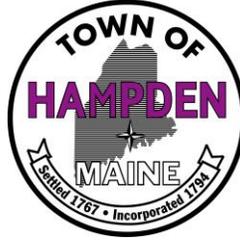


Town of Hampden
106 Western Avenue
Hampden, Maine 04444



Phone: (207) 862-3034
Fax: (207) 862-5067
Email:
townmanager@hampdenmaine.gov

TO: Infrastructure Committee
FROM: Angus Jennings, Town Manager
DATE: February 24, 2017
RE: Update on LED street lighting

As you know, last year we received a preliminary proposal from Pemco to convert Hampden's street lights to LED. I attended a meeting for municipal managers hosted by another firm, Real Term Energy ("RTE"), this winter and provided RTE the same data regarding Hampden's streetlight electrical costs that I had provided to Pemco. RTE recently contacted me to let me know that they have completed an analysis and report regarding a potential LED street light conversion project in Hampden.

RTE has requested a meeting to present their report but I have not yet scheduled this, as I do not know whether this initiative is part of our FY18 work plan or whether this is something for further out. I am aware that Brewer will shortly issue an RFP for LED street light conversion and have had some correspondence with their Finance Director.

I have enclosed:

1. Baseline information regarding street lights and electrical costs;
2. Materials received from RTE following the winter meeting; and
3. References provided to me by Councilor McAvoy, who has expressed interest in tracking this issue.

My recommendation is to accept the meeting with RTE because, even if we don't move forward on any near or mid-term time schedule, I think we may benefit from understanding the proposal as baseline information for future consideration. On the other hand, time is precious.

At Monday's meeting I'll seek input regarding whether to proceed with a meeting, and if so whether one or more Councilors would also like to attend.

Town of Hampden Analysis of Street Light Account Cost Trends, FY14 to FY16, as of 11-17-16

Account Number	Account Name	FY14		FY15		FY16	
		Budgeted	Expended	Budgeted	Expended	Budgeted	Expended
Non-Dept. Utilities							
06-06-15-05	Streetlight Electricity	\$ 49,000.00	\$ 45,072.00	\$ 49,000.00	\$ 54,494.71	\$ 52,000.00	\$ 57,051.68
06-06-20-30	Streetlight Repair	\$ 2,500.00	\$ -	\$ 2,500.00	\$ 245.55	\$ 2,500.00	\$ 748.00
Source: Angus Jennings, Town Manager							

Town of Hampden Analysis of Street Light Accounts as of 1-27-16

Acct. Number	Service Location	Street Light(s)?	If lights, unit count?	Wattage (if known)	Acct (paid from)
10056982-9	RT 202 BUSINESS PARK	Not sure - bill lists meter.			06-06-15-05
10056985-6	KENNEBEC RD STREET LIGHT	Not sure - bill lists meter.			06-06-15-05
10027066-1	KENNEBEC RD CIVIL DEFENSE	Not sure - bill lists meter.	n/a	n/a	06-06-15-05
10027065-9	DUDLEY ST RT 9 CIVIL DEFENSE	Not sure - bill lists meter.	n/a	n/a	06-06-15-05
10057014-8	STREET LIGHTS	14 units	14	105W Incandescent Lighting	06-06-15-05
10056973-0	STREET LIGHTS (part 1)	19 units	19	100W High-Pressure Sodium Vapor	06-06-15-05
10056973-0	STREET LIGHTS (part 2)	1 unit	1	150W High-Pressure Sodium Vapor	06-06-15-05
10027067-3	OLD COUNTY RD CIVIL DEFENSE	Not sure - bill lists meter.	n/a	n/a	06-06-15-05
10057012-4	RT 1A & RT 9 INTERSECTION	no - traffic signal(?)			06-06-15-05
10056997-1	STREET LIGHTS	12 units	12	250W High-Pressure Sodium Vapor	06-06-15-05
10056998-3	STREET LIGHTS	12 units	12	70W High-Pressure Sodium Vapor	06-06-15-05
10057015-1	ACADEMY BLINKING LIGHT	no - blinking signal light			06-06-15-05
10056974-2	STREET LIGHTS	5 units	5	150W High-Pressure Sodium Vapor	06-06-15-05
10056971-6	STREET LIGHTS	231 units	231	70W High-Pressure Sodium Vapor	06-06-15-05
10056970-4	STREET LIGHTS	56 units	56	50W High-Pressure Sodium Vapor	06-06-15-05
10056972-8	STREET LIGHTS	6 units	6	100W High-Pressure Sodium Vapor	06-06-15-05
10056981-7	KENNEBEC RD	Not sure - bill lists meter.			06-06-15-05
10057000-9	STREET LIGHTS RTE #1 (part 1)	4 units	4	175W Mercury Vapor Lighting	06-06-15-05
10057000-9	STREET LIGHTS RTE #1 (part 2)	5 units	5	400W Mercury Vapor Lighting	06-06-15-05
10057000-9	STREET LIGHTS RTE #1 (part 3)	1 unit	1	100W Mercury Vapor Lighting	06-06-15-05
10056990-6	BALLFIELD	Not sure - bill lists meter.			20-05-15-05
10113822-0	BALLFIELD RD	Not sure - no charge on bill.			20-05-15-05
10056992-0	CANOE CLUB RD - HOCKEY	Not sure - bill lists meter.			20-05-15-05
10056976-7	VFW DRIVE BALLFIELD	Not sure - bill lists meter.			20-05-15-05
10057003-5	MAIN RD GATE	No - lighting for Library sign.			20-10-15-05
			366		
Source: Angus Jennings, Town Manager					

Town of Hampden
106 Western Avenue
Hampden, Maine 04444



Phone: (207) 862-3034
Fax: (207) 862-5067
Email:
townmanager@hampdenmaine.gov

TO: Emera Maine
FROM: Angus Jennings, Town Manager
DATE: November 17, 2016
RE: Consent

I, Angus Jennings, Town Manager of Hampden, Maine, consent to the release of information to an authorized representative of RealTerm Energy, and specifically to Francisco Reinoso, (freinoso@realtermenergy.com) for the purpose of calculating our energy savings from converting our street lights to LEDs. I understand that this consent will apply to inquiries made regarding the following accounts relating to our electric consumption/usage history over the past five years.

<u>Acct. Number</u>	<u>Service Location</u>
10056982-9	RT 202 BUSINESS PARK
10056985-6	KENNEBEC RD STREET LIGHT
10027066-1	KENNEBEC RD CIVIL DEFENSE
10027065-9	DUDLEY ST RT 9 CIVIL DEFENSE
10057014-8	STREET LIGHTS
10056973-0	STREET LIGHTS (part 1)
10056973-0	STREET LIGHTS (part 2)
10027067-3	OLD COUNTY RD CIVIL DEFENSE
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10056971-6	STREET LIGHTS
10056970-4	STREET LIGHTS
10056972-8	STREET LIGHTS
10056981-7	KENNEBEC RD
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10113822-0	BALLFIELD RD
10056992-0	CANOE CLUB RD - HOCKEY
10056976-7	VFW DRIVE BALLFIELD
10057003-5	MAIN RD GATE

Signature: _____

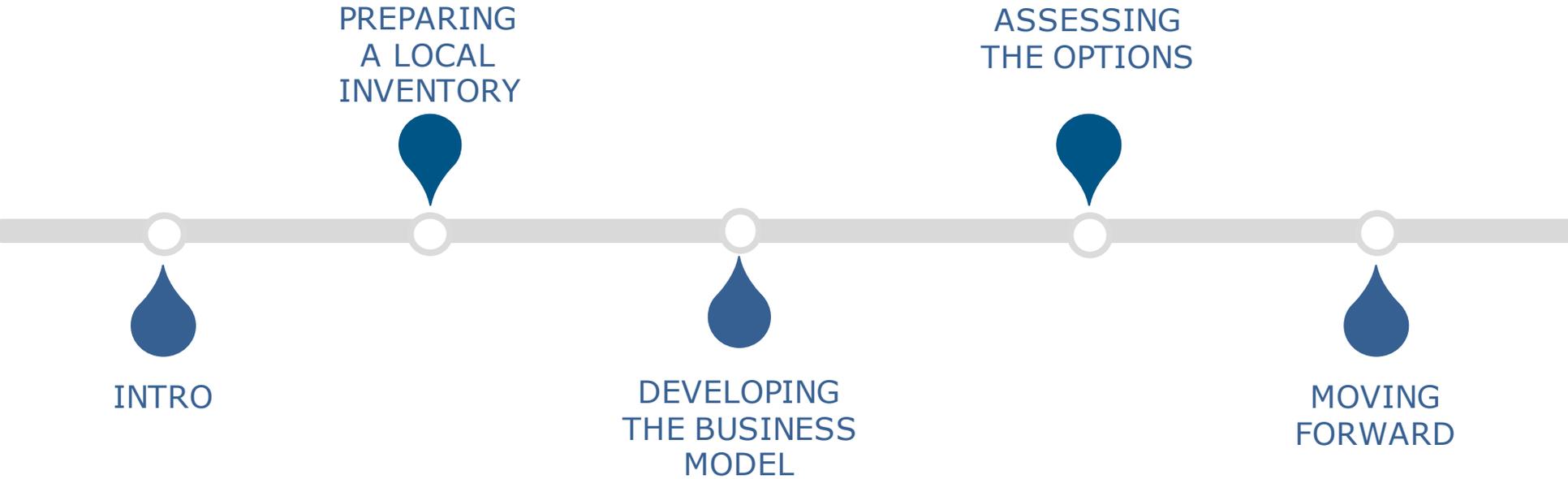
Title: Town Manager Date: Nov. 17, 2016

The Advantages of Upgrading to LED Street Lighting

Maine Lunch & Learn Seminars
November 9-10, 2016



AGENDA

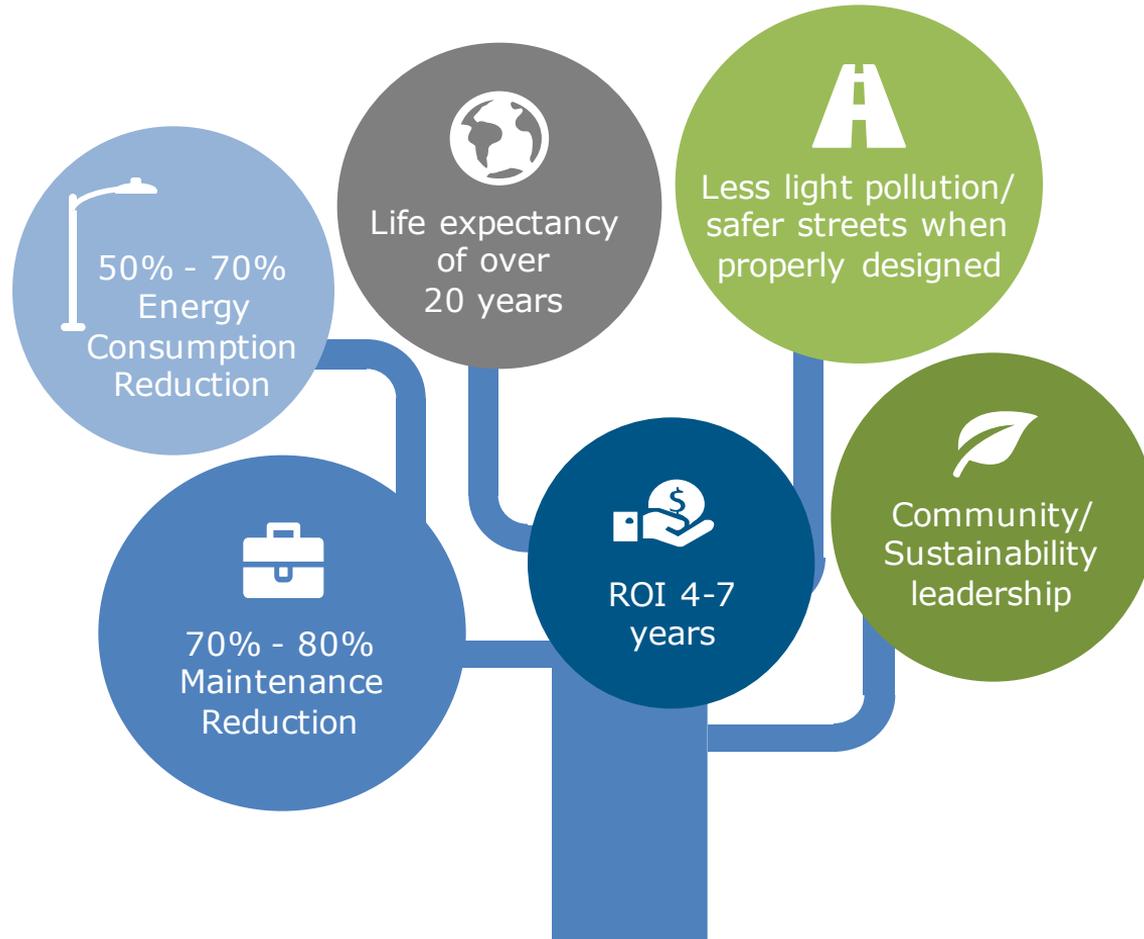


RTE STREETLIGHT PROJECTS

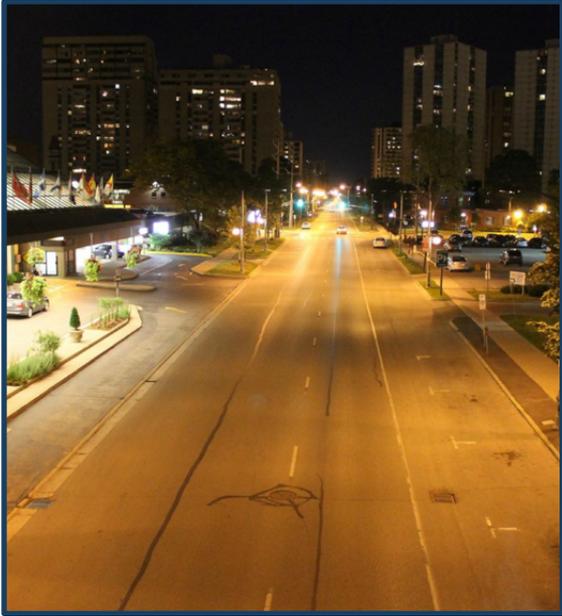


- ✓ 160+ projects in 3 Provinces and 6 States
- ✓ Case Studies and Design White Paper plus more available on realtermenergy.com

WHY SWITCH TO LED STREETLIGHTS



WHY SWITCH TO LED STREETLIGHTS



Before



After

OTHER BENEFITS FROM A STREETLIGHT UPGRADE

SAVE MONEY

Rising energy prices, municipal fiscal challenges, and lower LED prices make business case compelling.



SAVE STAFF TIME

Significantly less maintenance means either more staff time and/or greater savings that can be utilized elsewhere.



INCENTIVES

Support from Utilities helps with payback and shows municipality leveraging partnerships in the public interest.



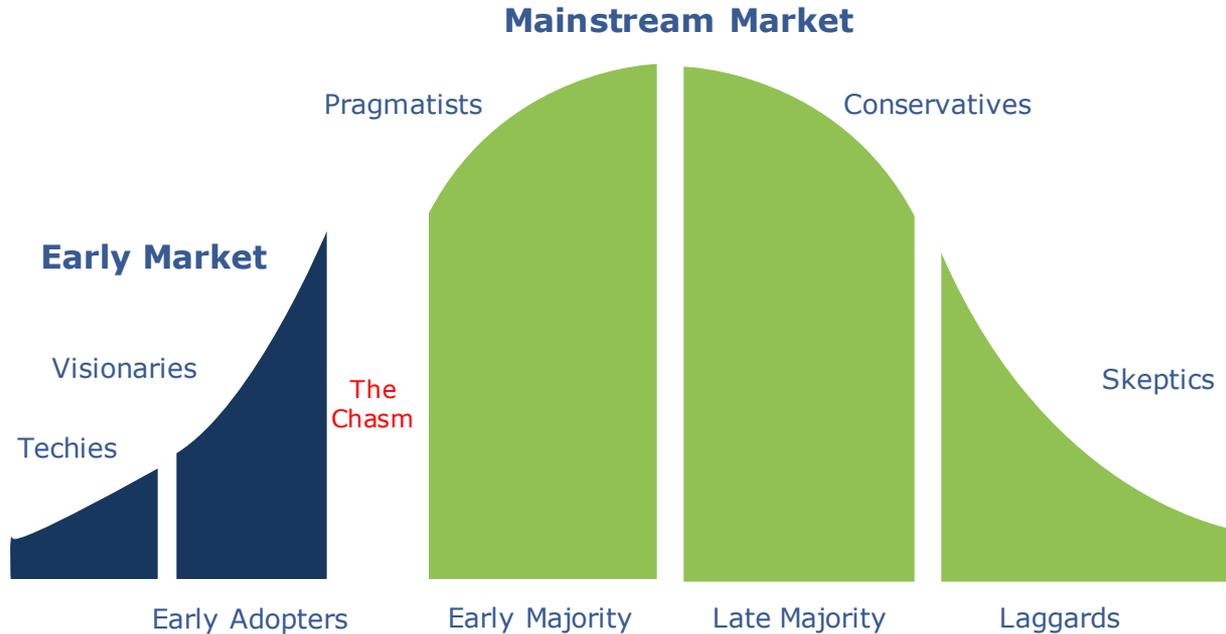
POLITICAL CAPITAL

Streetlights are very visible EE project. Successful projects garners Council support for future EE projects.



SAFELY CROSSING THE CHASM - FIXTURES VS. CONTROLS

Innovation Adoption Lifecycle

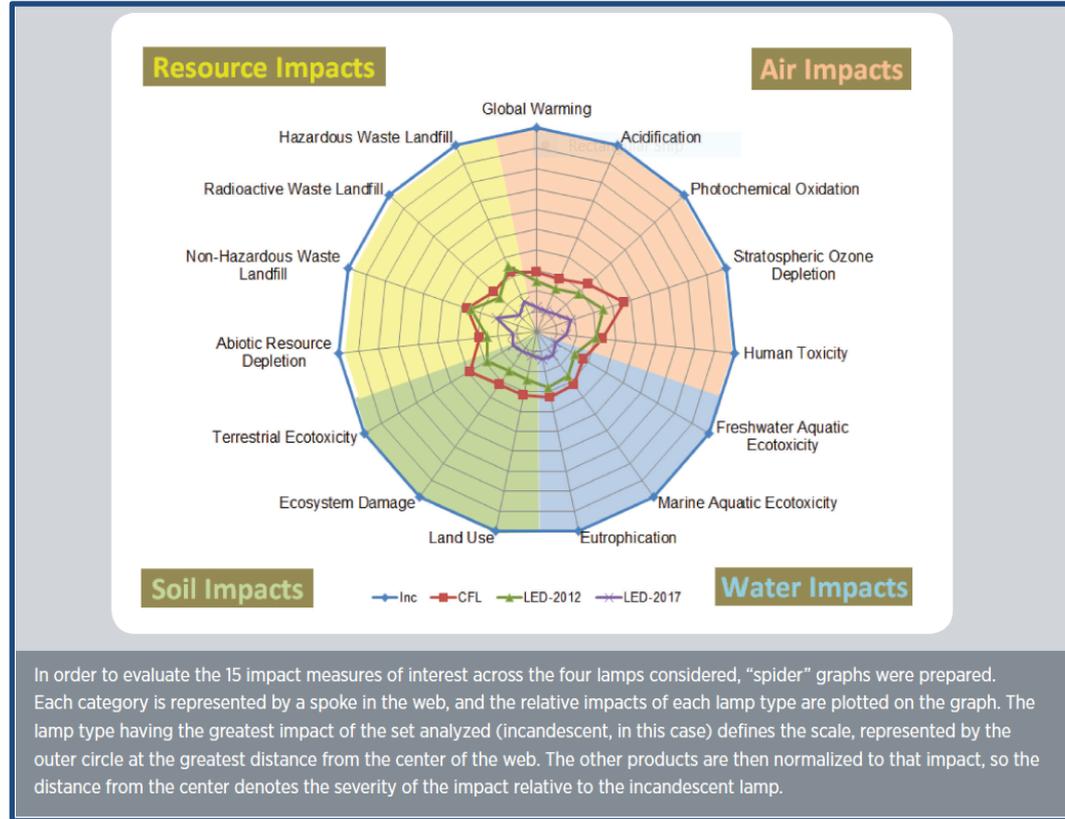


SELECTING THE STREETLIGHT IS THE EASY PART



- LED lighting is an energy-efficient way to illuminate streets. But it's important to direct the light only where it's needed to support visibility, safety, and the health of humans and other living creatures; and to limit glare for pedestrians, bicyclists, and drivers. (AMA 2016)

LIFE-CYCLE ASSESSMENT IMPACT OF LAMPS ANALYZED



In order to evaluate the 15 impact measures of interest across the four lamps considered, "spider" graphs were prepared. Each category is represented by a spoke in the web, and the relative impacts of each lamp type are plotted on the graph. The lamp type having the greatest impact of the set analyzed (incandescent, in this case) defines the scale, represented by the outer circle at the greatest distance from the center of the web. The other products are then normalized to that impact, so the distance from the center denotes the severity of the impact relative to the incandescent lamp.

From US OE's Life-Cycle Assessment of Energy and Environmental Impacts of LED Lighting Products

Step One: Develop an Accurate Inventory

STREETLIGHT INVENTORIES: THEORY VS REALITY

Municipalities
confident in their
existing inventory:

60%

Municipalities whose
existing inventory
was accurate:

0%

Some degree of error, often up to 20%, in every single one of the over 160 municipalities we have worked with.

DEVELOPING AN INVENTORY

Check Current Databases (municipal)



Identify and validate utility data

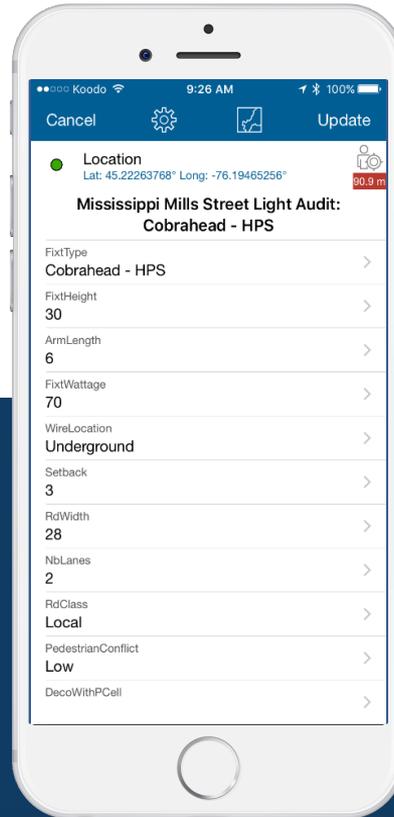
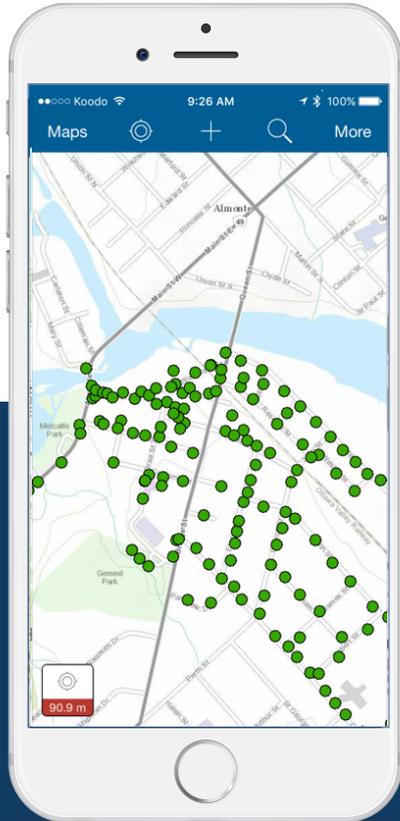


Determine how ongoing / future growth and construction plans will impact streetlight assets



Verify and consolidate via a fulsome street by street geomatics-based inventory

A ROBUST INVENTORY INCLUDES



- Fixture Type
- Fixture Wattage
- Fixture Height
- Road Width
- Pole Setback
- Pole Material
- Wire Location
- # Traffic Lanes
- Road Classification
- Pedestrian Traffic
- Intersections
- Colour (if Decorative)
- Street Name
- Pole ID + Ownership
- Comments

Step Two: Develop a Business Model

FINANCIAL ANALYSIS – THE STARTING POINT

- ✓ Validate how conversion would impact rates

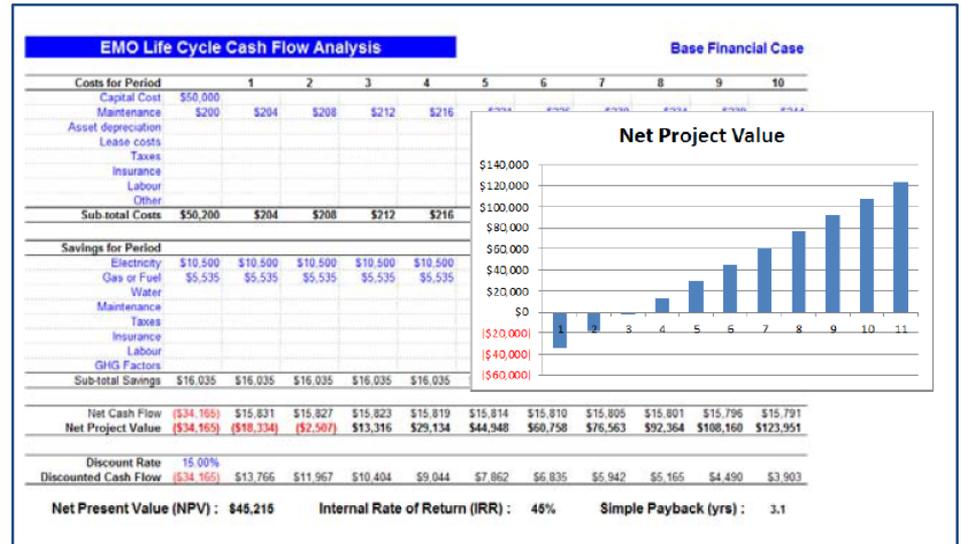
- ✓ Check on M&V, potential for controls and impact on billing, and other requirements

- ✓ Obtain financing rates from MFA and any other relevant source

- ✓ Conduct analysis on the options & compare with other capital projects

ANALYSIS SHOULD FOCUS ON INVESTMENT VERSUS COST

- Focus on simple payback is flawed and often leads to unexpected overruns in the future
- Move to Lifecycle cost analysis via
 - Net Cash Flow,
 - Net Present Value (NPV), and/or
 - Internal Rate of Return (IRR)
- Maine municipalities must include costs of buying back fixtures from their utility
- Include Sensitivity Analysis (on incentives and rate increases) and Opportunity Cost



FACTORS TO INCLUDE IN YOUR FINANCIAL ANALYSIS

- ✓ Number of streetlights being replaced and installed
- ✓ Service life of LEDs
- ✓ Appropriate discount rate (rate of borrowing)
- ✓ Capital cost of LED luminaires
- ✓ Buyback costs (depreciated assets) and other fee from utilities
- ✓ Installation costs (including cost of roadway closures if required)

- ✓ Project timeline (phased retrofit or turnkey solution)
- ✓ Maintenance costs of replacing luminaire components (including warranty agreements)
- ✓ Estimated energy costs throughout service life of LED (incl. inflation)
- ✓ Energy efficiency incentives
- ✓ Financing options

A WORD ON INCENTIVES



- Frequently change
- Patience required
- Experience helps
- Need to balance between maximizing incentive and optimizing design
- Only applies to fixtures on non-utility poles

Step 3: Assess Your Options

COMPARE IMPLEMENTATION TIMELINES

	Single Phase Project (1 year)				Two Phase Project (2 years)				3 Year Project Rollout			
Year	1	2	3	4	1	2	3	4	1	2	3	4
Total Operating Cost (before upgrade)	\$1,386,468	\$1,424,462	\$1,463,524	\$1,503,684	\$1,386,468	\$1,424,462	\$1,463,524	\$1,503,684	\$1,386,468	\$1,424,462	\$1,463,524	\$1,503,684
Total Operating Cost (after upgrade)	\$418,476	\$430,311	\$442,486	\$455,011	\$938,472	\$430,311	\$442,486	\$455,011	\$1,062,740	\$760,933	\$442,486	\$455,011
Annual Savings	\$967,991	\$994,151	\$1,021,038	\$1,048,673	\$447,996	\$994,151	\$1,021,038	\$1,048,673	\$323,728	\$663,529	\$1,021,038	\$1,048,673
Investment Cost	-\$ 6,132,317				-\$3,066,158	-\$3,208,096			-\$2,044,106	-\$2,138,731	-\$2,232,981	0
Cash Flow	\$967,991	\$994,151	\$1,021,038	\$1,048,673	-\$2,760,100	\$994,151	\$1,021,038	\$1,048,673	-\$2,044,106	-\$1,815,003	-\$1,569,452	\$1,021,038
10 years IRR	11.6%				10.5%				9.6%			
NPV Cost Savings Over 20 Years	\$15,079,550				\$14,584,316				\$14,166,082			

COMPARE THE POSSIBLE SERVICE DELIVERY APPROACHES

	MUNICIPALITY ON ITS OWN	INSTALLATION CONTRACT ONLY	INTEGRATED SERVICE PROVISION
RFPs Required	None	One	One with multiple service components
Internal PM Required	Yes	Yes	No
Utility Billing, M&V Support	No	No	Yes
Photometric Design	In-house design expertise and capacity unlikely	No	Yes
Public Outreach and Marketing Support	In-house communications required	No	Yes
Capital Provided Option	Reserve funds or MFA	No	Possibly
Third Party Verification	Rarely	Rarely	Yes
Risk Transfer	No	Some	Yes

COMPLETE TURNKEY CONVERSION



GIS Data
Collection



Photometric Design



Investment Grade
Audit



Installation &
Project Management



Incentive & Grant
Support plus
Billing Changes



Final Report
& Binder



Measurement &
Verification

Step 4: Move Forward

TAILOR YOUR MESSAGING

Council

- Visible project
- Save money
- Celebrate success
- Improve light levels
- Achieve sustainability goals
- Asset Mgmt

Procurement Staff

- Visible project
- Save money
- Fast deployment
- Best value (LCC)
- Risk transfer
- Celebrate success

Public Works

- Save money
- Reduce operational risk
- Improve asset mgmt.
- Redeploy maintenance staff
- Celebrate success

Enviro Staff

- Save energy & money
- Reduce light pollution
- Best value (LCC)
- Leverage for other projects
- Celebrate success

THINGS TO KEEP IN MIND



Design is crucial, must be independent of manufacturer

- Good design leads to less public complaints, safer streets, much greater value over project's life.
- Requires experienced technicians employing appropriate technology on street level not street type basis.



Infrastructure is old and problems will occur

- Trouble-shooting should evolve with new scenarios.



Random third-party verification for installation work

- Even excellent firms only as good as weakest link, must be subject to random audits

LESSONS LEARNED



If you want best value, you have to look to lifecycle costs

- Requires more effort in design and installation but pays off (+12-15%)
- Municipalities tend to lowest price – whereas value is the better metric



Communication is vital

- Proactive with all parties, beginning with Council and the public
- Very helpful to have specific website to track the project



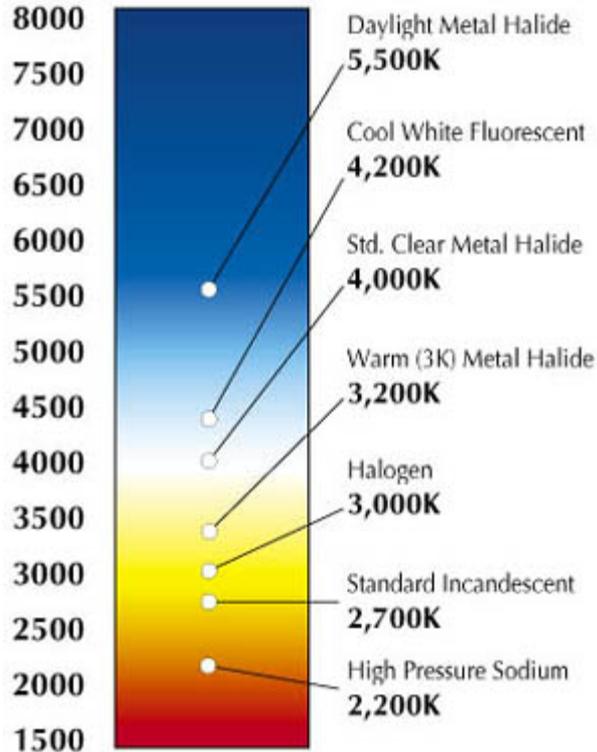
Things change

- Technology moves quickly, essential to keep up to date
- Fast adaptation to changes in the rules or market conditions is essential



DISCUSSION

A WORD ABOUT COLOUR TEMPERATURE



- One factor among many to consider
- Efficiency + payback considerations
- More options now on market
- Blue light is emitted by all lights regardless of source type. Nothing dangerous about LED lighting but it should be used with same prudence with which we use any other technology and direct it where it is needed.
- Choosing color temperature is a balance between public safety and aesthetics whereas statistics seem to indicate that cool-CCT lighting had increased safety in a municipality.



How many people does it take to change a streetlight?

INFRASTRUCTURE CHALLENGES AND LED STREETLIGHT UPGRADE INSTALLATION BEST PRACTICES

This White Paper outlines many of the challenges surrounding the current state of streetlight infrastructure across North America and describes installation and project management best practices related to LED upgrade projects.

INSTALLATION BEST PRACTICES **WHITE PAPER**

Streetlights are all around us, and if you're like most people you don't normally pay a lot of attention to them until there's a problem, or you are considering an upgrade. For the uninitiated, an upgrade to LED streetlights would seem to be as simple as changing a light bulb, only on a bigger scale. By now, you have heard many variations of the joke: "How many (insert group here) does it take to change a light bulb?" Before proceeding, we'd like to share three of our favorites:

How many psychologists does it take to change a light bulb?

None, but the light bulb has to want to change.

How many folk singers does it take to screw in a light bulb?

Two. One to change the bulb, and one to write a song about how good the old light bulb was.

How many existentialists does it take to screw in a light bulb?

Two: One to screw it in and one to observe how the light bulb itself symbolizes a single incandescent beacon of subjective reality in a netherworld of endless absurdity reaching out toward a cosmos of nothingness.

While the jokes pertain to the common household light bulb, it's fairly common that many approach changing their municipal streetlights in the same fashion. Since the earliest days of the electric streetlight, maintenance has more or less been confined to changing burnt-out bulbs, with almost no consideration for design. If it felt underlit, just replace it with a higher wattage, like one would do at home. After all, goes the thinking, how hard can it be to change a few streetlights?

The answer is, it depends.

DID YOU KNOW?

Early oil-based lamps were used by the Greeks and Romans to protect travelers from hazards and for keeping potential robbers at bay. Since then, there have been several major advancements in the efficiency of both the energy source (candle→whale oil→gas→electricity) and light fixtures (glass lanterns→arc lamps→incandescent→high-intensity discharge <metal halide and high-pressure sodium>→LED). While most communities benefit from a wide variety of decorative lighting fixtures to give character to the streetscape, by and large the provision of streetlights remains primarily motivated by public safety.

Given this focus on public safety, it is a little odd that unlike the maintenance of roads and highways (which are strictly governed by standards and generally carry hefty penalties for contravention), there are very few standards that govern the actual delivery of light to the street. It seems that the simple provision of light sources has been the primary consideration, while such factors as energy efficiency, good design, potential light pollution, ongoing performance, maintenance, and others, have been more of an afterthought.

Most major cities have developed their own standards, but generally these are either engineering standards for such physical elements as overhead wiring, poles, and fixtures, or aesthetic-driven guidelines around what is acceptable in the downtowns and other targeted areas. However, very few municipalities have detailed standards or guidelines around their ongoing operation. It's as if we all just take it for granted because it's just there, part of the urban furniture, and therefore overlooked.

The complexity and resources required to upgrade a streetlight network to LED depend upon the state of the current infrastructure, the scale of the project, and the desired outcome in terms of project management and product performance. This paper will examine the first two factors and describe some best practices around installation and project management.

STREETLIGHT INFRASTRUCTURE MANAGEMENT

It's unlikely that anyone enters municipal politics with a burning passion for streetlights. Elected officials have an incredibly wide range of issues to grapple with, and streetlights are usually far, far down on that list. Only recently have technological advancements and the compelling economics of upgrading streetlights to LED pushed this issue back on the radar screen of elected officials and the staff that assist them in their deliberations. The same applies for most Boards of Directors at municipal and cooperative utilities that provide street lighting services.

In addition to budgetary concerns, politics and the lack of legal standards, there are two other obstacles standing in the way of proactive streetlight management: the lack of accurate inventories and fragmentation of ownership. There's a popular adage that states that if you can't measure it, you can't manage it, and this applies perfectly to streetlight operations and maintenance. The vast majority of municipalities do not have an accurate idea of their monthly energy or maintenance costs nor of their current inventory. While those communities or utilities that own their own streetlights usually have a decent idea of their energy costs (though the accounting of maintenance costs varies dramatically), it is exceptionally rare to find one with a complete inventory of all fixtures and their individual attributes (see our [White Paper on Photometric Design](#) for a complete list). For those that own none or only some of their lights, it is common to see significant discrepancies in what the utilities and municipalities believe is physically on the street, versus what's actually there. In our experience in analyzing well over 200 communities, we have found that when comparing the city's inventory with those of the utility, both end up being wrong, sometimes significantly so—100% of the time!

While some systems are incredibly well maintained, most current streetlight networks have certain weaknesses such as wire deterioration, poor pole condition, a lack of proper fusing, and a lack of bonding. As previously mentioned, the lack of legal standards has led to inconsistency in specifying new streetlights as well as their actual operation and maintenance. Not surprisingly, inconsistent policy often results in erratic enforcement, which has further compounded other challenges (see below). As a result, anyone considering an upgrade should plan on encountering some potential hazards.

A WORD ON MUNICIPAL STANDARDS

High quality municipal street lighting standards vary in detail but address how proposed lighting will: **(a)** contribute to roadway user safety, **(b)** assist in preserving the experience of the night sky, **(c)** provide respect for the privacy of residential space (minimize light trespass), **(d)** assist in the conservation of energy, **(e)** provide a consistent and standard approach to design, and **(f)** ensure financial sustainability with respect to construction, maintenance and operating costs.

The [Illuminating Engineering Society \(IES\)](#), the [Municipal Solid State Street Lighting Consortium](#), the [American Association of State Highway and Transportation Officials](#), and the [International Dark Sky Association](#) have some excellent technical information that is helpful for standards development. Certain state and country transportation departments can also offer some helpful guidance.

EXAMPLES OF HAZARDOUS INFRASTRUCTURE AND INSTALLATION PITFALLS

The quality and condition of wiring, fuses, poles, and arms all vary tremendously and should be scoped out fully during the asset inventory gathering-stage of the project. Failure to do so will almost certainly result in time delays and cost overruns during installation, and may cause significant and costly performance issues later on. Ungrounded poles can and do present what's known as a 'step-touch' hazard (whereby poles and other metal surfaces can become electrified), a dangerous and potentially life-threatening condition that must be dealt with immediately to ensure public and worker safety.

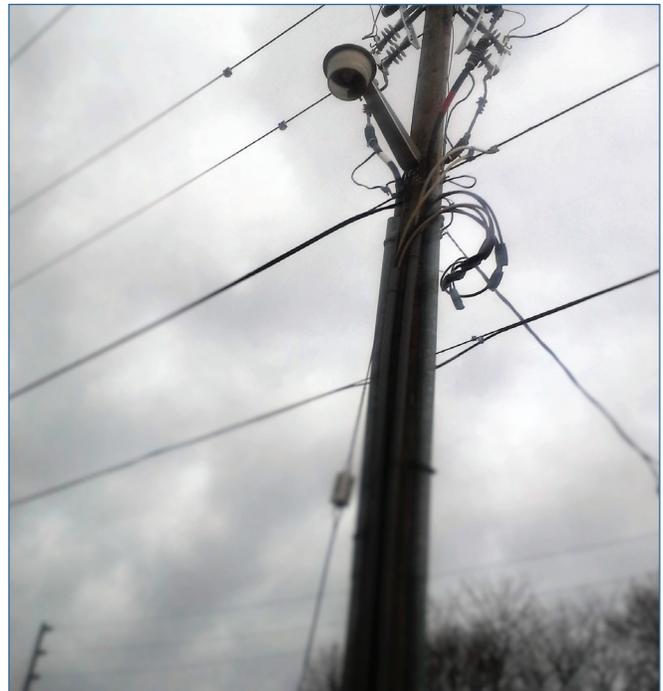
Access issues such as the one pictured below are also a common occurrence:



Other safety issues include the utility laying secondary cables across the back of the davit arm when they installed new poles:



Or when the fixture is much too close to the primary wire as in this example our team called the 'death trap':



Occupational electrical-related fatalities are a significant and ongoing problem and a particular hazard to those who routinely work near electrical sources. Studies have shown that the highest proportion of electrocution deaths is among electricians and apprentices, power linepersons, and those working in construction and manufacturing industries.

SAFETY FIRST!

Contractors should comply with Industry Codes at all times

All quality installers will be familiar with the Codes and Standards that govern their industry. While certain states and provinces have local documentation, the National Electrical Safety Code published by the IEEE (or the very similar Canadian Electrical Code for Canadian projects) is a great place to start.

The Code has emerged as a foundational element in the culture of safety that has grown up around the business of installing, operating and maintaining both underground and overhead electric supply and communication lines, as well as conductors and equipment in electric supply stations. Utilities, contractors and others look to the code for practical safeguarding guidelines.

Primary wires are those at the top of the pole and usually carry from 1,000 to 46,000 volts of electricity from a substation. Only qualified personnel should go anywhere near primary wires and most utilities strictly limit or prohibit access.

Sometimes you will inherit the mess that previous contractors may have left behind as in this instance (below), where the davit arm is mounted between and through the primary phases:



Or here in this double fail where the light in the foreground is too close to the primary cable and the one in the background is mounted on a loose metal extension on a wood pole:



It is also very common to see bad fuses, no fuses at all and wiring in all states of disrepair as in this tricky mess our install crews had to straighten out:



The importance of finding a reliable and experienced installation team cannot be overstated. First, your installers usually will have to be more than licensed electricians or journeymen but also skilled problem-solvers. They will also have to deal with the full range of weather issues including rain and heat, which slows down projects for different reasons (cold is usually not an issue), plus a wide range of insects and animals that are quite at home in the streetlight network, and are sometimes determined to stay that way.

DID YOU KNOW?

Birds, insects, and rodents can become long-term tenants inside both streetlight fixtures and poles. And like all such tenants they dislike being dislodged from their comfy homes. We've even had a startled mouse jump into the overalls of one of our installers, which sounds funny after the fact, but presented a genuine hazard to an equally startled installer 30 feet in the air!

Finally, it is also possible to run across some strange scenarios at times, as in this example, where the fixture is facing away from the street, illuminating only the resident's driveway:



INSTALLATION AND PROJECT MANAGEMENT BEST PRACTICES

The best practices outlined below are subjective in that they are defined by standard practices here at RealTerm Energy (RTE) as well as some other quality projects we have been fortunate enough to study. We have had the good fortune of working with many excellent municipal and utility staff people that have often suggested process improvements and helped us to improve upon deficiencies. As in life, most best practices are learned the hard way, and we share them with our readers in the hopes that they will avoid similar mistakes.

HUMAN-FOCUSED INSTALLATION PITFALLS

Just like every other industry, levels of integrity can vary widely amongst installation contractors. Individual installers often can and do cut corners or exaggerate their experience, so take care with any firm that quotes significantly lower costs than the market rate. Similarly, not all installers deploy a disciplined approach to the actual installation, and this can lead to timely and expensive delays during the project, costly repairs later for sub-standard workmanship, or even failure to pass inspections.

Considerable efficiencies exist when inventories, routes, and crews are planned in advance. For example, a quality installer may have a higher hourly rate, but if the installer is efficient and organized, and can install more fixtures per day, the job will progress without some of the issues that a less qualified firm might leave behind.

A high-quality contractor puts a premium on safety. Safe work practices need to be utilized at all times when working near powerlines and proper procedures put in place for operating High Reach equipment, loading and unloading of material, as well as proper use of ladders.

In certain areas, workers will also have to prevent against theft, vandalism, as well as homeless people trespassing into their vehicles. Police details may be required and should be considered for reasons other than simply closing down intersections.

RTE prides itself on its excellent design processes that are supported by an accurate inventory of the actual assets, incorporating recognized roadway classifications and recommended practices for design. We do not proceed to the installation stage until these stages have been completed and vetted by the client, and we highly recommend that anyone considering an upgrade spend the time necessary for a proper GIS-based asset inventory and robust photometric design. In our considerable experience, it always pays off in the end.

As a LED streetlight specialist, RTE follows a very detailed installation and project management work flow. To enable your preparations for selecting a partner or even if you plan to do it on your own, there are seven general principles that should apply to any streetlight upgrade:

- 1) Plan and prepare for the delivery, unloading, and secure storage of new fixtures as well as the recycling of old fixtures in a properly licensed facility.
- 2) Utilize your initial inventory and designs to plan routes and equip installers with an App that stores a complete file on all of the work that is performed at each location. This both enables them to save time at each pole (versus paper records) and can allow you to see progress in real time.
- 3) Incorporate construction and road maintenance schedules (parades, road closures, etc.) into installation plans in advance to avoid the potential for time delays and cost overruns.
- 4) Hold a kick-off meeting between your staff, the installers, and the Project Manager to clarify scope, expectations, and reporting cycles.
- 5) Insist that your Project Management firm provides training for the installation teams and maintains an expert presence at the initial stages.
- 6) Conduct random inspections throughout the installation phase (concentrating on the earlier work at first) to ensure installers do a quality job throughout your community.
- 7) Insist on a full commissioning process that includes a sign-off on all services, training for staff, as well as an overview on maintenance and warranty provisions.

INSTALLATION CASE STUDY: CITY OF BARRIE

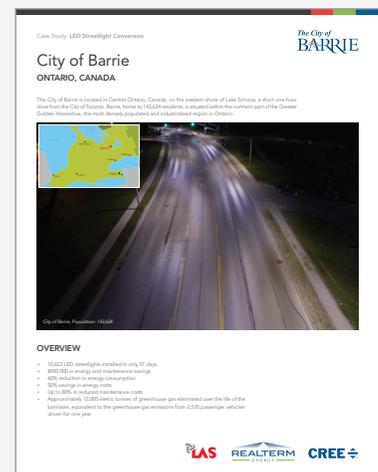
Barrie's City Council entrusted RealTerm Energy to assess its existing streetlight network, create an energy efficient and cost-effective street lighting design and coordinate the purchase and installation of the new LED lights.

"Many municipalities seemed to be going with a one-for-one replacement and we trusted the GIS mapping and the photometric design to bring additional value to the project," said Barry Thompson, Manager of Energy Management for the City of Barrie.

In the fall of 2015, RealTerm Energy delivered a complete turnkey LED streetlight upgrade in the City of Barrie. The Municipality had ambitious goals of finishing the entire project by the end of 2015 in order to qualify for a utility incentive. With a proven installation protocol that allowed for rapid deployment without any sacrifice in the quality of the installation, the conversion of all 10,622 LED streetlights was completed in 57 working days, several weeks ahead of the original completion date. Installation crews worked day and night to make this happen. RealTerm Energy also provided a real-time installation map that was posted on the City's website allowing the installation progress to be tracked by all residents.

"The LED streetlight conversion project went very smoothly. We found their field crew to be extremely responsive to any issues or requests we made and everything was done in a very professional manner," added Thompson.

An overnight success story....three years in the making.



Case Study: LED Streetlight Conversion

City of Barrie
ONTARIO, CANADA

The City of Barrie is located in Central Ontario, Canada, on the western shore of Lake Simcoe, a short one-hour drive from the City of Toronto. Barrie, home to 14,626 residents, is located within the northern part of the Greater Golden Horseshoe, the most densely populated and industrialized region in Ontario.

OVERVIEW

- 10,622 streetlights installed in only 57 days
- 80% reduction in energy and maintenance costs
- 80% reduction in energy consumption
- 10% savings in energy costs
- 50% reduction in maintenance costs
- Approximately 12,000 metric tonnes of greenhouse gas eliminated over the life of the lamps, equivalent to the greenhouse gas emissions from 12,000 passenger vehicles driven for one year

Logos: LAS, REALTERM ENERGY, CREE



How Photometric Design Enhances Energy Savings and Asset Management

WHITE PAPER

This paper shows how photometric design should be included in any streetlight upgrade as good design provides optimal energy savings while providing safe streets.

PHOTOMETRIC DESIGN WHITE PAPER

We all experience design in our everyday lives in some fashion or another without giving it much thought. We know what we like and we often presume that good design is subjective. But design must move beyond merely personal taste to address tested, universal principles if it is to be most effective. The same is true for lighting design for streetlights.

Street lighting is first and foremost about safety. Good lighting can prevent accidents by serving drivers and offering protection to otherwise unprotected pedestrians and cyclists. Lighting levels on roads at night need to provide adequate visual acuity for the driver of a vehicle and pedestrians. This enables an individual to detect movement of other vehicles and pedestrians. Good lighting on streets and sidewalks also enhances the feeling of personal safety for pedestrians. Street lighting in newer neighbourhoods was likely designed with this in mind—but in older neighbourhoods and rural areas this is usually not the case as lights would have been put on existing utility poles.

DID YOU KNOW?

Utility poles are an inexpensive way to keep electric wires insulated from the ground and out of the way of people and vehicles. Utility poles can be made of wood, metal, concrete, or composites like fiberglass.

The governing code for utility pole spacing is the law of gravity. The limiting factors are the type of conductor used and the maximum sag allowed, required clearances, their ability to support their own weight along with the necessary tension required and the need to avoid breaking the dead end pole that will have to take the load.

There is no universal formula for pole spacing as they are conservatively engineered factoring in local conditions such as soil types and weather patterns.

The **ANSI/IES RP-8-14** Roadway Lighting guide distinguishes between roadway lighting (freeways and major roads without pedestrians) meant to help motorists remain on the road by “detecting obstacles within and beyond the range of their headlights” and street lighting (majors, collectors, locals) meant to help the motorist “identify obstacles, provide adequate visibility of pedestrians and cyclists, and assist in visual search tasks, both on and adjacent to the street. Design is driven by the classification of the particular roadway, the geometric position and frequency of the luminaires with respect to the roadway, and the unique distribution pattern of a prospective fixture. Good lighting for both roadways and streets means reducing back light and up light while delivering the required light to the targeted surfaces.

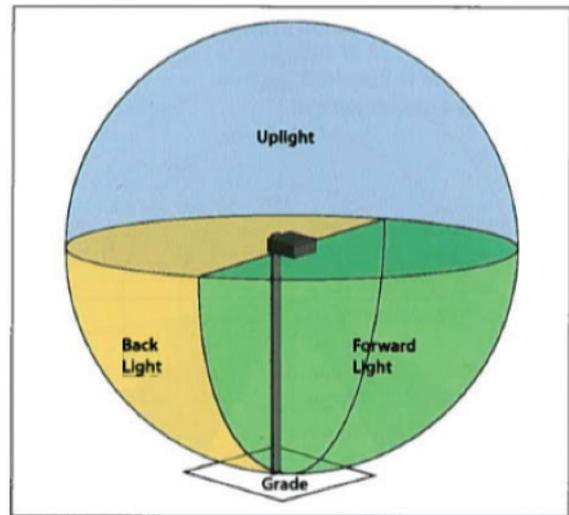


Figure 2a: LCS main solid angles. (© Illuminating Engineering Society of North America)

Good lighting necessitates photometric design based on all of these inputs.

WHAT IS PHOTOMETRIC DESIGN?

Photometry is the science of the measurement of visible light, especially luminous intensity. Our eyes cannot see all wavelengths of visible light so photometry tackles this by weighing the measured power at each wavelength with a factor that represents how sensitive the eye is at that wavelength. The result is a model of the eye’s response, called luminosity function, to light conditions (photopic vision) and dark conditions (scotopic vision). Photometric design for lighting focuses on the eye’s photopic response. *The Illuminating Engineering Society of North America* (IESNA) provides guidance in this area, including standards, recommended software, and file types. Lighting designers use these IES files, which are fixture measurements conducted by third party equipment independent of the manufacturer, to complete their designs. While this science continues to evolve, sometimes rapidly, one of the most important considerations for photometric designers at this time is luminance.

Table 3. **LIGHTING DESIGN CRITERIA FOR STREETS**

ANSI/IES RP-8-14

Street Classification	Pedestrian Area Classification	Avg. Luminance L_{avg} (cd/m ²)	Avg. Uniformity Ratio L_{avg}/L_{min}	Max. Uniformity Ration L_{max}/L_{min}	Max. Veiling Luminance Ration $L_{V_{max}}/L_{avg}$
MAJOR	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
COLLECTOR	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
LOCAL	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

L_{avg} Minimum maintained average pavement luminance
 L_{min} Minimum pavement luminance
 $L_{V_{max}}$ Maximum veiling luminance

Luminance is the “photometric quantity most closely associated with one’s perception of brightness. It usually refers to the amount of light that reaches the eye of the observer measured in units of luminous intensity (candelas) per unit area (m²).” In other words, it is the measure of surface brightness or reflected light that we can see. Here’s where it starts to get confusing. A second important consideration, especially for intersections, crosswalks, walkways and sidewalks, is called illuminance. **Illuminance** is the amount of light striking a surface calculated as the density of lumens per unit area, stated as footcandles (lumens/square foot) or lux (lumens/ square meter). In its simplest, illuminance is the light that hits a surface whereas luminance is the light that is reflected or ‘bounced’ off a surface.

Good photometric design must also consider uniformity. **Uniformity** addresses how evenly light spreads over a task area. Uniformity is measured as a ratio between road surface illumination levels: max. to min. or max to average. Light levels along roadways and streets vary according to mounting height, luminaire spacing, and luminaire output. Designers generally seek to maximize uniformity to minimize the contrast drivers have to deal with. Fortunately, the **RP-8-14** guide provides direction on luminance, illuminance, and uniformity measures according to three different street classifications: Major, Collector, and Local.

OTHER FACTORS TO CONSIDER

When providing roadway and street lighting, planners must balance the benefits of lighting against potential drawbacks such as “engineering, capital, and maintenance costs, energy use, appearance, added fixed object hazards of poles, plus spill light on adjacent residential or commercial property and into the sky,”. The RP-8-14 guide adds that “lighting is ‘good’ when it is economical in equipment, energy and maintenance costs, and meets a proven or reasonably predictable need, with a minimum of adverse effect.” Lighting designs thus must also consider both the initial installation cost and the subsequent operating (maintenance and energy) costs.

One of the biggest benefits of an LED lighting retrofit is increased lifespan. For some municipalities and utilities the maintenance cost savings can be even more valuable than the energy savings of a streetlight retrofit. As a result, a good design must also create a lighting system that performs well to the end of the fixtures expected life. This involves accounting for light loss factors such as LED depreciation. The standard here is the L70 rating which is an IES standard for rating the relative output (70%) after X number of hours. The 70% figure is significant because it is generally when the difference in light output is noticeable by the human eye. The difference between a fixture’s initial and end of life brightness is referred to as lumen maintenance.

A FURTHER CONSIDERATION

Those communities with observatories or sensitive natural heritage features sometimes also wish to incorporate the Model Lighting Ordinance (MLO) into their lighting design. The MLO is the result of extensive efforts by the International Dark Sky Association (IDA) and the Illuminating Engineering Society of North America (IES). The MLO enables communities to drastically reduce light pollution and glare and lower excessive light levels. The recommended practices of the IES can be met using readily available, reasonably priced lighting equipment. Among its features is the use of lighting zones (LZ0-4) which allow each governing body to vary the stringency of lighting restrictions according to the sensitivity of the area as well as accommodating community intent. In this way, communities can fine-tune the impact of the MLO without having to customize the MLO. The MLO also incorporates the Backlight-Uplight Glare (BUG) rating system for luminaires, which provides more effective control of unwanted light.

WHY SHOULD I CARE ABOUT GOOD DESIGN?

In addition to the range of safety considerations addressed above (and the inherent liability concerns in not addressing them), good design results in significant upfront and ongoing cost savings. Good design means addressing areas that are under or over lit. Good design means moving beyond a simple one for one fixture replacement to one tailored to your

local infrastructure—which often results in selecting lower wattage fixtures than a simple one for one would suggest. The cost savings are both immediate, in terms of selecting lower wattage fixtures that tend to cost less, and long-term as the operating costs for the life of that fixture are lower because lower wattage lights use less energy. The design team at RealTerm Energy has found that good design nets an average of an additional 12% of savings over one-for-one type replacement for most (not underlit) communities.

HOW DOES REALTERM ENERGY’S DESIGN PROCESS WORK?

RealTerm Energy prides itself on its excellent design processes that are supported by an accurate inventory of the actual assets and based on recognized roadway classifications and recommended practices for design.

DID YOU KNOW?

Both municipal and utility inventories are often wrong—meaning neither match what actually exists on the streets. In 100% of the communities in which we have completed an asset map both inventories have been incorrect, sometimes dramatically. Accidents, weather incidents, failures, additions of streets and/or fixtures, quality concerns related to previous mapping, as well as discrepancies over who owns what are common causes of inaccuracies in existing data.

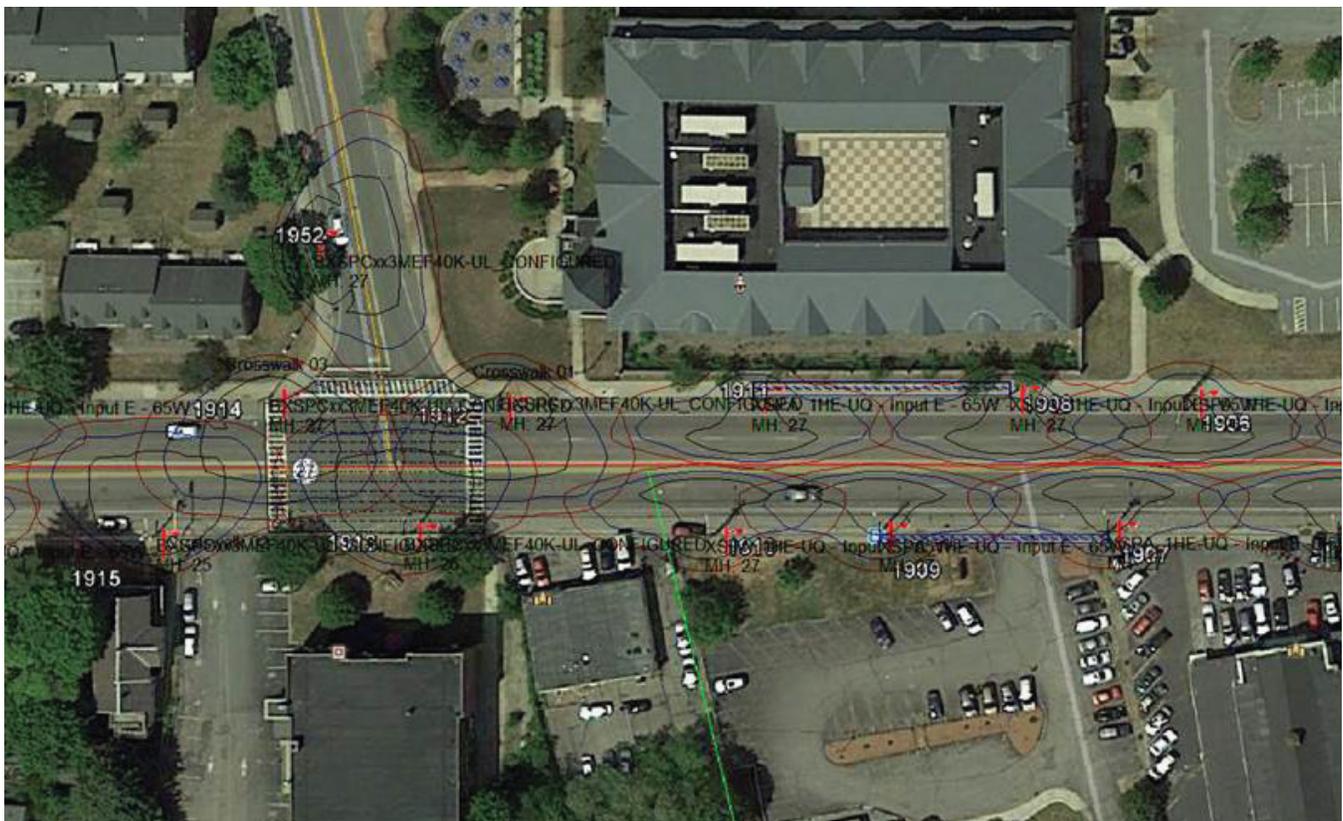
The first step in our design process is to accurately verify and map the streetlight assets via our Roadway Survey Data collection. Our GIS Engineering Department collects the following critical metadata using a custom-designed smartphone App: Fixture Type, Wattage, Mounting Height, Road Width, Pole Setback, Arm Length, Road Classification, and XY Coordinate. Each fixture is assigned a unique ID# and mapped in ESRI GIS software.

Roadway illumination design is driven by the classification of the particular roadway, the geometric position and frequency of the luminaires with respect to the roadway, and the unique distribution pattern of a prospective fixture. Roadway classifications have two components. **1.** Vehicular traffic volumes, which are determined by the National Roadway Network (NRN) and the data presented terms of Local/Collector/Major naming conventions. **2.** Pedestrian conflict, or volumes determined by the land use within 200m of the roadway in question and IES prescribed naming conventions, which are as follows for average nighttime activity: **a.** Low: less than 10, **b.** Med: less than 100, **c.** High: more than 100 pedestrians per hour.

Photometric Models are created with an industry leading software. The inputs to those models are taken from RTE’s Roadway Survey Data and the photometric performance of selected fixtures. The outputs from these models are compared to industry recommended practice prescribed by the IES. The unique distribution pattern of a luminaire is fixed intrinsically by the model of fixtures used. The photometric performance of these are measured, verified and published by a 3rd party laboratory in the form of luminous intensity tables that can be fed into a photometric calculation by means of an .ies file. The Photometric Models are evaluated by comparing the results to **RP-8-14** design criteria.

Numerous iterations are performed in each design to yield average luminance values that meet or marginally exceed the target design criteria. If the output calculation of Photometric Model meets, or exceeds **RP-8-14** average luminance design criteria, the process moves onto Fixture Specification.

Base designs for representative streets are determined and then carefully applied to other streets with the same parameters until each street that supports the design is specified. This process is repeated for each unique set of street conditions where unique designs can be applied.



SECTION 53
MUNICIPAL OWNERSHIP OF STREETLIGHTS

53.1 GENERAL DESCRIPTION

- A. As required by Section 2523 of Title 35-A of the Maine Revised Statutes, Central Maine Power Company (the “Company”) will provide municipalities the option to own and maintain light fixtures attached to poles owned by the Company, whether such pole is owned individually by the Company or as a joint owner with another utility.
- B. Municipalities requesting street lighting service may choose among three options to receive such service:
 - 1. The Company will provide all of the components of the street lighting system, including installation on Company poles and maintenance of such lighting system. The Company will deliver electricity to the street lighting system from a power vendor selected by the municipality. For such service (Full Service Lighting), the municipality shall pay the appropriate charges set forth in the Company’s Rate SL (Street Lighting Service) Electric Delivery Rate Schedule; or
 - 2. The Company will install and connect on its poles all of the components of the street lighting hardware as selected, purchased and owned by the municipality. Maintenance of all components of light fixtures will be the responsibility of the municipality or its contractor. Specific requirements and charges related to this option are set forth in Section 53.2 below and in provisions related to Delivery-Only Lighting Service in the Company’s Rate SL (Street Lighting Service) Electric Delivery Rate Schedule.
 - 3. The Company will connect to its distribution system light fixtures owned and installed by the municipality on Company poles. Maintenance of all components of light fixture and mounting hardware will be the responsibility of the municipality or its contractor. Specific requirements and charges related to this option are set forth in Section 53.3 below and in provisions related to Delivery-Only Lighting Service in the Company’s Rate SL (Street Lighting Service) Electric Delivery Rate Schedule.
- C. Unless otherwise agreed to by the municipality and the Company, nothing set forth in these Terms and Conditions shall disrupt or in any way modify any arrangements between a municipality and the Company that pre-dates the effective date of these Terms and Conditions.

53.2 MUNICIPAL OWNERSHIP AND MAINTENANCE – COMPANY INSTALLATION

- A. The Municipality will provide, own and maintain the street lighting bracket, luminaire, lamp, photocell, fuse, fixture conductor wire, hardware and controls for each lighting unit. Dedicated street lighting conductors will be owned and maintained by the Company.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.2 MUNICIPAL OWNERSHIP AND MAINTENANCE – COMPANY INSTALLATION (Continued)

- B. All street light fixtures provided by the Customer for installation on the Company's system shall be free from all defects and shall in no way jeopardize the Company's electric distribution system. The Company may refuse to allow the placement of any streetlight fixture which, in the Company's sole reasonable opinion, are not so free from defects or that might so jeopardize said system.
- C. All components of a street lighting unit, including the bracket, luminaire, lamp, photocell, fuse, fixture conductor wire, hardware and controls, shall be of a modern type approved roadway lighting for normal use by the Company. Once a specific fixture type has been approved by the Company as acceptable equipment, additional use of that fixture type as a replacement in a location where a street light currently exists will not require additional approval by the Company, provided that the replacement light has a similar or lesser weight and wind profile as the light being replaced.
- D. The Company will apply charges for connection, fusing, and installation as set forth in Section 53.7 below.
- E. For each street light fixture owned by a municipality and located on utility-owned poles, the municipality shall take Delivery Service for such fixture in accordance with the Company's Rate SL Electric Delivery Rate Schedule.
- F. A municipality shall make any request to the Company for the installation, removal, and relocation of street light fixtures in writing on an approved form for acceptance by the Company. By its approval or acceptance of any street light installation, the Company does not give any warranty, expressed or implied, as to the adequacy, safety or other characteristics of said installation.
- G. Once a municipality has executed a Customer Owned Street Lighting Agreement with the Company, the municipality has no obligation to provide notice to the Company prior to undertaking "routine maintenance," as such term may be defined in the Customer Owned Street Lighting Agreement.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.3 MUNICIPAL OWNERSHIP, INSTALLATION AND MAINTENANCE

- A. The municipality will provide, own, install and maintain the street lighting bracket, luminaire, lamp, photocell, fuse, fixture conductor wire, hardware and controls for each lighting unit. Dedicated street lighting conductors will be owned and maintained by the Company.
- B. All street light fixtures provided by the Customer for installation on the Company's system shall be free from all defects and shall in no way jeopardize the Company's electric distribution system. The Company may refuse to allow the placement of any streetlight fixture which, in the Company's sole reasonable opinion, are not so free from defects or that might so jeopardize said system.
- C. All components of a street lighting unit, including the bracket, luminaire, lamp, photocell, fuse, fixture conductor wire, hardware and controls, shall be of a modern type approved roadway lighting for normal use by the Company. Once a specific fixture type has been approved by the Company as acceptable equipment, additional use of that fixture type as a replacement in a location where a street light currently exists will not require additional approval by the Company, provided that the replacement light has a similar or lesser weight and wind profile as the light being replaced.
- D. Once a municipality has executed a Customer Owned Street Lighting Agreement with the Company, the municipality has no obligation to provide notice to the Company prior to undertaking "routine maintenance," as such term may be defined in the Customer Owned Street Lighting Agreement.
- E. The Company will apply charges for connection and fusing as set forth in Section 53.7 below.
- F. For each street light fixture owned by a municipality and located on utility-owned poles, the municipality shall take Delivery-Only Service for such fixture in accordance with the Company's Rate SL Electric Delivery Rate Schedule.
- G. Prior to the installation, removal, and relocation of any street light fixture, a municipality shall notify the Company in writing on a form approved by the Company. By its approval or acceptance of any street light installation, the Company does not give any warranty, expressed or implied, as to the adequacy, safety or other characteristics of said installation.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.4 MAINTENANCE REQUIREMENTS FOR MUNICIPALITIES

- A. Any contractor or municipal employee utilized by a municipality to perform street light maintenance work on Company poles shall be properly trained, certified (i.e., licensed) and insured prior to performing such work. Such work shall be performed in accordance with all applicable federal, state, and local laws, regulations, safety codes, ordinances and Company safety requirements. In particular, provided that it is a practice required of the Company's own employees and contractors, a municipality or its contractor may not install a fixture head or cut-in fuse unless the Company has first disconnected electric power to the applicable light fixture. Upon installation of a cut-in fuse for the fixture, the Company will not need to disconnect electric power to the applicable light fixture in order for the municipality or its contractor to perform routine maintenance. Prior to the commencement of any work on Company poles, the municipality shall provide written certification of contractor and employee qualifications to the Company.
- B. Minimum qualifications for working on street lights are:
1. Must hold a current Maine electrician's license
 2. Working appropriately under license (Master electrician, or Journeyman working for a Master electrician)
 3. Meet OSHA (1910.269) standards
 4. Have training re Maine High Voltage Safety Act (OSHA 1910.269)
 5. Trained and certified under NFPA 70E
 6. IMSA Certification
- C. The installation, maintenance, and removal of connections to the Company's secondary distribution system is restricted to authorized Company personnel. Work involving only replacing a photo cell or light bulb does not require inline fusing and does not require disconnection prior to the municipality or its contractor performing such work. A municipality does not need to notify the Company prior to replacing a photo cell or light bulb.
- D. All existing fixtures must be fused within ten (10) years of the date that the municipality acquires them from the company. All new fixtures must be fused when installed. Any existing municipal owned street lights, or street lights acquired from the company, will be set to operate in the "Fail Off" mode which can be phased in over the same ten (10) year period. All new fixtures will be installed to operate in the "Fail Off" mode.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.4 MAINTENANCE REQUIREMENTS FOR MUNICIPALITIES (Continued)

- E. The municipality will repair or replace inoperative lighting controls for the lights owned by said municipality within sixty (60) days of failure. The Company will bill standard attachment fees for any de-energized fixtures and/or associated equipment left attached to the Company's poles for longer than sixty (60) days that is not being billed and paid for under the Company's Rate SL Electric Delivery Rate Schedule. This provision will not apply in the event that the Company is performing maintenance on behalf of the municipality and is the cause of the delay in repairing or replacing inoperative lighting equipment.
- F. A municipality may request, and the Company may agree at its sole option, that the Company provide maintenance service for street lights owned by a municipality. Pricing for such maintenance service will be as set forth in Section 53.7 below.
- G. As a condition of installing any lighting equipment on Company poles or performing any street light maintenance on Company poles, the municipality shall at all times maintain in place \$1 million of excess liability insurance with the utility named as an additional insured. Municipalities shall indemnify the Company for any costs, losses, or damages that result from a municipal contractor or employee performing work on any Company pole. A municipality is not required to indemnify the Company for any costs, losses, or damages resulting from work performed by the Company, even if the Company is performing maintenance on behalf of the municipality.

53.5.1 MUNICIPAL PURCHASE OPTION

- A. A municipality may purchase street lighting equipment from the Company all at one time or over a period not to exceed three years. If the municipality elects to phase-in the purchase of the Company's street lights over multiple years, the municipality must purchase all street lights billed to the municipality's account(s) within three years from the date of the first purchase. All purchase phases shall consist of specified street lighting components within a specifically defined geographic area of the municipality, as mutually agreed to by the Company and the municipality. On a case-by-case basis, a municipality may request ownership of only a portion of the street lights in such municipality, with disputes regarding such partial ownership requested to be presented to the Commission for resolution in accordance with Section 53.8 below.
- B. The price for any such purchase shall be based on net book value, including associated income tax impacts.

Effective Date: November 1, 2016

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.6 MISCELLANEOUS REQUIREMENTS

- A. All street lighting equipment owned by a municipality shall bear an ownership identification marking or label which is readily visible from the ground during daylight hours. All street lighting equipment purchased from the Company pursuant to Section 53.5 shall be so identified at the expense of the municipality no later than six (6) months from the time of purchase. In addition, street lighting equipment shall have lamp fixture identification in accordance with the latest NEMA or ANSI Standard for High Intensity Discharge Lamps and Luminaires (ANSI Publication C 136.15 - 1980 and subsequent revisions). The ownership identification marking or label requirements set forth in this subsection of these Terms and Conditions shall not apply in the circumstance in which a municipality has purchased all street lighting equipment in the municipality from the Company all at one time.
- B. Prior to owning, installing or maintaining any street lights located on Company poles, a municipality shall be required to execute a Customer Owned Street Lighting Agreement with the Company. The Customer Owned Street Lighting Agreement may require, among other things:
1. Street Lighting Equipment Definition
 2. Ownership
 3. Maintenance of Street Lighting Equipment
 4. Connection and Disconnection
 5. Installation, Removal, Replacement, Relocation, and Transfer
 6. Billing
 7. Payment Schedule
 8. Insurance Requirements
 9. Indemnification
 10. Exhibit showing description and location of street lights,
- C. The municipality shall notify the Company thirty (30) days in advance of making any changes to its street lighting inventory. Street lighting equipment shall at all times contain the lamp type and size as recorded with the Company and shall be subject to a periodic field audit by the Company to confirm same. The Company will not charge the municipality for the cost of these periodic audits. However, if the Company finds lamps which are in addition to or different from those reported by the municipality, the Company may conduct a full audit to determine the extent of the violations. The Company shall bill the municipality for the reasonable cost of the full audit. Prior to conducting a full audit, the Company will consult with the affected municipality and will work with the municipality to coordinate such an audit.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.6 MISCELLANEOUS REQUIREMENTS (Continued)

- D. All work performed by the Company at the expense of the municipality shall be billed to the municipality monthly, with reasonable itemization, at the Company's then current rates for such work. All such bills shall be payable when rendered; bills paid more than 30 days after billing shall bear interest at the rate of 1 percent per month from the date of billing.
- E. When the Company needs to replace or repair existing poles/wire configurations as a result of vehicle-pole accidents, road changes requiring pole relocation, routine maintenance / replacement of poles, or for any other reason, the Company will notify the municipality. The municipality or their contractor must remove, relocate, and reinstall municipal-owned street lighting fixtures and/or equipment at their expense. The Company shall bill the municipality for any cost incurred by the Company to remove, relocate or reinstall municipal-owned street lighting fixtures or equipment.

53.7 CHARGES FOR STREETLIGHTING SERVICES

Charge Type per Job	Without Flaggers	With Flaggers
<u>First Streetlight</u>		
Connection Only	\$ 99.76	\$ 134.56
Connection and Fusing	\$ 112.38	\$ 152.98
Connection and Installation	\$ 137.61	\$ 189.81
Connection and Installation Including Installation of Mast Arm	\$ 150.23	\$ 208.23
Connection and Installation Including Installation and Assembly of Mast Arm	\$ 169.16	\$ 235.86
Connection, Fusing, and Installation	\$ 150.23	\$ 208.23
Connection, Fusing, and Installation Including Installation of Mast Arm	\$ 162.85	\$ 226.65
Connection, Fusing, and Installation Including Installation and Assembly of Mast Arm	\$ 181.78	\$ 254.28

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.7 CHARGES FOR STREETLIGHTING SERVICES (Continued)

Charge Type per Job	Without Flaggers	With Flaggers
Disconnection	\$ 99.76	\$ 134.56
Maintenance ¹	\$ 80.84	\$ 106.94
Project Management	\$ 56.31 per hour	\$ 56.31 per hour
Limited Protective Cover	No Charge	No Charge
First Streetlight if Company is Onsite Removing Lights Older Than 15 Years		
Connection Only	\$ 61.91	\$ 79.31
Connection and Fusing	\$ 74.53	\$ 97.73
Connection and Installation	\$ 99.76	\$ 134.56
Connection and Installation Including Installation of Mast Arm	\$ 112.38	\$ 152.98
Connection and Installation Including Installation and Assembly of Mast Arm	\$ 131.31	\$ 180.61
Connection, Fusing, and Installation	\$ 112.38	\$ 152.98
Connection, Fusing, and Installation Including Installation of Mast Arm	\$ 124.99	\$ 171.39
Connection, Fusing, and Installation Including Installation and Assembly of Mast Arm	\$ 143.92	\$ 199.02
Disconnection	No Charge	No Charge
Maintenance ¹	\$ 80.84	\$ 106.94
Project Management	\$ 56.31 per hour	\$ 56.31 per hour
Limited Protective Cover	No Charge	No Charge
<u>Each Additional Streetlight</u>		
Connection Only	\$ 37.85	\$ 55.25
Connection and Fusing	\$ 50.47	\$ 73.67
Connection and Installation	\$ 75.70	\$ 110.50

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.7 CHARGES FOR STREETLIGHTING SERVICES (Continued)

Charge Type per Job	Without Flaggers	With Flaggers
Connection and Installation Including Installation of Mast Arm	\$ 88.32	\$ 128.92
Connection and Installation Including Installation and Assembly of Mast Arm	\$ 107.25	\$ 156.55
Connection, Fusing, and Installation	\$ 88.32	\$ 128.92
Connection, Fusing, and Installation Including Installation of Mast Arm	\$ 100.93	\$ 147.33
Connection, Fusing, and Installation Including Installation and Assembly of Mast Arm	\$ 119.86	\$ 174.96
Disconnection	\$ 37.85	\$ 55.25
Maintenance ¹	\$ 18.93	\$ 27.63
Project Management	\$ 56.31 per hour	\$ 56.31 per hour
Limited Protective Cover	No Charge	No Charge

¹Maintenance charges are per fixture as service is needed. The Company will coordinate maintenance jobs with the municipality to minimize the number of trips to the extent reasonably possible.

A job is defined as work that can be completed in one business day in a contiguous area of the municipality. If streetlighting job spans more than one business day, the Company will apply both first and additional charges for streetlighting job completed on each subsequent day.

Other charges may apply should the municipality impose additional requirements on any work performed by the Company, to the extent that such requirements impose additional costs on the Company.

Effective Date: November 1, 2015

Eric N. Stinneford

SECTION 53
MUNICIPAL OWNERSHIP OF STREET LIGHTS

53.8 RESOLUTION OF DISPUTES

Any disputes regarding the rights or obligations of the Company or a municipality under these Terms and Conditions shall be referred to the Maine Public Utilities Commission for resolution. Neither the Company nor a municipality may petition the Maine Public Utilities Commission to initiate such dispute resolution procedures unless the parties have first attempted in good faith to resolve the dispute.

Effective Date: November 1, 2015

Eric N. Stinneford

Docket No. 2014-00313

Vice President–Controller, Treasurer & Clerk

RATE SL
 STREET LIGHTING SERVICE

AVAILABILITY

This rate is available for street lighting service furnished on a dusk-to-dawn basis. The Company will furnish, install and/or maintain street lights on the distribution system of the Company for purposes of providing street lighting service pursuant to this rate schedule and as is authorized in writing by a governmental entity (referred to as the “customer”).

TERM OF SERVICE

The term of service under this rate schedule shall be by service agreement for a period of fifteen (15) years and on a continuing basis thereafter. Requests for additions, changes or removals for street lighting service may require 90 days' advance written notice.

BASIC RATE PER MONTH

1. Full Service Lighting (Fixtures, Delivery Service and Maintenance)

Full Service Lighting is defined as service: 1) with aerial feed requiring not more than one section extension of wire and with Company-standard luminaries, lamps, and brackets not over 6 feet in length, on distribution system poles in use by the Company for other purposes, on other poles provided and owned by the Company at the request of the customer, or on poles acceptable to the Company and supplied by the customer; or 2) with customer-owned underground systems in accordance with Special Conditions, Item 6 of this rate schedule.

a. Standard Lighting

The following Standard Lighting fixtures are available as a Full Service Lighting option:

<u>Type Lamp</u>	<u>Type Luminaire</u>	<u>Rated Lamp Watts</u>	<u>Rated Input Watts</u>	<u>Rated Lumens</u>	<u>Monthly Rate Per Luminaire</u>	
					<u>Delivery Service</u>	<u>Lighting Service</u>
High Pressure Sodium	Cutoff	50	65	3600	1.27	9.67
	*Open	70	95	5670	1.88	8.21
	Cutoff	70	95	5670	1.88	9.04
	Post Top	100	130	8550	2.54	9.12
	Cutoff	100	130	8550	2.54	9.12
	Post Top	150	195	14400	3.82	10.75
	Cutoff	150	195	14400	3.82	10.11
	Flood	150	195	14400	3.82	13.85
	Cutoff	250	300	25600	5.92	12.98
	Flood	250	300	25600	5.92	12.07
	Decashield	250	300	25600	5.92	14.35
	Cutoff	400	465	45000	9.12	15.01
	Flood	400	465	45000	9.12	13.52
	Decashield	400	465	45000	9.12	20.21
	Flood	1000	1100	126000	21.62	36.70

*The open bottom sodium fixture is not available for roadway lighting without the express consent of the Company.

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
 STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

1. Full Service Lighting (Continued)

b. Other Lighting Options

The following Other Lighting fixtures are available as a Full Service Lighting option:

<u>Type Lamp</u>	<u>Type Luminaire</u>	<u>Rated Lamp Watts</u>	<u>Rated Input Watts</u>	<u>Rated Lumens</u>	<u>Monthly Rate Per Luminaire</u>	
					<u>Delivery Service</u>	<u>Lighting Service</u>
Metal Halide	Post Top	175	210	10500	4.15	16.25
	Cutoff	175	210	10500	4.15	15.76
	Flood	175	210	10500	4.15	16.74
	Cutoff	250	300	17000	5.92	17.74
	Flood	250	300	17000	5.92	18.71
	Cutoff	400	460	28800	9.01	20.80
	Decashield	400	460	28800	9.01	23.23
	Flood	400	460	28800	9.01	21.77
	Flood	1000	1080	88000	21.18	37.34
Mongoose Flood	H. P. Sodium	400	465	45000	9.12	33.19
Mongoose Vector Series	H. P. Sodium	250	300	25600	5.92	23.58
	H. P. Sodium	400	465	45000	9.12	26.62
Mongoose Close In	H. P. Sodium	250	300	25600	5.92	23.58
	H. P. Sodium	400	465	45000	9.12	26.12
Granville Simple	H. P. Sodium	70	95	5670	1.88	18.60
	H. P. Sodium	100	130	8550	2.54	18.99
	H. P. Sodium	150	195	14400	3.82	20.53

**Must also include charge for selected bracket

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

1. Full Service Lighting (Continued)

b. Other Lighting Options (Continued)

<u>Type Fixture</u>	<u>Type Luminaire</u>	<u>Rated Lamp Watts</u>	<u>Rated Input Watts</u>	<u>Rated Lumens</u>	<u>Monthly Rate Per Luminaire</u>	
					<u>Delivery Service</u>	<u>Lighting Service</u>
Granville Simple w/Finial	H. P. Sodium	150	195	14400	3.82	21.53
Esplanade**	H. P. Sodium	150	195	14400	3.82	29.04
	H. P. Sodium	250	300	25600	5.92	30.36
Hallbrook**	H. P. Sodium	70	95	5670	1.88	24.10
	H. P. Sodium	100	130	8550	2.54	25.00
Radial Wave**	H. P. Sodium	50	65	3600	1.27	14.49
	H. P. Sodium	70	95	5670	1.88	14.59
	H. P. Sodium	100	130	8550	2.54	15.48
	H. P. Sodium	150	195	14400	3.82	16.53
Mongoose Flood	Metal Halide	400	465	28800	9.12	31.13
Mongoose Vector Series	Metal Halide	250	300	17000	5.92	27.08

**Must also include charge for selected bracket

Effective Date: July 1, 2016

Eric N. Stinneford

Docket Nos. 2016-00035 and 2016-00026

Vice President–Controller, Treasurer & Clerk

RATE SL
STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

1. Full Service Lighting (Continued)

b. Other Lighting Options (Continued)

<u>Type Fixture</u>	<u>Type Luminaire</u>	<u>Rated Lamp Watts</u>	<u>Rated Input Watts</u>	<u>Rated Lumens</u>	<u>Monthly Rate Per Luminaire</u>	
					<u>Delivery Service</u>	<u>Lighting Service</u>
Mongoose Close-In	Metal Halide	250	300	17000	5.92	26.58
Granville Simple	Metal Halide	70	95	4000	1.88	19.45
	Metal Halide	100	130	5850	2.54	20.37
	Metal Halide	175	210	10500	4.15	20.24
Granville Simple w/Finial	Metal Halide	70	95	4000	1.88	20.45
	Metal Halide	100	130	5850	2.54	21.37
	Metal Halide	175	210	10500	4.15	21.24
Esplanade** Pedestrian	Metal Halide	70	95	4000	1.88	22.95
Esplanade** Standard	Metal Halide	175	210	10500	4.15	28.75
	Metal Halide	250	300	17000	5.92	30.86
Hallbrook**	Metal Halide	100	130	5850	2.54	25.88
	Metal Halide	175	210	10500	4.15	25.75
LED	LED	50	50	4190	1.00	19.52

Cancellation

Cancellation of a lighting project after an agreement has been signed and prior to project completion must be made in writing. If a project is canceled after an agreement is signed, and prior to installation of fixtures, the customer will reimburse the Company for any costs incurred up to the date written notice is received by the Company.

**Must also include charge for selected bracket

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
 STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

1. Full Service Lighting (Continued)

c. Discontinued Lighting

Service to the following Lighting fixtures is limited to existing installations. No new street lighting service will be available under this subsection and will be subject to the availability of replacement parts:

<u>Type Fixture</u>	<u>Type Luminaire</u>	<u>Rated Lamp Watts</u>	<u>Rated Input Watts</u>	<u>Rated Lumens</u>	<u>Monthly Rate Per Luminaire</u>	
					<u>Delivery Service</u>	<u>Lighting Service</u>
<u>Standard Lighting</u>						
Incandescent	Open	58	58	600	1.16	7.64
	Open	105	105	1000	2.05	8.31
	Open	205	205	2500	4.04	9.24
	Enclosed	448	448	6000	8.79	11.90
Mercury	Open	100	120	3400	2.38	8.40
	Enclosed	100	120	3400	2.38	8.74
	Open	175	205	7500	4.04	9.24
	Enclosed	175	205	7500	4.04	9.51
	Enclosed	250	290	10500	5.70	11.32
	Enclosed	400	455	19000	8.96	13.37
High Pressure Sodium	Flood	400	455	19000	8.96	13.90
	Enclosed	50	65	3600	1.27	8.04
	Enclosed	70	95	5760	1.88	8.32
	Enclosed	100	130	8550	2.54	8.74
	Enclosed	150	195	14400	3.82	9.14
	Enclosed	250	300	25600	5.92	11.64
<u>Other Lighting</u>	Enclosed	400	465	45000	9.12	13.27
	Edison Enclosed	H. P. Sodium	50	65	3600	1.27
Granville Leaf w/Finial	Metal Halide	70	95	4000	1.88	21.45
	Metal Halide	175	210	10500	4.15	22.24

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

1. Full Service Lighting (Continued)

d. Maintenance

Maintenance for Full Service Lighting will be provided as follows:

Notice of Outages:

If any light fails to operate, the Company will repair or replace it, at its option, within a reasonable time after the customer gives the Company notice of the light failure.

Company-Owned Lamps and Fixtures:

The Company will repair or replace any part of a lamp or fixture that fails due to normal wear and tear during its life at no cost to the customer.

If lamp/fixture failure is due to reasons other than normal wear and tear, the Company will repair or replace any part of a lamp or fixture and may charge material, labor, and expense costs for repairs. The Company will install a vandalism-protection shield for any fixture at the customer's request and will charge the customer for all material, labor and expense costs associated therewith.

Other Lighting Options:

Repairs to Other Lighting options will be made as soon as possible, allowing for lead time required to order parts from the manufacturer, since the Company will not inventory replacement fixtures, poles, or any other parts for Metal Halide and Decorative Lighting.

2. Delivery-Only Service Lighting

Delivery-Only Service Lighting is defined as dusk-to-dawn service to a customer that has qualified maintenance forces and agrees, unless the Company agrees otherwise, to take its entire purchase of street lighting as Delivery-Only Service Lighting. Pricing for Delivery-Only Service Lighting is as follows:

\$ 0.055293 per kWh of usage based on rated input watts and an average of 355 hours usage per month. The Company will assess applicable per job charges as described in the Company's Term and Condition 53.7 for customer-owned luminaires. The customer will notify the Company in writing of any changes to fixtures as those changes occur.

The customer may contract with the Company to maintain customer-owned lamps and fixtures. This option is available only to Delivery-Only Service Lighting customers, and will require a special contract.

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
STREET LIGHTING SERVICE

BASIC RATE PER MONTH (Continued)

3. Holiday Lighting

Holiday Lighting is defined as service to unmetered, customer-owned, seasonal lighting, installed and removed by the customer. Pricing for Holiday Lighting will be as follows:

\$ 0.06 per kWh of delivery service and \$ 0.08 per kWh for lighting equipment service. The Company will use operating hours, wattage of lamps, and numbers of lamps, provided by the customer, to derive kWh usage per month.

The customer will notify the Company in writing of service start date and end date plus a total count of lamps and lamp sizes each year. The Company reserves the right to verify operating hours, wattage of lamps, and numbers of lamps by whatever means the Company deems appropriate.

4. Airport Beacon Lighting

Airport Beacon Lighting is defined as service to unmetered, customer-owned lighting for airports operated by governmental entities. Pricing for Airport Beacon Lighting will be as follows:

\$ 0.06 per kWh of delivery service and \$ 0.21 per kWh for lighting equipment service. The Company will use operating hours, wattage of lamps, and numbers of lamps, provided by the customer, to derive kWh usage per month.

The customer will notify the Company in writing of any changes to wattage and operating hours. The Company reserves the right to verify operating hours, wattage of lamps, and numbers of lamps by whatever means the Company deems appropriate.

5. Miscellaneous Unmetered Lighting

Miscellaneous Unmetered Lighting is defined as service to unmetered, customer-owned lighting that is not Full Service Lighting, Delivery-Only Service Lighting, Holiday Lighting, or Airport Beacon Lighting. Pricing for Miscellaneous Unmetered Lighting will be as follows:

\$ 0.06 per kWh of delivery service and \$ 0.08 per kWh for lighting equipment service. The Company will use operating hours, wattage of lamps, and numbers of lamps, provided by the customer, to derive kWh usage per month.

The customer will notify the Company in writing of any changes to wattage and operating hours. The Company reserves the right to verify operating hours, wattage of lamps, and numbers of lamps by whatever means the Company deems appropriate.

TRANSMISSION CHARGE

The transmission charges in accordance with Subsection 44.1 of the Terms & Conditions are included in the above rates.

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
 STREET LIGHTING SERVICE

EFFICIENCY MAINE TRUST ASSESSMENT CHARGE

The Efficiency Maine Trust assessment charges in accordance with Subsection 49.1 of the Terms & Conditions are included in the above rates.

SPECIAL CONDITIONS

1. Service with Standard Facilities

For service to customers with special facilities that are Company-standard but that are in excess of, or exceed the cost of, those furnished by the Company for Full Service Lighting, there will be additional monthly charges billed under the provisions of Section 13 of the Terms & Conditions and priced as follows:

<u>Company-Standard Special Facilities</u>	<u>Monthly Charge</u>
a) Wood Pole ¹	
Standard 30 Foot or Less	\$10.47
Standard 35 Foot	12.99
Standard 40 Foot	14.99
Laminated 20 Foot	14.04
Laminated 36 Foot	68.00
b) Section of Secondary Wire ²	5.12
c) Stub Pole & Aerial Guy (Complete)	25.49
d) Anchor Guy	7.59
Ledge Work (Per Hole)	7.11
f) Brackets - Standard	
6-8 Foot	-0-
10 Foot	2.38
12-15 Foot	3.02
20 Foot	6.07
g) Brackets - Other Lighting Options	
6 Foot	2.08
8 Foot	2.95
10 Foot	6.45

^{1/} Normal setting, less guy and less ledge work.

^{2/} Charge is applicable only to sections of secondary wire run to intermediate poles carrying no lights and furnished solely for providing service to street lights

Effective Date: July 1, 2016

Eric N. Stinneford

RATE SL
STREET LIGHTING SERVICE

SPECIAL CONDITIONS (Continued)

2. Service with Other than Company-Standard Facilities

The customer must furnish and maintain at its sole cost and expense any facilities for street lighting not of a standard adopted by the Company. The monthly charge will be the same as the basic monthly rate for a lamp of equivalent rating. Customer-owned brackets and luminaires shall not be mounted on Company owned poles.

Service to the following non-standard items listed below, is limited to existing installations (i.e., no new street lighting service will be available under this section 2 of the rate schedule) and by the availability of replacement parts:

<u>Description</u>	<u>Monthly Charge</u>
a. Ornamental Poles	\$.79
b. Steel pole w/bracket - 1959	5.15
c. Concrete pole (26 ft-installed prior to 1/1/75)	.85
d. Aluminum pole (14 ft-ornamental)	6.04
e. Special 6 foot bracket	.68

The company will provide non-standard items at cost plus the applicable overheads. There will be monthly charges for these items billed at the special facilities rate as calculated in provisions of Section 13 of the Terms & Conditions and priced as follows:

Effective Date: For service rendered on
and after October 1, 2002

Curtis I. Call

Docket No.: 2002-513

Vice President

RATE SL
 STREET LIGHTING SERVICE

SPECIAL CONDITIONS (Continued)

2. Service with Other than Company-Standard Facilities (Continued)

<u>Special Facility</u>	<u>Monthly Charge</u>
Aluminum Pole - black	
10 foot	\$ 8.84
12 foot	9.23
18 foot	11.87
Salem Series - 4" diameter shaft - black or dark green - used with Granville	
8 foot	15.54
10 foot	16.15
12 foot	16.75
Hallbrook Poles - black or dark green - also used with Esplanade	
12 foot - single	25.00
15 foot - single	27.00
18 foot - single	28.95
12 foot - twin	28.43
15 foot - twin	30.40
18 foot - twin	32.37
Aluminum Poles - round, tapered. 4-bolt base - black or dark green – used with Granville	
8 foot	12.33
10 foot	13.11
12 foot	13.93
West Liberty slipfitter - black or dark green	2.88
Boston Harbour slipfitter - black or dark green	2.88
Contemporary slipfitter - black or dark green	2.88
West Liberty Upswept Arm	
4 foot	17.83
6 foot	18.74
8 foot	19.71
Cast Aluminum Deco Base Cover - black or dark green	18.87
Radial Wave Mounting Arm - black or hunter green	.82
Radial Wave Scroll Arm - black or hunter green	2.94
Esplanade Wood Pole Bracket - 66" – black or dark green	5.54

Effective Date: For service rendered on
 and after October 1, 2002

Curtis I. Call

Docket No.: 2002-513

Vice President

RATE SL
STREET LIGHTING SERVICE

SPECIAL CONDITIONS (Continued)

3. Other Special Facilities

The monthly charge for special facilities other than those listed in Special Conditions, above, will be based on the actual cost of the specific equipment installed plus applicable overheads and billed under the provisions of Section 13 of the Terms & Conditions. The installation of other than Company-standard special facilities is subject to prior approval by the Company.

4. Underground Street Lighting Service

The Company will provide underground street lighting service in qualified cases subject to:

- a) The customer providing, at its expense, all necessary excavating and backfilling, all necessary duct lines and conduit, and all necessary maintenance and repairs.
- b) Contribution by the customer of the initial cost of the length of underground feed in excess of 125 feet per light per circuit, measured from the base of the pole (excluding length of run up the pole and through the bracket). The Company will own the entire length of underground feed, including the excess over 125 feet.
- c) The Company will furnish, own and maintain standard distribution-type poles or other standard poles as designated by the Company for street lighting service with underground feed. Any such poles furnished by the Company strictly for street lighting service will be subject to special facilities charges. The customer must furnish, own and maintain any desired poles other than the standard types offered by the Company, subject to approval by the Company.

5. Relocation of Facilities

When a customer requests a relocation in existing street lighting equipment that has not reached the end of its normal useful life, the customer may be required to pay for any relocation costs of the equipment, including material, labor and expense costs.

Effective Date: For service rendered on
and after October 1, 2002

Curtis I. Call

Docket No.: 2002-513

Vice President

RATE SL
STREET LIGHTING SERVICE

SPECIAL CONDITIONS (Continued)

6. Removal of Facilities

When a customer requests the discontinuation of the use of street lighting equipment, the customer will be required to pay for a portion of the net book value plus the removal and disposal costs of the equipment in accordance with the following terms:

- a. Purchasing electric energy for street lighting service from a supplier other than the Company or its affiliates, when a customer taking service under this rate schedule can choose electric energy suppliers, does not constitute a discontinuation of the use of street lighting equipment.
- b. All incandescent and mercury luminaires will be treated as fully depreciated and will be removed and disposed of without cost to the customer.
- c. Requests to remove High Pressure Sodium lamps and replace them with Metal Halide lamps will be considered to be removal of the High Pressure Sodium luminaires, and will be subject to removal costs and net unrecovered investment charges.
- d. The unrecovered investment in High Pressure Sodium and Metal Halide luminaires will be based upon the initial date of installation of the luminaire type at that location. Luminaire replacement due to maintenance will not be considered in determining the unrecovered investment.
- e. The removal and disposal costs will be payable at the time facilities are removed and will be the actual costs incurred by the Company.
- f. CMP will determine the average age of the street lights to be removed by calculating a weighted average age of the street lighting equipment, based on the age and level of the investment. For each street light to be removed, CMP will multiply the original cost of the street light by the number of years the street light has been in service. CMP then will sum (i) the aforementioned products and (ii) the original cost of all street lights to be removed and will divide (i) by (ii). If the outcome is fifteen or greater, CMP will not assess a charge to remove the street lights. If the outcome is less than fifteen, CMP will subtract the outcome from fifteen and divide the difference by fifteen. CMP then will apply this result to the remaining net book value of the street lights to be removed to determine the charge to remove the street lights. The net book value will be based on CMP's records.
- g. The charges calculated in part f. may be paid either in full at the time the facilities are removed or paid in equal monthly installments at the customer's option, subject to the following:
 - i. An annual interest rate equal to the latest allowed rate case cost of capital adjusted for income tax effects will be applied to the balance to determine the interest component.
 - ii. The balance and interest component will be billed and payable (amortized) monthly over a period not to exceed three (3) years.
 - iii. The total monthly payment including balance and interest will be calculated according to the actuarial method resulting in equal monthly payments.
 - iv. Interest shall cease to accrue on prepayment of balance in full.

Effective Date: November 1, 2016

Eric N. Stinneford

RATE SL
STREET LIGHTING SERVICE

SPECIAL CONDITIONS (Continued)

6. Removal of Facilities (Continued)

f. v. The table in subpart (vi), below, lists the factor to be multiplied times the net unrecovered investment to determine the amount of the equal monthly payments. The customer may select one of the options shown up to a maximum payoff period of 36 months.

vi. Table:

<u>Number of Months to Pay</u>	<u>Monthly Factor</u>
3	0.34152
6	0.17388
9	0.11802
12	0.09109
15	0.07338
18	0.06224
21	0.05429
24	0.04834
27	0.04372
30	0.04003
33	0.03701
36	0.03451

7. Attachments to Poles in Use for Street Lighting Service Only

a) Telephone and/or CATV Attachments

When a telephone or CATV company makes an attachment to poles in use for street lighting service purposes only, for which special facilities charges are being made, the Company will give the customer a credit for the equivalent monthly rental paid by the telephone and/or CATV company. This credit shall not exceed the special facilities charges for the poles (and associated guys) involved.

b) Attachments by the Company

When the Company makes an attachment (primary or secondary line, transformer, service drop, etc.) to poles in use for street lighting service purposes only, for which special facilities charges are being made, the customer will no longer be required to pay special facilities charges on those distribution system poles (and associated guys) to which attachments were made. This policy will have no effect on special facilities charges being made for street lighting equipment other than poles (and associated guys).

Effective Date: For service rendered on
and after October 1, 2002

Curtis I. Call

Docket No.: 2002-513

Vice President