Regulatory Issues and Approaches to Municipal LED Street Lighting Conversions

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Regulatory Issues and Approaches to Municipal LED Street Lighting Conversions*

Municipalities considering energy-efficient light-emitting diode (LED) street lights for their jurisdiction face a variety of regulatory issues. This brief describes how cities can successfully address these challenges to achieve multiple advantages:

- *Lower energy costs.* Today's LED technology can offer equal or superior lighting performance while lowering street lighting electricity consumption by 50% or more.[1] Given that street lights can constitute as much as 40% of municipal energy bills,[2] these savings are significant for local budgets.
- *Lower maintenance costs.* Because LEDs have a much longer lifetime than other lighting technologies, they require replacement less often. Dollar savings from reduced maintenance can be twice as large as dollar savings from reduced energy consumption.[3]
- *Better street light tracking.* Street lighting replacement efforts often identify unnecessary street lights that can be removed entirely, or even "phantom" street lights that do not exist or belong to another municipality but for which customers are being erroneously charged. For example, some municipalities in Vermont have eliminated 30-40% of their street lights during LED replacement projects.[4]
- *Better street light management.* Advanced lighting controls, with which LED technologies are compatible, can further reduce energy use through automated dimming.[5]
- *Better lighting quality*. LEDs improve visibility, reduce nighttime light pollution significantly, and may create public safety benefits.[6]
- *Reduced greenhouse gas emissions.* LEDs lower electricity usage and associated emissions, which creates worldwide benefit and helps municipalities attain smart or green city status.

Despite all of these benefits, LED street lighting replacement projects have proven difficult to implement for many municipalities. The U.S. Department of Energy's Outdoor Lighting Accelerator, developed to "accelerate the adoption of high-efficiency outdoor lighting and improve system-wide replacement processes at the municipal level,"[7] has

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[1] See http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf. Also, the city of Los Angeles saved about 63% relative to its existing high-pressure sodium lights. See http://www.forbes.com/sites/justingerdes/2013/07/31/los-angeles-completes-worlds-largest-led-street-light-retrofit/#3882870e4b54. Other cities have saved 70-75%.

[2] http://www.navigantresearch.com/blog/smart-street-lights-face-financial-hurdles#pq=xfjXDG

[3] http://www.neep.org/sites/default/files/resources/DOE_LED%20Street%20Lighting%20Assessment%20and%20Strategies%20for%20the%20Northeast%20and%20Mid-Atlantic_1-27-15.pdf

[4] http://aceee.org/files/proceedings/2012/data/papers/0193-000144.pdf

[5] For more on LED street lighting controls, see https://betterbuildingssolutioncenter.energy.gov/webinars/lessons-learned-outdoor-connected-lighting-system-installations

[6] http://www.leotek.com/education/documents/Leotek.LED.Streetlight.Guide.V7-101613.pdf

[7] http://betterbuildingssolutioncenter.energy.gov/accelerators/outdoor-lighting

identified a number of barriers that confront such projects. These barriers fall into three categories: technical, financial, and regulatory.

This brief focuses on regulatory barriers, which have proven to be widespread in the experience of Accelerator participants. In particular, these barriers are centered around how the utility charges for the LED service:

- *No LED tariff*: The majority of street lights are owned by utility companies, not municipalities.[8] In these cases, municipalities can only elect services for which the utility company has established a tariff. Many utilities do not offer a tariff that allows LED lighting,[9] taking this option off the table. Other utilities control the pace of LED conversions, requiring individual municipalities to wait years for a conversion.
- *High LED tariff*: Where LED tariffs exist (for either utility-owned or municipally-owned lights), the rates specified by these tariffs are sometimes higher than equivalent tariffs for traditional lighting technologies, meaning that municipalities may not see cost savings from adopting LEDs. Where LED tariffs are lower than those for traditional technologies, in some cases the difference may not be enough to pay back upfront costs of conversions that municipalities often need to pay. The first section of this brief discusses LED tariffs and addresses this issue.
- *Ownership alternative*: Where utility LED tariffs are not available or not attractive, municipalities can attempt to purchase utility-owned street lights and retrofit them themselves. However, few utilities offer a formal buyback option, thus complicating these transactions. Without such buyback options (and even in some cases in the presence of them), some municipalities have found utilities unwilling to offer their street lights for purchase.

Further complicating these issues, many municipalities must confront multiple ownership situations – for example, where the municipality owns some lights and one or more utilities also own some of the lights in the jurisdiction. When served by multiple utilities, a municipality may find that those utilities have widely differing tariffs and levels of interest in facilitating LED conversion.

This brief first reviews the structure of street lighting tariffs and the costs and cost assumptions that underlie them. It then lays out pathways that municipalities can take to consider street lighting retrofits if faced by these regulatory barriers. The brief references cases of municipalities' successes and challenges in pursuing these pathways. For more information, see the resources listed at the end of the brief.

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[8] Utilities own approximately 60% of street lights in the U.S. according to a recent survey by the Municipal Solid-State Street Lighting Consortium, with investor-owned utilities owning the vast majority of the utility-owned lights. See https://www1.eere.energy.gov/buildings/ssl/pdfs/msslc_inventory-phase1.pdf.

[9] Only 13 of 40 utilities in states tracked by the Northeast Energy Efficiency Partnerships (11 states plus District of Columbia) offered LED rates in 2013 (see http://www.neep.org/led-street-lighting-assessment-and-strategies-northeast-and-mid-atlantic); only one New York utility offered LED rates as of early 2014 (see https://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Energy-Efficiency-Services-Reports, "Street Lighting in New York State"). Of the 10 largest investor-owned utilities we reviewed for this brief, two do not include any mechanism for charging customers for utility-owned LED street lights, and four allow for LEDs only under emerging technology tariffs that do not specify a certain charge.

1. Overview of Street Lighting Tariffs

Utilities charge their customers for most street lighting-related services through electric tariffs. An electric tariff is a document that provides "the approved conditions, terms, and prices of utility services."[10]

In order to provide an overview of utility tariff structures, this brief in part reviews street lighting tariffs of the 10 investor-owned utilities with the largest number of customers.[11] Combined, the 10 utilities we reviewed account for nearly 8% of retail electricity sales (in kilowatt-hours or kWh) in the U.S. Given their size, the utilities serve diverse customer bases and in general tend to have tariff offerings that address a wider range of customer options than other utilities. As such, their street lighting offerings as a group are likely more well-developed than the average investor-owned utility, although considerable variation remains. Table 1 lists the 10 utilities and the states they serve.[12]

Table 1. Ten Largest Investor-Owned Utilities by Number of Customers

Utility	2014 Total Customers	2014 Sales (MWh)	State Served
Pacific Gas & Electric (PG&E)	5,188,308	75,114,523	California
Southern California Edison (SCE)	4,963,983	75,828,585	California
Florida Power & Light Co. (FPL)	4,708,793	104,431,096	Florida
Consolidated Edison (ConEd)	2,478,248	19,756,921	New York
Georgia Power Co.	2,410,042	83,740,365	Georgia
Virginia Electric & Power (doing business as Dominion Virginia Power)	2,381,312	75,562,974	Virginia
DTE Electric Company (DTE)	2,142,829	41,923,906	Michigan
Public Service Electricity & Gas (PSE&G)	1,900,444	19,571,938	New Jersey
Duke Energy Carolinas	1,896,136	56,750,616	North Carolina[13]
Consumers Energy	1,791,366	33,253,922	Michigan

The format for street lighting tariffs is not standardized across utilities. For most of the utilities reviewed for this brief, street lighting-related rates are spread across multiple tariffs. Some utilities have separate tariffs for utility-owned and customer-owned lights; some have separate tariffs for metered lights. In other cases, the utility offers a tariff only for conventional street lighting technology[14] — not including LED rates — with or without

[10] Lazar, 2016, 40.
[11] Customer counts are from 2014 EIA data, Form 861, from the "Sales to Ultimate Customers" data file. We reviewed the ten largest bundled (Part A) utilities. See https://www.eia.gov/electricity/data/eia861/
[12] Some of these utilities serve more than one state; the state listed is the state whose tariff we reviewed.
[13] Duke Energy Carolinas serves both North Carolina and South Carolina. The data here are only for North Carolina, which is the larger customer base. For this brief, we reviewed only the North Carolina tariff.
[14] In this brief, we use the terms "conventional" and "traditional" to refer to several street lighting technologies that predate LEDs, including high- and low-pressure sodium vapor, mercury vapor, and metal halide lights. Often, a single utility has more than one of these lighting technologies in place across its territory.

a separate tariff for emerging technologies (typically without pre-established pricing) that can be used for LED replacement.

Street lighting charges are generally composed of three major components (see Figure 1):[15]

1. An "energy charge" for electricity-related services;
2. A "facilities charge" or "service charge" for maintenance-related services; and
3. Where applicable, a charge to recoup capital costs incurred by a utility if it replaces its own street lights with LEDs.[16] Such charges go by different names in different tariffs, such as "incremental facilities charges" or "capital recovery fees." At times they are listed as supplements to facilities or service charges for some amount of time; other times they are assessed upfront (see section 1.3).

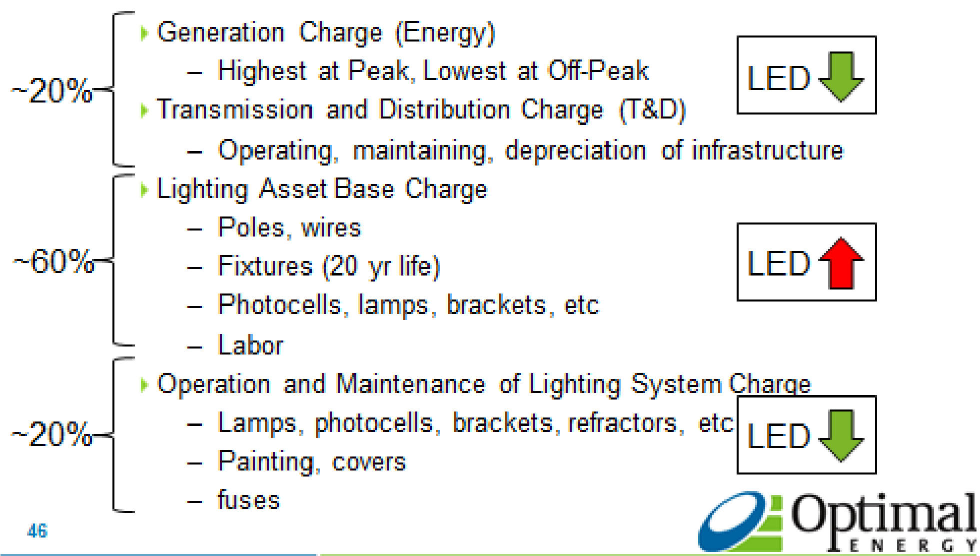

Figure 1. Composition of a typical street lighting tariff.
Arrows indicate relative cost differences between LEDs and conventional technologies. Source: "Street Lighting in New York State: Opportunities and Challenges," NYSERDA 2014.

[15] In some cases one or more of these components are rolled together into a single charge.
[16] Capital recovery costs may include those for light arms, poles, and wiring as well as luminaires.

1.1 Energy charges

Most street lights are not metered. In the absence of data on actual usage, most street lights are charged a flat rate per lamp per billing period for electricity-related services. These rates are based on assumptions about hours of usage, coupled with the wattage used by the lamp and ballast or driver and the electricity rate per kWh approved by the state regulator:

(Assumed hours of usage) x (wattage) x ($/kWh) / 1000

The cost-effectiveness of energy charges for LEDs hinge on three critical issues.

- *Defining LED replacements:* The LED replacement chosen for an existing street light can be consequential. As technology improves, lower wattage lamps can be used to provide comparable lighting performance to incumbent technology. [17] Utility companies, which generally have authority to define LED replacements, should choose luminaires that reflect the most effective street lighting design in order for their customers to fully benefit from LED energy savings. This choice can have important rate and cost ramifications.

- *Pricing for LED wattages*: LED rates may be defined for a range of LED wattages or restricted to only specified wattages. Any luminaire with wattage within a defined range is charged at the midpoint wattage for that range. The width of these ranges can have important consequences, as wide ranges[18] can result in less accurate charges for customers whose LED wattages fall near the boundaries of the ranges. Some utilities[19] define LED charges in 5-watt bands, significantly reducing the potential for less accurate charges. (Others provide a formula for calculating the charges based on actual luminaire wattage, like the one shown at the top of this section, which avoids this issue but requires an additional calculation.)

  A similar issue can arise when a utility offers only a few predefined LED wattages in its tariff, as this may effectively require a customer to choose a luminaire that is more powerful (and consumes more electricity) than necessary.[20] Utilities prefer to carry fewer types of LED bulbs, as costs go up when maintaining many different styles. Models with adjustable drive settings or dimming capacity can help reduce the number of different types the utility stocks.

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[17] Lighting performance is generally measured by lumens of lighting output. However, LEDs also deliver those lumens to a specific area more efficiently, so LED replacement lights can provide comparable performance at lower lumen levels than conventional lights. In addition, standard electricity rates typically account for peak loads as a percentage of the total peaks (see NARUC Cost Electricity Cost Allocation Manual). Conversion to LED significantly reduces peak loads from street lighting and their contribution to total system peaks, which should result in an additional corresponding reduction in their share of those costs.

[18] For example, National Grid's LED tariff has 50-watt bands. See http://www.mass.gov/eea/docs/doer/green-communities/pubs-reports/led-streetlights-qa.pdf.

[19] For example, PG&E (http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_LS-1.pdf) and SCE (https://www.sce.com/NR/sc3/tm2/pdf/ce36-12.pdf)

[20] The bulk of the cost impact of an oversized LED is generally found in higher capital costs, not higher energy charges, as the former is a much larger portion of an LED tariff.

- *Accounting for lighting controls*: Many LED street lights have the capacity to operate at less than full capacity through dimming, either prescheduled or controlled by sensors.[21] This can further reduce LED electricity usage relative to existing lighting technologies that are simply on or off. LED dimming technology is distinct from photocells, which can be used on any street lighting technology to automatically turn the lights on or off. While many tariffs charge lower rates for photocell-equipped lights or for lights that operate for fewer hours, none of the 10 reviewed tariffs include pre-established, non-metered rates that reflect electricity savings from dimmable or networked LEDs.[22] The only ways to receive credit for dimmers under the reviewed tariffs are through (1) metered tariffs, for utilities that offer them or (2) pursuing emerging technology provisions in tariffs. Instead, PECO (a Pennsylvania investor-owned utility) promotes dimming controls in two ways:[23]
    - For wireless controls, PECO takes the average percentage dimmed and reduces the total wattage charged by that percentage.
    - For pre-installed or field adjustable dimmers, PECO simply charges based on the dimmed wattage. The customer provides PECO the dimmed wattage rate to include and copies of the dimmer spec sheets.

1.2 Facilities or service charges

Facilities or service charges cover maintenance of street light lamps and other hardware, including repairing or replacing the lamps themselves as well as ballasts and wiring. Tariffs for utility-owned lights typically offer comprehensive maintenance services. Tariffs for customer-owned lights generally have a lower facilities or service charge than tariffs for utility-owned lights, because the customer performs some maintenance — either the vast majority of maintenance or only routine maintenance. For example, customer-owned street lighting tariffs may include utility relamping services, where the utility replaces broken lamps and recovers its anticipated cost through the tariff. Other tariffs for customer-owned lights do not include such services, leaving them to the municipality, and include only a minor charge to maintain electric service to the fixture. Some tariffs give a choice between these options.

While the nature of these maintenance services for LED lights is analogous to those for traditional lights, the actual cost of these services is not the same. LED luminaires have a much longer life than traditional street light technologies. As a result, luminaires fail

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[21] For more on advanced control technologies, see http://cltc.ucdavis.edu/sites/default/files/files/publication/2011_NEEA_Network_Outdoor_Controls_Report.pdf

[22] The California Street Lighting Association is intervening in a San Diego Gas and Electric rate case to propose a rate credit for dimmable lights and lighting controls. In addition, Georgia Power is planning to introduce controls to dim utility-owned LED street lights and a tariff that provides rate credits for dimming. Finally, Rhode Island will install both controls and meters in some of its LED street lights, potentially yielding data that might support controls credits in tariffs in the future. For information on these cases, see http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf

[23] Tariff is at https://www.peco.com/SiteCollectionDocuments/6.%20PECO%20EXHIBIT%20RAS-1_001.pdf, rate SL-E

much less often, lowering maintenance costs substantially.[24] The dollar savings from lower LED maintenance costs can be double the dollar savings from electricity use reduction.[25]

In the tariffs reviewed for this brief, utility maintenance charges do not vary in keeping with these large potential cost savings. Some utilities charge the same facilities or service charge per street light for LEDs as they do for other lights. For utilities with differentiated LED facilities or service charges, in most cases those rates are somewhat lower than those for traditional technologies – though in some cases the LED charges are actually slightly higher.

Several factors contribute to the relative maintenance pricing of LED and conventional lights:

- *Utilities' relative lack of experience with LED technologies*. Utilities do not want to risk undercharging for street light maintenance. As utilities gain experience with operating LED street lights, rates may go down if maintenance savings prove to be reliable.
- *Utility revenue incentives*. Street lighting maintenance charges are a major source of utility revenues. They represent a much larger share of street light revenues than do energy charges, and the basis for their calculation is generally less transparent.
- *Outdated rates for conventional lighting*. In some cases, flat charges per conventional street light have been in effect for decades without being updated. LEDs have brought that process gap to light. A new cost-based LED rate should be complemented by updates to rates for conventional lighting.

[24] Typical high-pressure sodium lamps have an average annual failure rate of 18 to 20% while thus far LED systems such as in Los Angeles have experienced failure rates of less than 1% per year. Some LED installations are experiencing "dirt depreciation" — performance degradation over time due to dirt buildup. This may require cleaning each fixture periodically, reducing maintenance savings. See, for example, http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/beckwith_depreciation_seattlemsslc2011.pdf.

[25] See http://www.neep.org/sites/default/files/resources/DOE_LED%20Street%20Lighting%20Assessment%20and%20Strategies%20for%20the%20Northeast%20and%20Mid-Atlantic_1-27-15.pdf.

1.3 The Role of Capital Cost

As Figure 1 shows, LED technology generally has lower energy and other operations and maintenance expenses than traditional technologies. However, the capital cost – the cost of the luminaires and associated equipment – is higher for LEDs.

Where utilities own LED street lights, they generally make the capital investment to procure them.[26] These capital investments may be rolled together with other charges (as is done with traditional street lights) or may be charged to customers separately. In circumstances where these investments are partially or fully rolled into a maintenance-related charge, that may explain what might otherwise appear to be a lack of accounting for maintenance-related savings from LEDs.

Even with research, it can be difficult to unpack the role of capital costs in utility tariffs. A utility typically must submit work papers in support of the rates it requests the state regulator to approve. The work papers detail the assumptions about costs that support the rate. However, the level of detail and accessibility of these work papers vary. To the extent that the supporting assumptions are available to municipalities, review of them may help explain the charges or may reveal inaccurate assumptions that might be contested in a rate proceeding.

The utility tariffs reviewed take a wide variety of approaches for handling capital costs of utility-owned LED street light conversions.

- *Contributions in aid of construction*. Some utilities require municipalities to pay the full capital cost of an LED conversion upfront (e.g., Florida Power & Light, Consumers Energy), or may require or allow at least a partial payment upfront (e.g., Georgia Power, DTE Energy, PSE&G). These payments may be referred to as "contributions in aid of construction." Such financing structures may benefit some municipalities. This approach should provide for a lower tariff cost because the utility does not have to capture the depreciation of the capital cost of equipment. Further, municipalities may be able to raise money at more favorable rates than investor-owned utilities. On the other hand, some municipalities – especially smaller towns – may not be able to raise the capital needed for this financing structure.

- *Upfront fee per light*. Some utilities (e.g., Duke Energy Carolinas) do not charge a contribution in aid of construction but instead charge a flat fee upfront per LED conversion – again requiring at least a portion of the capital upfront.

- *Incremental facilities charges*. Other utilities include incremental facilities charges for a fixed time period[27] to finance utility-owned LED lighting, either paid by the

[26] One interesting exception is Eversource New Hampshire, which has a "customer contributed" tariff that allows a customer to procure lights and lighting upgrade services from a third party rather than the utility itself. See http://www.neep.org/blog/street-lighting-high-low-hanging-fruit.

[27] This time period varies across utilities. For example, SCE's tariff includes a small incremental charge for 20 years. PG&E's includes a larger incremental charge for an unspecified time period; however, PG&E has indicated that it may discontinue the incremental charge in its 2017 general rate case, which would mean the charge was in

individual customer (e.g., Southern California Edison, PSE&G) or spread across all customers in the rate class (e.g., Pacific Gas & Electric, which is converting all its street lights to LEDs).

- *No provision*. Some tariffs are entirely silent on LEDs, and therefore have no explicit provisions for treatment of capital cost recovery (e.g., Dominion Virginia Power, ConEd).

For more on financing options and solutions, see the Better Buildings Solutions Pathways document.[28]

Typically, utilities recover the cost of conventional street lights over time through tariffs. If conventional lights are removed before their costs have been fully recovered, the utility may seek to recover this cost through other means, creating an additional cost for LED conversion. For example, MidAmerican Energy charges its customers a flat $100 fee at time of upgrade for lights that have not reached the end of their assumed useful lives. Alternatively, PG&E is replacing all its street lights over a multi-year period and is charging all customers of its utility-owned street lights an incremental charge to (in part) recover remaining costs for replaced street lights. Other utilities may forecast their cost shortfall due to this issue and roll these costs into their LED tariffs.

Another factor for upgrading utility-owned street lights is that the utility's stated cost to perform the upgrades may be considerably higher than those quoted by other providers such as energy service companies (ESCOs).[29] Utilities are not required to compete with outside providers on cost for street light upgrades; if the utility's regulator is satisfied with the proposed rates, they can be approved.

Most utilities do not provide financing to convert customer-owned street lights to LEDs, though a few do offer financing options — as part of electric tariffs or as a separate service.[30]

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place for three years at most (see https://www.pge.com/nots/rates/tariffs/tm2/pdf/ELEC_4488-E.pdf). Shorter incremental cost periods mean that the utility is charging a rate of return for fewer years. On the other hand, shorter time periods also mean higher payments in those years as the amortization period is shorter.

[28] http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf

[29] For example, see http://www.mypalmbeachpost.com/news/business/boynton-beach-seniors-outraged-over-proposed-fpl-l/nq849/

[30] An example is PG&E's LED Streetlight Turnkey Replacement Service. See https://www.pge.com/en_US/business/save-energy-money/business-solutions-and-rebates/lighting/led-street-lighting/led-street-light-turnkey.page

1.4 LED Tariff Best Practices

Based on experience to date with LED conversions, following are several best practices for LED tariffs:

- *Explicit LED Option*. Include LEDs as an explicit option, rather than relying on general emerging technology tariffs that lack pricing specificity.
- *Flexible Energy Charges*. Specify LED energy charges through either (1) a set of narrow wattage bands or (2) a simple and transparent method for calculating charges based on wattage.
- *Metered Provision*. Include provisions for a metered tariff using meter data supplied by the control system.
- *Wide Range of LED Options*. Provide a broad range of LED wattage options to allow a more precise tariff and to recognize continually improving technology without the need to modify the tariff.
- *Appropriate Maintenance Charges*. Set maintenance charges that reflect growing utility experience with the actual cost of maintaining LED lighting, compared to conventional lighting technology.
- *Tariff-Based Financing*. For utility-owned lights, offer a means of financing the lights through the tariff, rolled into the maintenance charge (as with conventional technologies), through a short-lived incremental charge, or by allowing third-party services.[31]
- *Controls Provision*. Include emerging technology provisions to allow credit for lighting controls based on experience with their performance.
- *Ancillary Equipment Provision*. The evolution of the control systems for LED lights will lead to many applications that take advantage of street lighting communication networks to provide other information and services. Tariffs should allow communities to use their network for more than just lighting.

Table 2 lists several tariffs for utility-owned lighting that have many of these features and may serve as potential models for further refinement. However, none of these tariffs include provisions for LED-specific controls to improve operational efficiency. In Rhode Island, Docket 4513 directed the utility to conduct a pilot to explore this issue.[32]

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[31] For an example of potential third-party ESCO services, see http://www.mypalmbeachpost.com/news/business/boynton-beach-seniors-outraged-over-proposed-fpl-l/nq849/.

[32] See http://www.ripuc.org/eventsactions/docket/4513page.html

Table 2. Tariffs for Utility-Owned Street Lights With Features Favorable for LED Upgrades

Tariff	Explicit LED Option	Flexible Energy Charges	Tariff-Based Financing	Controls Provision
Pacific Gas & Electric	✓	✓	✓	—
Georgia Power	✓	✓	✓	—
Mid-American	✓	✓	✓	—
Duke Energy Progress	✓	✓	✓	—
Portland General Electric	✓	✓	✓	—

2. Solution Pathways for LED Street Lighting Upgrades

Broadly, LED street lighting upgrades can occur two ways. One, a utility can replace lights that it owns with LEDs, recovering the cost using any of the various mechanisms discussed above. Two, a municipality that owns the lights (or purchases them from the utility) can replace them itself.

Figure 2 outlines the potential pathways that municipalities can pursue.

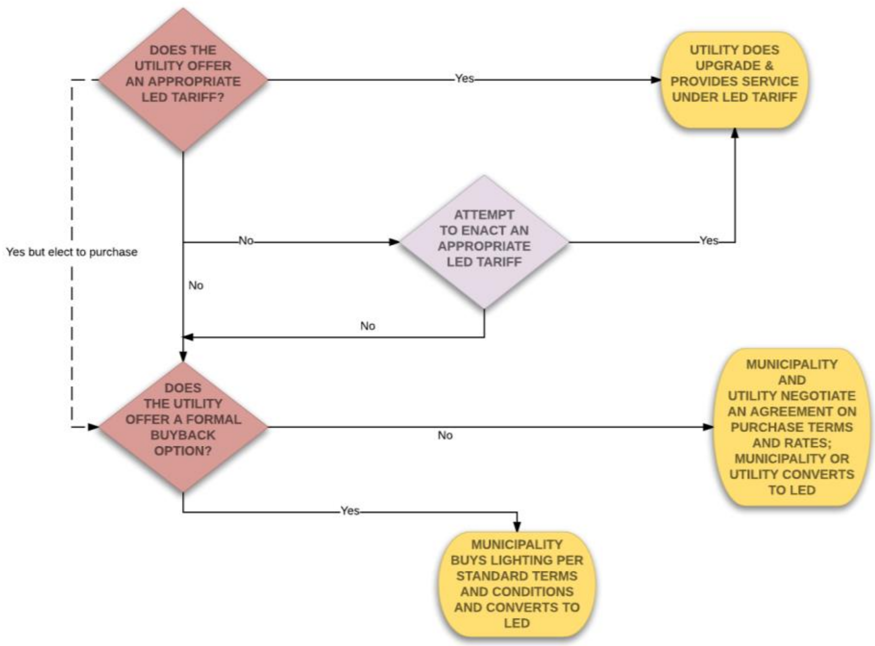

Figure 2. Regulatory Pathways for LED Street Lighting Upgrades

2.1 Implementing Upgrades to Utility-Owned Street Lights Via Tariffs

2.1.1 Establishing or Revising LED Tariffs: The Regulatory Process

To offer utility-owned LED street lights to its customers, a utility must have a tariff establishing this service. Many utilities do not have such a tariff. Further, the total cost for LED retrofits under some established LED tariffs is higher than for conventional products, frustrating municipalities who feel that these rates do not reflect the cost savings LEDs afford.[33] Therefore, municipalities interested in achieving the benefits of energy-efficient street lights may need to take action to bring about new tariffs or changes to existing tariffs. This section of the brief provides an overview of the regulatory process for tariff setting and revision in the context of street lighting services.

The utility submits proposed new or revised retail electric tariffs to its state regulatory commission for approval, most often through a general rate case, a proceeding involving all of the rates and policies of a utility.[34] The commission also may consider new or revised tariff filings in a stand-alone proceeding.

Regulatory practices vary from state to state. However, in almost all states, an electric utility can request a general rate case at any time, as long as it can demonstrate that its existing tariffs do not offer the utility the opportunity to earn its allowed rate of return.[35] Some states also have a mandatory schedule for rate cases, but most do not.[36]

A general rate case offers the opportunity for the municipality to negotiate a proposed settlement with the utility on tariff changes. Municipalities may wish to monitor when general rate case proceedings occur, but it is challenging and potentially expensive to engage in them. The most effective way to initiate potential changes to the tariff is to make a direct request to the utility. Municipalities also can bring the issue to the attention of the state regulatory commission.

It can be challenging to demonstrate that a utility's current or proposed street lighting tariff is not fair and reasonable. Ultimately, the commission must determine if the utility's tariffs are fair and reasonable.

After a utility files a rate case application or a tariff revision, a regulatory proceeding ensues. Table 1 shows a typical schedule for a major rate case. Some state commissions provide information online about their rate case process, including how the public can participate.[37]

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[33] For example, see http://midwestenergynews.com/2015/07/13/michigan-cities-gearing-up-for-fight-with-utilities-over-led-streetlights/.
[34] For example, in March 2016, Southern California Edison revised its LED street lighting tariff as part of its rate case. "Lighting- Street and Highway," SCE, accessed July 12, 2016. https://www.sce.com/NR/sc3/tm2/pdf/ce36-12.pdf
[35] Lazar, 2016, 40.
[36] Lazar, 2016, 40.
[37] For example, see http://www.psc.state.fl.us/Files/PDF/publications/consumer/brochure/ratemaking.pdf

Table 1. Typical Schedule for a Major Rate Case[38]

Typical Schedule for a Major Rate Case

Activity	Calendar Date	Months From Filing Date
Notice of intent to file	Jan 15	-2
Initial filing of tariffs and evidence	Mar 15	0
Discovery period ends	Jun 15	3
Staff and intervenor evidence due	Jul 1	3.5
Rebuttal evidence due	Aug 1	4.5
Rebuttal discovery period ends	Aug 15	5
Expert witness hearings	Sep 1-20	6
Public witness hearings	Sep 25-27	6.5
Briefs due	Nov 1	7.5
Commission decision	Dec 15	9

The utility relies on multiple analyses to calculate the proposed rates and allocate costs to its customers. The utility must first determine its revenue requirement, a complex process that considers all costs and revenues and comprises the majority of the rate case. After determining the total revenue requirement, the utility can use a Cost of Service Study to determine how to allocate the revenue requirement across customer classes. These two components are used to determine the proposed tariffs.

As a municipality considers participation in a rate case, it must first determine if it should officially intervene in the proceeding. Active intervention can be a time-consuming process,[39] including review of the utility's application, "discovery" (including data requests to the utility and interveners, including the municipality), rounds of testimony, a hearing with cross-examination and briefs. The interested party submits an application for party status with requisite information to the state utility regulator.[40] The commission reviews the application and determines if it will grant intervener status. Some common criteria that an intervener must prove are that it is affected by the proposed change, and its interests are unique and not represented by the parties called out by law to participate (e.g., consumer advocates, utilities).

When determining whether to seek intervention in a proceeding, the municipality should consider its ultimate goal. It will likely be judicious to have informal discussions with the electric utility regarding street lighting tariff concerns prior to intervening in a proceeding. Similarly, informal conversations with regulatory commission staff may help the interested party determine if intervention is the best solution. Another potential solution

[38] RAP 2016

[39] An alternative is to intervene in order to track a proceeding and receive documents, rather than filing testimony and the like. This is not as difficult or time-consuming, though some proceedings generate a formidable volume of documents.

[40] There are a variety of names for state electric utility regulators. The public utility commission is common, as is the public service commission.

may be to work with commission staff, national experts, or entities that provide technical assistance to conduct a workshop or develop a focused work group to allow for informal, collaborative, and open dialogue.

If a municipality determines that intervention is the best course, it is useful to consult commission staff regarding the requirements for intervention, as the rules vary significantly by state. For example, some states require an attorney to represent an intervener, and other states do not; most states allow for electronic filings, though some require a designated number of paper copies be provided to the commission and parties. The specific requirements for how to intervene in a docket are listed on most state public utility commission websites.

In testimony in the rate case, an interested party can suggest changes to the utility's application. It is most effective to provide a clear request and articulate why the proposed change is superior to the utility's application, based on expert opinion. Commissioners may be interested in hearing about other utilities that have a similar street lighting tariff to what the municipality is proposing. Strong documentation of research and clear analysis that can be easily understood by commission staff and commissioners are powerful components of any request for change.

2.1.2 Examples of Municipal Actions to Revise Tariffs

Negotiation with Utility[41]

A municipality can approach its utility directly to negotiate new or revised tariffs, and the utility can file the resulting proposal with the regulatory commission for approval. For example:

- The city of West Palm Beach, Florida, successfully negotiated with Florida Power & Light to reduce its LED rate while simultaneously reaching terms on a street light buyback (discussed in Section 2.2).
- The city of Asheville, North Carolina, successfully negotiated with Progress Energy (which has since merged with Duke Energy) for a lower LED rate.
- Through its general rate case, Georgia Power recently began offering an LED rate, in part based on prior requests from its municipal customers — although the tariff is no lower, and perhaps slightly higher, than for conventional lighting.[42]
- The city of Portland purchased lights from Portland General Electric, addressing a range of issues along the way.[43]

[41] See pages 17-18 at http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf

[42] See http://www.ajc.com/news/business/revolutionary-street-lights-save-bundles-but-not-f/nrHm6/

[43] http://energy.gov/sites/prod/files/2015/09/f26/2015_gateway-msslc_portland_0.pdf

Regulatory Interventions

Alternatively, or if direct discussions with the utility are unsuccessful, the municipality can intervene in regulatory proceedings to establish new or improved tariffs for LED street lights. Examples include the following:

- A collection of Michigan municipalities, with support from the Southeast Michigan Regional Energy Office, has formed the Michigan Street Lighting Coalition and intervened in two DTE Electric general rate cases in pursuit of lower LED tariff rates.[44]
- The North Carolina League of Municipalities intervened in a Duke Energy Carolina rate case in part to recommend an LED rate for utility-owned street lights. This intervention was successful, as the regulatory commission required Duke to include this rate.[45]
- The city of Manchester, New Hampshire, intervened when the Public Service Company of New Hampshire (now part of Eversource) proposed a new LED rate the city found unfavorable. The city reached a settlement that produced a substantially different and more acceptable rate.[46]
- In Southern California, the Coalition for Affordable Streetlights (a group of local governments) and the California Street Lighting Association (representing municipalities served by investor-owned utilities statewide) intervened in a Southern California Edison rate case to contest an LED rate increase.

2.1.3 Legislation to Implement Tariffs

The legislative pathway is an option if utilities are resistant to offering LED rates and municipalities are not achieving changes through the regulatory process. However, pursuing legislation can be a time-and resource-intensive process. Following are two examples of successful legislative initiatives:

- California passed legislation[47] requiring its investor-owned utilities to offer LED street lighting tariffs for utility-owned fixtures and a means for municipalities to finance conversion projects.
- Rhode Island enacted legislation[48] directing its distribution companies to offer LED rates that give credit for dimmable controls. (This legislation also required investor-owned utilities to offer a buyback provision for its street lights, which is discussed in the next section.)

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[44] This rate case is ongoing. For the coalition's initial filing, see https://efile.mpsc.state.mi.us/efile/docs/17767/0417.pdf. The full docket for the rate case is at https://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=17767. See http://midwestenergynews.com/2015/07/13/michigan-cities-gearing-up-for-fight-with-utilities-over-led-streetlights/ for a news article reviewing the issue involved.

[45] The order approving the LED tariff is at http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=5d96b757-a902-4217-ae76-c23ffca2f303

[46] This docket is at http://www.puc.state.nh.us/regulatory/Docketbk/2013/13-248.html.

[47] See http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB719

[48] http://www.environmentcouncilri.org/content/municipal-streetlight-investment-act

2.2 Implementing Upgrades Via Municipal Buyback of Street Lights

2.2.1 Municipal Buyback Options

Faced with unattractive or no LED rate options, many municipalities have explored buying street lights from their utilities and undertaking LED conversion projects themselves. Experiences with this pathway have varied widely.

In several states in the Northeast and Mid-Atlantic regions, legislation has required utilities to offer a buyback option to municipal customers (see Section 2.2.3). In other states, a potential street lighting buyback is generally[49] handled on a case-by-case basis as a direct negotiation between a customer and its utility. Buybacks have been substantially more widespread where legislatively required buyback options exist and where buyback options explicitly specify pricing.[50]

Utility regulatory commissions can play a role in adjudicating disagreements over street lighting pricing. Municipalities have the right to bring a complaint to the state utility regulator if a utility sets a price they feel is unfair, or if the utility fails to respond to a pricing inquiry. However, this is often a time-consuming process, and the cost of bringing a complaint before a regulatory commission can swamp any gains in lower pricing, particularly when lost cost savings due to delay are factored in.[51]

Legislation requiring buyback options generally governs how pricing is determined. Some components of this calculation — for example, the depreciation schedules for street lights — rely on values approved by the utility regulator in rate cases.[52] Even in states without legislatively governed buyback options, such values are a natural point of reference for determining pricing.

Street lighting buybacks require a number of determinations in addition to the purchase price of the lighting. Notably, utilities and municipalities must agree on the extent of maintenance services the utility will provide and the pricing of those services. These options may be defined by existing tariffs for customer-owned lighting. If a new LED tariff for customer-owned lights is being established, however, or where the existing tariffs are not attractive, the ratemaking discussion in Section 2.1.1 applies. Alternately, customer-specific arrangements can be made that do not involve setting or modifying a tariff, though regulatory approval for such contracts is generally required.

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[49] Individual utilities may set up their own buyback programs, but this is not common. Southern California Edison ran a buyback program for a short time, but then discontinued it.

[50] For example, in Massachusetts, where a 1997 law requires a buyback option, more than 75 municipalities have bought back street lights and over half of these have converted them to LEDs. In Maryland, which has a legislative requirement to allow buybacks but does little to specify the terms of buybacks, they have been much less frequent. For more details, see http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf.

[51] See, for example, http://www.mapc.org/sites/default/files/Notes_Streetlight-Buyback-Roundtable_092012.pdf

[52] http://www.mapc.org/sites/default/files/Notes_Streetlight-Buyback-Roundtable_092012.pdf

2.2.2 Municipal Buyback Experiences

The Outdoor Lighting Challenges and Solution Pathways document[53] reviews a number of municipalities' experiences with utility buybacks. These municipalities include:

- West Palm Beach, Florida, negotiated a buyback from Florida Power & Light.
- Asheville, North Carolina, completed a similar process with Progress Energy.
- Over 70 municipalities in Massachusetts, including Somerville, have purchased their lights and more than 30 have converted lights.[54]
- Huntington Beach, California, is in the process of negotiating a street lighting purchase from Southern California Edison, facilitated by the utility's now-discontinued buyback program.
- Richmond, California, negotiated a street light purchase with Pacific Gas and Electric, including a special tariff approved by the regulatory commission.
- In Rhode Island over 30 communities are in the process of acquiring their street lights and the City of Providence is well underway converting its lights.

2.2.3 Legislative Pathway for Buybacks

Legislation requiring buyback options can be a powerful tool for encouraging LED retrofits. Pursuing this pathway, as with legislation requiring LED tariffs discussed earlier in this brief, can be a time- and resource-intensive process. Approaches taken include the following:

- Massachusetts passed legislation requiring utilities to sell their street lighting assets to any community that wished to purchase them for their net book value. Communities were then able to either take advantage of existing tariffs for "other" lights or convince their utility to provide an LED tariff for customer-owned lights.
- The State of New York PSC directed utilities to provide a mechanism for an LED tariff and/or the ability for communities to transition to customer owned lights.
- The State of Maine passed legislation requiring sale of the assets and an LED tariff for customer-owned lights.

Vermont,[55] Rhode Island, and Maryland also have legislation that requires their utilities to offer buyback options. Many state legislative approaches are summarized in the Better Buildings Solutions Center's Outdoor Lighting Challenges and Solution Pathways.[56]

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[53] http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf
[54] For discussion of Somerville, see http://www.mapc.org/system/files/bids/Buy%20Back%20Streetlights%20from%20Utility.pdf
[55] For more on Vermont, see http://aceee.org/files/proceedings/2012/data/papers/0193-000144.pdf
[56] http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf

3. Additional Resources

Other Accelerator Resources

Outdoor Lighting Decision Tree Tool – covers a range of considerations for implementing LED street lighting projects and embeds a number of links to municipal-specific documents with more information. Available at http://betterbuildingssolutioncenter.energy.gov/solutions-at-a-glance/outdoor-lighting-decision-tree-tool-successful-approaches-cities-states-and

Outdoor Lighting Challenges and Solutions Pathways – discusses technological, financing, and regulatory barriers to LED street lighting upgrades and presents short case studies of solutions to those barriers. Available at http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Outdoor%20Lighting%20Challenges%20and%20Solutions%20Pathways%20Paper.pdf

Additional Resources on Regulatory Issues

Electricity Regulation in the U.S.: A Guide – an overview of electricity regulation from the Regulatory Assistance Project. See especially chapter 7. Available at http://www.raponline.org/knowledge-center/electricity-regulation-in-the-us-a-guide-2/

LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic – from the Northeast Energy Efficiency Partnerships, regionally focused but covers many regulatory and other aspects of implementing projects. Available at http://www.neep.org/led-street-lighting-assessment-and-strategies-northeast-and-mid-atlantic

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