost savings. Recently KCP&L did receive an LED permanent tariff in the state of Missouri.

Progress in the effort is ongoing, however many smaller cities continue to wait for utility tariff relief in order to pursue LED replacement of their street lighting systems. In contrast, cities with municipally owned utilities like Independence, MO, have been able to accelerate their retrofits and are posting progress on interactive LED streetlight maps.

Kansas City Power & Light is pursuing a "structured conversion" by offering LED luminaires for new and replacement lights and recently replaced 5500 streetlights with LED technology.

Additional Information

High Efficiency Lighting Project Kansas City Region

City of Independence LED Street Light Program

PARTNER: SOUTHEAST MICHIGAN REGIONAL ENERGY OFFICE (SEMREO)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
70,000	24,395,000	$2,610,265	17,150

Program Description

SEMREO was founded in 2007 to help cities share resources and expertise to help each other save energy. Since then it has grown from five founding cities to 26 participating communities covering a total population of more than 1.8 million. The Southeast Michigan Regional Municipal Street Lighting Consortium is a recent SEMREO initiative that aims to upgrade all public streetlights to LEDs throughout the Detroit metropolitan region by 2020.

Service Area

The Detroit metropolitan region.

Situation Highlights

In 2015, the Michigan Street Lighting Coalition was formed to intervene in Michigan Public Service Commission (MPSC) case U-17767 that was brought by DTE, proposing a permanent increase in street lighting tariffs. This rate increase would serve to make LEDs more expensive than the HPS fixtures they were replacing in the sizes most commonly used for street lighting. At the same time, some of the existing rates for HPS technology were reduced.

The outcomes from the hearing on the intervention concluded that the utility's proposed rates were not cost-based and were not transparent in terms of how they were developed; that the Cost In Aid of Construction (CIAC) contributions were not being credited in the monthly rates proposed; and that the improvements in maintenance expected from LEDs were not being recognized.

Additional Information

SEMREO Street Lighting Consortium

Creating a Plan to Convert Streetlights in Southeast Michigan to Energy Efficient LED's by 2025

PARTNER: SOUTHERN CALIFORNIA REGIONAL ENERGY NETWORK (SoCal REN)

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
82,073	28,602,441	$3,060,461	20,108

Program Description

The Energy Network Public Agency Program identifies energy saving measures and works with public agencies through design, financing and construction to help accomplish energy efficiency projects. All services provided by The Energy Network are provided at no cost and are available to more than 700 public agencies in Southern California.

Service Area

Southern California.

Situation Highlights

The Network initially focused on a pilot project to offer cities a "one-stop" opportunity for street lighting upgrades, to streamline the implementation process, and to provide assistance to public agencies through every step of their projects.

This type of support is particularly helpful to smaller cities that face a number of challenges--the most prominent challenge in this particular effort was access to and accuracy of street light data in one utility service area, where a typical 10-15% discrepancy was found between the records held by the utility and those held by cities in their territory. Another challenge addressed was the rapid pace of improvement in LED technology, where manufacturers produce new models at such a rate that those previously approved under the formal process are no longer manufactured.

Additional Information

The Energy Network Streetlight Projects

Project Management Plan Preliminary Financial Feasibility Analysis City of Alhambra Street Lighting Retrofit Pilot Project

City Partners:

- Albany, NY
- Anchorage, AK
- Chicago, IL
- Dearborn, MI
- Deerfield Beach, FL
- Detroit, MI
- Flint, MI
- Huntington Beach, CA
- Little Rock, AR
- Los Angeles, CA
- Portland, ME
- Racine, WI
- San Diego, CA
- St. Petersburg, FL
- Takoma Park, MD
- West Palm Beach, FL

PARTNER: ALBANY, NY

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
10,300	3,589,550	$384,082	2,523

Program Description

The City of Albany, NY was part of New York Power Authority's (NYPA) Five Cities Energy Master Plan project. Approximately 57% of Albany's energy budget was spent on street lighting, most of which was spent on operations and maintenance. The City investigated funding opportunities to convert to LED street lighting.

Service Area

Municipally-owned and utility-owned street lighting.

Situation Highlights

The City of Albany, NY spends in excess of $3-4 million annually on street lights. In the absence of an LED tariff offer by National Grid, Albany looked toward the state for supportive legislation on the cost structure for buybacks on utility-owned lights in order to access LED street lights. NYPA provided Albany and four other upstate New York cities with technical assistance for the initial inventory assessment and grant funds for the initial phase of the conversion project. The NYPA program also provided assistance to develop an energy master plan (released in 2015) for a clean energy economy and maximize energy efficiency in the built environment. The New York state assembly passed the LED Streetlights Act in 2015, which gives municipalities the right to purchase street lights from utilities in order to implement energy efficiency measures without restrictions. In 2016 Albany was pursuing opportunities with National Grid to identify a path forward to broad scale deployment, either a negotiated sale of streetlights or tariff option approved by the Public Service Commission (PSC).

Additional Information

BuildSmartNY Five Cities Energy Plan: City of Albany

Request for Proposal: City of Albany Energy Efficiency Streetlight Feasibility Study

LED Streetlights Act of 2015

PARTNER: ANCHORAGE, AK

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
16,000	5,576,000	$596,632	3,920

Program Description

In the effort to reach 100% adoption of LED street lights throughout the city, Anchorage experienced impediments due to asset ownership across four agencies. The City investigated collaborative pathways to implement the city-wide retrofit project.

Service Area

Municipally-owned and utility-owned street lighting.

Situation Highlights

The City of Anchorage, AK realized an annual energy savings of $260,000 after converting about 4,000 street lights to LED technology. The city determined LED street lights an acceptable option in support of sustainability initiatives and began pursuing ways for broad scale deployment by converting the balance of its inventory. The inventory assessment revealed street light ownership by the State Department of Transportation, Municipal Light & Power (ML&P), Municipality of Anchorage, and Chugach Electric. The city's Maintenance and Operations Department is responsbile for installations per the outcome of the Anchorage Assembly's authorization of a $1.6 million contract to install LED street lights with the ability to add controls and network the system with other agencies in the future. The added controls will enable Anchorage to manage inventory outages and replacement in a street lighting system with multiple owners.

Additional Information

City of Anchorage LED Street Light Retrofit Projects

ML&P LED Street Light Conversion

PARTNER: CHICAGO, IL

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
270,000	181,679,358	127,721	$9,300,000

Program Description

The Chicago Infrastructure Trust worked with the Mayor's Office and multiple departments to upgrade the city's street lighting infrastructure to LED technology. The 2016-2017 procurement process focused on: replacement of approximately 270,000 of the city's high pressure sodium fixtures to LEDs, targeted infrastructure stabilization repairs, and deployment of a lighting management system enabling real-time monitoring and control of the fixtures, and to support future smart city applications.

Service Area

The City of Chicago.

Situation Highlights

Chicago has decided to not only upgrade its lights but also to proactively prepare ts entire street lighting network to serve as part of the underlying architecture for future "Smart City" technologies. Agencies across the city were engaged, including but not limited to the Chicago Infrastructure Trust, Department of Transportation (CDOT), the Department of Innovation and Technology (DOIT), Fleet & Facility Management (2FM), Office of Emergency Management and Communications (OEMC), as well as Chicago Park District. By 2021, the Chicago Smart Lighting Project will replace about 85% of the city's outdoor lamps. The new lights will consume 50-75 percent less electricity and the savings are to be used to offset the cost of the modernization.

The initial focus of the replacement program (and the commitment to OLA) was on high-pressure sodium cobrahead fixtures, the most common type; ornamental fixtures may be converted in later stages. The project includes a public engagement process to solicit input from residents about preferences and priorities for neighborhood lighting. The City included a full infrastructure condition assessment into the project scope to help prioritize targeted infrastructure stabilization repair work. Work is expected to start mid-2017 and be completed by 2021. Currently the city does not expect to utilize separate project financing but will include the annual project costs in its capital expenditures budget throughout the project timeline. Chicago will continue to own and maintain all street lights following the conversion, however, the city may need to negotiate tariff with Commonwealth Edison.

Additional Information

Chicago Smart Lighting Project

Chicago Smart Lighting Project Implementation Model

City of Chicago Moves Forward with Street Light Modernization Program

PARTNER: DEARBORN, MI

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
50,000	17,425,000	$1,864,475	12,250

Program Description

Build a coalition of neighboring cities and towns to create a regional lighting authority.

Service Area

DTE Energy.

Situation Highlights

The City of Dearborn and a coalition of cities in southeast Michigan intervened in a rate case with the local investor owned utility (DTE Energy) due to a proposed tariff rate increase for LED street lights. The proposed LED street light tariff would make LED street lights more expensive than high pressure sodium. Additionally, the coalition of cities focused on on state legislation to allow cities to take control of their street lights and only pay the utility energy charges. Unique ways to finance LED street light retrofits including the creation of a regional lighting authority with bonding authority is another area of interest, along with leveraging available ancillary technology with LED street lights including controls, communication, and driverless vehicles.

Additional Information

2014 City of Dearborn Street Lighting Upgrade Communications Package

PARTNER: DEERFIELD BEACH, FL

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
4,000	1,394,000	$149,158	980

Program Description

The city pursued the replacement of the street lighting system as part of a larger sustainability project that also aimed to retrofit public buildings and undertake other efficiency measures throughout its metro area. Ownership across the city is divided among four agencies: the city, Florida Power & Light (FPL), Broward County, and the Florida Department of Transportation.

Service Area

The City of Deerfield Beach, FL.

Situation Highlights

The city is pursuing an ESCO approach to replacing their street lighting system. The plan is to conduct a thorough inventory, including the recording of GPS location for each light and pole and their general condition, and then financing the conversion of the city-owned lights using the energy savings achieved. It is unlikely that the utility's lights will be replaced at the same time as those of the city, and so will likely have to be financed separately. The utility has their own ESCO for replacing their lights throughout their territory and is unwilling to sell the lights they own to the city.

The utility appears to be poised to also roll out a controls system for the lights they own, which they have proposed to integrate with an automated water metering system the public works department is planning to implement within the next couple of years. The city is tentatively interested in the controls system but is proceeding cautiously in their interactions with FPL. The tariff bins FPL offers do not currently include dimming options, although there are some additional metered accounts that may be available that measure actual energy use.

The city's conversion program is expected to begin its replacements in 2017.

PARTNER: DETROIT, MI

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
65,000	22,652,500	$2,423,818	15,925

Program Description

The Detroit Public Lighting Authority (PLA) was established in 2013 to manage a comprehensive restoration of the city's street lighting system. In addition to repair and replace most of the street lights, much of the associated wiring and supporting electrical infrastructure also needed replacement. Restoration of the system was one of the top two priorities identified by the city following its declaration of bankruptcy.

Service Area

The greater Detroit metropolitan area.

Situation Highlights

The PLA's highest priority was to get the street lighting system back up and operating as quickly as possible, given that many neighborhoods had lacked reliable street lighting for years. A second priority was to help get the city out of the street lighting business by transferring system operation and maintenance to the serving utility, DTE Energy. The ultimate goal was to provide the most effective street lighting possible given formidable budget and schedule demands of the city.

Detroit's original lighting system of 88,000 units included alleyways and multiple lights on every residential block. PLA concluded that the best action was to reduce the number of luminaires installed on a typical neighborhood street, thus reducing both present capital and future operating costs, with the final system amounting to 65,000 units. Financing was obtained through a $185 million bond issued by the Michigan Finance Authority. For the portion of the replacement consisting of street lights, the incremental investment in LEDs (vs. a conventional set of HPS fixtures) yielded a simple payback of 2.5 years from energy savings alone.

Detroit completed the replacement program in December, 2016, a year ahead of schedule. Relighting of the city has been viewed as an important symbol of the city's turnaround.

Additional Information

Public Lighting Authority

Restoring Detroit's Street Lighting System

PARTNER: FLINT, MI

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
11,000	3,833,500	$410,185	2,695

Program Description

The City of Flint, MI began the initial street lighting inventory process in preparation for suitable retrofit opportunities under the existing Consumers Energy LED street lighting program. Flint was challenged by limited staffing and funding resources along with re-prioritization of public service infrastructure projects.

Service Area

City of Flint municipal street lights.

Situation Highlights

Flint's system consists of about 11,600 mercury vapor and high-pressure sodium street lights that use a total of about 18.5 MWh per year in electricity, worth about $2.5 million. Street light facilities staff conducted a full inventory and system-wide assessment, complete with GIS mapping of poles and fixtures. The initial financial review (See below) showed a promising ROI on a full-scale replacement project. While all lights are owned by Consumers Energy, there was some early indication of the utility's willingness to collaborate with the city to achieve favorable terms for a street light replacement project.

Additional Information

Project: Flint's Street Lights Design Review

PARTNER: HUNTINGTON BEACH, CA

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
11,000	3,833,500	$410,185	2,695

Program Description

Street lights cost the City of Huntington Beach about $2 million per year and are increasing. Southern California Edison (SCE) owns the ~13,000 street lights responsible for about $1.8 million of that cost and the City owns the rest (~2000 street lights, amounting to $164,000 of unmetered street lights and $43,000 of metered lights).

Service Area

The City of Huntington Beach, CA.

Situation Highlights

In 2012, SCE agreed to amicably sell utility-owned street lights back to municipalities located within their service territory. HB proceeded with a preliminary Phase I effort to convert a few streets and parking lots from HPS to LED, and estimated results of more than a 50% reduction in energy use and 80% reduction in fixture maintenance costs. An inventory-grade audit was also conducted that indicated a very favorable economic case for the city to pursue this opportunity. By then, more than 80 cities had applied to SCE to purchase their street lighting systems and SCE changed its position so that cities would have to complete their acquisition of these assets by August, 2016. HB's process was well underway by then although the city estimated that taking possession of the lighting system would require at least another year beyond that point.

SCE valued the system at approximately $4.3 million, or about $450 per pole for the ~11,000 poles that would be eligible for sale. The remaining approximately 2,000 poles hold SCE equipment in addition to the street lights or are otherwise in areas requiring access to SCE equipment and are thus to be retained by SCE. The city plans to pay off the acquisition using savings achieved so that its initial annual savings realized will be held between $70K and $120K. Following payoff, the city estimates annual savings of $1 million.

Additional Information

City of Huntington Beach RFQ for Energy Savings Performance Contract for Street Lighting Systems

Huntington plans to Upgrade, Buy over 11,000 Street Lights

PARTNER: LITTLE ROCK, AR

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
24,000	8,364,000	$894,948	5,880

Program Description

Determine the benefits of street light ownership and Little Rock's ability to absorb the expense of infrastructure upgrades.

Service Area

Entergy Arkansas.

Situation Highlights

Little Rock has approximately 24,000 streetlights billed monthly through the Entergy tariff. The city owns and is responsible for maintenance for about 1000 of those lights. Little Rock currently pays $2.5 million per year for lights currently billed under the street light tariff rate structure.

The new Entergy tariff rate for high efficiency lighting (LED) was adopted at a higher rate than existing technology. Little Rock will need to consider enhanced rate relief and maintenance cost saving opportunities to justify the economic feasibility of a city-wide street lighting retrofit project.

PARTNER: LOS ANGELES, CA

Summary Impacts Table			
	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
110,000	38,335,000	$4,101,845	26,950

Program Description

The City of Los Angeles (LA) owns and operates one of the largest street lighting systems in the nation. The City's Bureau of Street Lighting is responsible for the design, construction, operation, maintenance and repair of the street lighting system within the city limits. There are currently more than 210,000 lights in LA, consisting of more than 400 designs.

Service Area

The City of Los Angeles.

Situation Highlights

Los Angeles continues its widespread street lighting conversion which started in 2009 and by 2016 was testing decorative fixtures and evaluating smart city solutions products to include remote monitoring systems, solar-to-grid connections, security cameras, EV charging stations, and mobile apps to report outages. In phase one, more than 170,000 cobra head street light conversions were completed and phase two will include over 30,000 post-top, decorative style luminaires. Los Angeles self-financed the upgrades using their existing budget, paying for the system out of the savings they achieved.

Many of the post-top street lights were originally lighted by incandescent sources in the early 20th century, with a very warm (~2800 K) correlated color temperature (CCT). In order to preserve the original look, these neighborhoods prefer a similar CCT of LED. When LA's LED conversion program began, such warmer CCTs carried significant cost and energy use tradeoffs, and thus these applications were delayed until a later second phase effort. As the costs of LED products have in fact decreased while their performance has steadily increased over this time period, LA is now able to install such warm CCT post-top products in these neighborhoods at competitive pricing and performance. For a consistent appearance, remaining cobra head fixtures on the feeder roads in these neighborhoods will be installed with warm CCT products to match the post-tops.

LA installed a controls system on the first 50,000 street lights with the primary purpose of monitoring their operation. This was done because LED street lights were still very new and the city didn't know what to expect in terms of reliability and wanted to monitor their operation in real time. It turns out the reliability was so high on the first 50,000 units that the city decided the controls system wasn't worth the additional expense beyond that point.

PARTNER: LOS ANGELES, CA (continued)

Additional Information

Los Angeles Bureau of Street Lighting

Los Angeles becomes first city in the world to control its street lighting through mobile and cloud-based technologies from Philips

PARTNER: PORTLAND, ME

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
6,700	2,334,950	$249,840	1,641

Program Description

The city issued an RFP for "Conversion of City Street Lights to LED Fixtures and Transfer of Ownership from Utility to Municipality".The project covered the LED conversion of all municipal streetlights as well as the lighting in parking structures. In 2016 most street lights were owned by Central Maine Power (CMP), and were 50 or 75 W HPS.

Service Area

The City of Portland, ME.

Situation Highlights

In Maine, the investor owned utility owns nearly all of the municipal streetlights in the state. The state recently enacted legislation that requires the utility to sell the lighting equipment to any municipality that wishes to purchase it. The Public Utilities Commission has created rules and tariffs to enable the legislation. No municipality has yet done so but the City of Portland along with the South Portland, Falmouth, Biddeford, and Rockland have selected firms to assist with the purchase and replacement of the lights. Each of the towns were planning on starting negotiations with the utility in 2017.

Additional Information

An Act To Lower Costs to Municipalities and Reduce Energy Consumption through Increased Competition in the Municipal Street Light Market

Request for Proposals – Conversion of City Street Lights to LED Fixtures & Transfer of Ownership from Utility to Municipality RFP #2917

PARTNER: RACINE, WI

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
500	174,250	$18,645	122

Program Description

The City of Racine was in search of financial mechanisms for broad-scale deployment of LED street lights. Small-scale projects were completed using Energy Efficiency and Conservation Block Grant (EECBG) funds under the American Reinvestment and Recovery Act (ARRA).

Service Area

WE Energies.

Situation Highlights

The City of Racine contains about 8,300 street lights, 4,800 of which are owned by WE Energies and about 3,300 owned by the city. About 1,000 street lights were removed earlier in a move to apply a street light spacing policy and cut operating costs to Racine. The completion of a small-scale conversion project for remaining city-owned lights proved to be a promising opportunity for broad-scale deployment. Racine has also expressed interest in a buyback option to acquire ownership and realize the maximum savings with LED street lighting upgrades. The most prominent barrier in Racine is financing, which has slowed progress.

PARTNER: SAN DIEGO, CA

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
10,000	3,485,000	$372,895	2,450

Program Description

San Diego has over 60,000 street lights in operation, 9,000 of which belong to local community "Lighting Districts" who pay a special assessment fee to support the additional or ornamental lighting in their neighborhoods. In addition, the City maintains more than 6,000 lights in parks, community ball fields, and other City facilities. The City also shares responsibility with Caltrans for lights on the freeway off/on ramps that intersect city streets.

Service Area

The City of San Diego.

Situation Highlights

Currently, there are two types of street lights in San Diego: Induction, a type of fluorescent source that emits a white light, and Low Pressure Sodium (LPS), which emits a monochromatic yellow light that is used to limit light pollution affecting Palomar Observatory. Induction lighting was the City's standard type of street lighting except in areas within a 30-mile radius of the Observatory. Now LED is the City standard within and outside the radius. 3000 CCT fixtures are allowable within the 30 mile radius. The City of San Diego has made progress with LED street lighting upgrades and controls. However, the City is pursuing a tariff solution with San Diego Gas & Electric to maximize the economic benefits of high performing technologies via adaptive controls and a metered tariff for street lights.

The City of San Diego conducted testing and verification of LED product types and controls with cooperation with SDG&E on verification of our approved adaptive control meter. This adaptive control meter is not the City standard moving forward with all outdoor lighting Citywide. The selection of the LED products was a result of testing and verification coupled with consultant review of performance with various dimming strategies. In order to engage in appropriate dimming and metering benefits, the appropriate LED light source was a critical component.

Additional Information

Regional Street Lighting Working Group

San Diego improving Downtown District with LED street lighting with wireless controls

PARTNER: ST. PETERSBURG, FL

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
30,502	10,629,947	$1,137,404	7,473

Program Description

St. Petersburg's public utility provider is Duke Energy, regulated by the Florida Public Service Commission. St. Petersburg currently leases about 30,000 street lights from Duke Energy, with an annual expenditure of about $1,876,000. A leasing arrangement allowed the city to benefit for street lighting service without purchasing the equipment outright. The street lighting equipment was purchased and installed by Duke Energy.

Service Area

The City of St. Petersburg, FL.

Situation Highlights

The most prominent barrier flagged during the initial assessment of the conversion project was regulated utility lost revenue. St. Petersburg overcame this barrier by breaking out three different components of the LS-1 rate tariff: energy, maintenance and rental. This analysis and extensive discussions highlighted the potential for Duke Energy to share in the energy and maintenance savings realized from the LED technology.

The release of the American Medical Association (AMA) Community Guidance on Street Lighting slowed the pace of conversion, but did not stop the project. Staff shared supportive data that illustrated the importance of parameters to consider beyond the color temperature of the light, when selecting an LED street light for city applications. More important parameters to consider would be color rendering index (CRI) and lighting fixture design.

St. Petersburg is looking forward to their LED Street Lighting project with Duke Energy. The project was scheduled to begin in February 2017 and run through August, 2018.

PARTNER: TAKOMA PARK, MD

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
1,500	522,750	$55,934	367

Program Description

The City of Takoma Park completed a pilot project for 49 lights as a first step to evaluating city-wide retrofits. Staff explored two options to achieve LED street lighting upgrades: 1) convert under utility ownership and LED tariffs; and 2) purchase the street lights from the utility using a Master Sales Agreement.

Service Area

Pepco service area.

Situation Highlights

Takoma Park has about 1,500 overhead streetlights on wooden poles, owned and maintained by Pepco. The energy use of these streetlights represents the largest single use of electricity that Takoma Park is responsible for. The conversion of the streetlights from energy inefficient bulbs to LED technology has been identified as a key factor in enhancing the city's standing in the Georgetown Energy Prize by reducing municipal energy use.

Takoma Park evaluated two options for conversion to LED street lighting: 1) convert through Pepco, continue Pepco ownership; and 2) purchase the Lights from Pepco, replace with LEDs and maintain new system.

The City Council voted and approved to proceed with the conversion of all Pepco-owned streetlights in Takoma Park. The Council chose to work with Pepco directly and finance through the utility. The alternative was to purchase the lights through a Master Sales Agreement and use a performance contractor for the operations and maintenance of the project and ongoing maintenance. This decision was the major step needed to push the project forward. See below for more information on analysis of options and what lead to City Council's decision to move forward through Pepco directly. The expected completion date is June 2017.

Additional Information

Takoma Park City Council Meeting – October 19, 2016

City Council provides direction on conversion to LED street lighting

PARTNER: WEST PALM BEACH, FL

Summary Impacts Table

	Estimated Results Achieved from Completed Conversion		
Number of Lights Committed	Electricity Savings (kWh/yr)	Value of Electricity Saved ($/yr)	Carbon Dioxide Emissions Reductions (metric tonnes/yr)
6,803	2,370,846	$253,680	1,667

Program Description

The City of West Palm Beach has had an ESPC in place for comprehensive energy management services since 2011. Street lights represented 25% of the city's energy expenditure and thus was a prime target for improvement, with strong support from the Mayor. The City and Florida Power & Light (FPL) each own about half of the 6800 lights in the city.

Service Area

The City of West Palm Beach.

Situation Highlights

West Palm Beach undertook the first LED retrofit project ever pursued by FPL. The utility did not have LED-specific rate tariffs at the time, but adapted an existing decorative lighting agreement especially for this effort. The project was carefully phased to allocate funds and address political districts in an equitable manner. The project started in Coleman Park in November 2013, and proceeded through seven phases that were all complete by April 2014. In all, 1451 street lights were retrofitted for an estimated annual energy savings of 364,000 kWh (54%), worth about $34,000.

In 2016, West Palm Beach was in the planning stages of retrofitting more than 3,000 additional street lights over the next five years at a cost of roughly $2.5 million and expected to save roughly $160,000 per year on energy.

Additional Information

Better Buildings Challenge Showcase Project: WPB Street Light Upgrade Project

Endnotes

1. As reported in manufacturer's literature, or measured separately.

2. U.S. Department of Energy, Municipal Solid State Street Lighting Consortium, 2014. Public Street and Area Lighting Inventory Phase 1: Survey Results. PNNL – 23723.

3. See, for example, Northeast Energy Efficiency Partnerships, 2015, "LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic."

4. The online version of the "Decision Tree Tool" can be accessed at http://betterbuildingssolutioncenter.energy.gov/solutions-at-a-glance/outdoor-lighting-decision-tree-tool-features-successful-approaches-cities. Underlying each node in the schematic are various information and other resources intended to assist users with the corresponding issue or question. Note that neither the individual elements nor their required sequence are absolute.

References

United States Conference of Mayors, 2016. "How Energy Technologies Are Reshaping America's Cities. A 178-City Survey." Mayors Climate Protection Center. January, 2016


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