May 2012

Montpelier Streetlight Committee

Update to Montpelier City Council

Background & Introduction:

The Montpelier Streetlight Committee was established in March 2011 to identify opportunities for the City of Montpelier to improve street lighting efficiency and thus reduce street lighting costs. Prior to the formation of the committee, staff had been working with Honeywell to develop a cost-saving strategy to address our high electrical costs, primarily related to our inefficient and outdated street lighting. In FY 2011, Montpelier spent approximately $91,200 for all leased streetlights (not including City-owned, metered area lights). In February, 2011, the City Council authorized the formation of a committee and approved a Memorandum of Agreement with Efficiency Vermont to obtain technical and financial assistance to address our inefficient lights.

As per guidance provided by Efficiency Vermont, in particular utilizing their step-by-step guide entitled "Improving Efficiency in Municipal Street and Public Space Lighting", the Streetlight Committee has been pursuing two paths toward improving efficiency: 1) exploring opportunities for eliminating unnecessary streetlights, and 2) replacing remaining fixtures with efficient light-emitting diode (LED) fixtures. On average nationally, street lighting can account for one-quarter of a municipality's electrical bill, and Montpelier is not far off the average at 21%. With LED lighting, municipalities can significantly reduce energy use and costs, improve lighting quality, resulting in lower energy costs, and enhance the nighttime environment.

Not long after the Committee began holding regular meetings, the City received notice from Green Mountain Power (GMP) that a new streetlight tariff would be taking effect in August 2011. The new tariff amended their billing for leased lights from our former rate 16 to a new rate 18 structure. The new rate structure notification also included lease rates for LED fixtures that GMP would be offering as replacements because all mercury vapor lamps are being phased out of service due to health risks associated with manufacturing, handling and disposal.

Rate 16 was a grandfathered rate for old mercury vapor fixtures. The most common street light in our inventory is the 100-watt mercury vapor fixture which was leased for just under $10 per month. The rate 18 tariff for these old fixtures and the newer mercury lamps is $13.45/month. Applying the new rate 18 structure to all of the mercury vapor fixtures represents a cost increase of approximately 32%. The rate for LED fixtures will now be only slightly more than the former rate 16 price ($10.39/month for LEDs vs. $9.83/month for mercury vapors).

The net result of this new tariff is that LED cost savings are significantly less than originally anticipated. Consequently, a portion of the savings to be realized by implementing the committee recommendations will be used primarily to offset the increased tariff costs. Nevertheless, the City Council will find within this report that there are still options available for substantial savings in both the short and long term, and through either a continued lease or an ownership scenario. Furthermore, the technologically advanced LED light fixtures have many environmental and photometric benefits and should be a welcome change. The photometric improvements include directional options (linear and rounded light

distribution patterns), decreased light spillage, improved uniformity and fewer hot spots, and better color rendering benefits. Dark sky initiatives can also be achieved. Energy savings are in the range of 50-75% for an equivalent light for the majority of our street light inventory. These savings and other comparisons are illustrated in the tables provided in the Efficiency Vermont publication entitled "Step-By-Step Guide – Improving Efficiency in Municipal Street and Public Space Lighting" (prepared by Kirick Engineering Assoc.) which accompanies this report. The committee utilized this helpful guide for our review process.

Although the Committee reviewed photometric lighting characteristics and considered the Illuminating Engineering Society (IES) standards as well as other outdoor lighting reference sources, the Committee's charge did not include a street lighting design sufficiency review. As an alternative approach, deference was given to existing conditions in regard to light spacing, mounting height, and wattage which guided the committee in reaching recommendations of light levels as categorized by lighting zones discussed in more detail below. Furthermore, meetings with Police Department staff were held to gauge where security and safety lighting was felt to be necessary.

As is customary with many design reviews, the "do nothing" approach is also considered as a base-line comparison. Taking no action will result in the phased replacement of our existing mercury vapor lamps by GMP over time due to the hazards associated with the manufacture and disposal of products containing mercury. Furthermore, taking no action would negate the substantial Efficiency Vermont participation toward the offset of depreciated values, would not address the unreliable and incomplete inventory data, and would preclude us from benefiting from an initial wattage reduction cost savings benefit due to improved photometric qualities. Last, the elimination of unnecessary and unjustifiable lights would not be addressed.

The Committee:

Members of the committee have included: Jeff Prescott, Kate Nicolet, Anne Watson, Andy Boutin, John Snell, Harold Garabedian, Paul Markowitz, and Tom McArdle. Our efforts to date have focused on the first phase of identifying opportunities for eliminating unnecessary streetlights.

To date, the following steps have been completed:

1) **Streetlight Inventory and Map:** We have established a digitized map of all municipal streetlights , including those leased from Green Mountain Power and those owned by the City. The Committee reviewed the leased GMP light inventory data in both map and spreadsheet formats, and attempted to reconcile billing, location and accuracy of the data. It is unknown when such a review was last conducted, but it revealed that billing for leased lights did not match City records for the total number of lights now in service. Additionally, streetlights listed in the GMP data could not be confirmed in the field and vice-versa; some leased lights now in service are not included in the GMP inventory. This effort is incomplete and therefore the total number of existing lights noted below in the recommendations and the number of lights by respective wattage is preliminary and not yet verified. A flow chart was prepared to help the committee visualize and organize the street light review process, entitled **"Proposed Process for Determining Street Lighting Removal / Retention for City of Montpelier"** which is included as an attachment.

2) ***Established criteria for where streetlights are needed:*** The committee identified the following criteria for evaluating where street lighting is needed:
    - *Pedestrian safety:* Is light essential or otherwise needed for pedestrian safety, particularly to help avoid pedestrian-vehicle conflicts?
    - *Traffic safety:* Would vehicular traffic be unsafe without adequate street lighting?
    - *Convenience:* There should be streetlights sufficient to illuminate sidewalks in residential areas where there is pedestrian movement.
    - *Support economic development and aesthetics*: In the downtown areas, streetlights illuminate roadways and sidewalks, and highlight architectural and other aesthetic features, such as storefronts, parks, statutes, and other public areas.

3) ***Defined lighting zones:*** We identified four lighting zones that correspond with different lighting needs and levels within the City. These include:
    - *Rural areas.* No municipal lighting provided. Zone is rural, agricultural, and undeveloped or sparsely developed with little or no pedestrian activity at night and no sidewalks.
    - *Predominately residential areas.* Low-level of lighting provided. There is relatively low-pedestrian activity at night, with residential areas with sidewalks. All crosswalks should be well-illuminated.
    - *Multi-family residential and mixed use.* Moderate level of lighting provided. This zone covers mixed use and multi-family residential development, home businesses, and some commercial with low-moderate traffic volumes.
    - *Commercial areas and high traffic areas.* Highest level of lighting provided. Zone is primarily commercial and high traffic areas, including downtown areas and main thoroughfares.

4) **Identified Opportunities for Eliminating Streetlights:** The Committee spent an extensive amount of time identifying opportunities for eliminating unnecessary streetlights. Many fixtures were placed in service 20, 30 or even 50 years ago, and may no longer serve their intended purpose. The Committee undertook the following steps to identify streetlights for possible removal:

    - **Looked at map and identified potential lights for elimination: F**irst, we overlaid the street lighting fixtures by joining it with the lighting zone map. Then we identified on the map potential fixtures that could be eliminated. We looked at their location within the lighting zones and the relative distances between fixtures (and thus the corresponding lighting levels).
    - **Conducted street-by-street assessment of the area lights:** The Committee prepared a "Walk-Through Guide" to assist the volunteer teams with identifying street light eliminations, retentions, or additions to the Montpelier street light inventory. With the map and guide in hand, we conducted a street-by-street drive-through of the entire City to check the accuracy of the mapped location of the fixtures and the GMP light inventory. The committee looked at site-specific lighting needs to verify need and appropriateness of lighting as it currently exists. Light meters were used to determine approximate existing lighting levels. However, it was discovered that many of the GMP lights are very old and extremely dim. Therefore, the Committee felt that determining current light levels was of little value.
    - **Developed list of recommended lights to remove, move, and add:** Based upon all of the above, the Committee developed a list (see attached) of potential street lights to remove, along with a few streetlights to add and some which

should be relocated to be more effective. The street lighting map provides an illustration of these proposed alterations. As noted above, the Committee discovered several lights that were listed in the GMP inventory data which did not exist through field confirmation attempts. Therefore, several lights being eliminated are actually only an identifying number on the GMP list only and not a physical removal from the current inventory. We also discovered several lights on the City leased light inventory that were found to be illuminating privately owned properties. Although the data was determined to be unreliable, from this review the committee was able to identify several candidate lights for removal.

- **Developed a recommendation summary:** Out of total of 603 leased streetlights, the Committee is recommending that the City eliminate 96 streetlights while adding four new lights, for a net reduction of 92 street lights or about 15% of the total. At an estimated $120/year/fixture, this will result in a total annual savings of about $11,000.

  The Committee also recommends replacing all higher wattage luminaries (175, 250 and 400 watt) with 20 LED (30-65 watt) lights which is roughly equivalent to a 100 watt mercury vapor lamp. Given the vastly superior photometric qualities of the new LED luminaries, Green Mountain Power is recommending that the 20 LED will be sufficient in most cases. Savings from this replacement effort is estimated to be an additional $8,000. Additionally, many of the existing higher wattage lights were found in areas that don't warrant higher lumens when uniformity of light spacing is the important variable with no high wattage "hot spots." The Committee had been primarily concerned with preparing recommendations about light retention and locations based on perceived needs and economical justification.

5) Next Steps: Next steps in the process include:

Public review process for streetlight removal: The Committee views this City Council meeting as the first step in notifying the public about our proposal to eliminate specific streetlights. In addition to tonight's meeting, we propose to:

- *Place signs on poles:* We are considering placing signs on utility poles where streetlights have been identified for elimination. If these signs will include information on who to contact if a resident has concerns about elimination of a particular streetlight.

- *Provide a viewable / downloadable (PDF) street light map together with the list on the City's web site for public review:* This map is now complete and is available for City Council and the public to review.
- *Establish an appeal process:* Residents who object to proposed streetlight eliminations will have the opportunity to appeal that decision to the City Manager and ultimately to the City Council.
- *Hold a public meeting:* following this presentation, we are considering holding a public meeting to invite the public to further discuss the lighting evaluation process we used. We will then allow 30 days as a public comment period before finalizing the list of specific lights that will be eliminated.

Finalize list of streetlights to retain: After public input, the Committee will develop recommendations for the street lights to be retained, relocated, or eliminated. The Committee intended to complete a leased streetlight inventory verification process to ensure the city is only paying for the actual lights we wish to retain in service. Considering the

overwhelming inaccuracy of the old data, the Committee has considered the GMP recommendation that the best approach to this effort will be to start with a clean slate. This final list will then be agreed upon and will be the basis for post-construction (LED conversion) billing by Green Mountain Power.

Determine whether the City should lease or own fixtures: A critical step that the City Council must decide is whether the City should continue to lease its fixtures from Green Mountain Power or purchase and own replacement LED fixtures.

To aid in developing a recommendation for the lease-vs-own option, the committee discussed the implications of ownership with GMP officials and with Hunter Rieseberg, Hartford Town Manager. The lease option is pretty familiar to us and the costs are outlined in the E-VT economic analysis. Hartford underwent this same process in 2010 and selected the purchase and ownership street light option. They eliminated about 30% of their light inventory and these savings were used to help off-set the financing for the purchase option with a corresponding short term pay-back time period projected. Hartford provides a reasonable comparison to Montpelier because their electrical service is also provided by GMP, they had been leasing lights for many years and were subject to the same tariffs. Furthermore, the original total number of lights in their inventory was similar. They also reduced wattage where possible to take advantage of the improved photometric characteristics and we are recommending this same cost savings strategy.

The tariffs discussed above include rates for municipally-leased lights and GMP now offers a tariff which allows for customer owned and maintained luminaries. The tariff covers the energy cost which is currently $3.68/month for the 20 LED fixture (equivalent lumens to 100 watt mercury vapor). There will also be a pole rental charge of $16.00 /annual or $1.33/month. Due to the restrictions of the tariff structure and general GMP policies on utility pole access and use, the customer is not permitted to perform it's own maintenance or replacement work. Therefore, materials (light fixtures & mounting hardware) must be provided by the customer for GMP to perform the installation through a negotiated construction contract. The City will need to decide how to address future maintenance needs with GMP through a negotiated a maintenance agreement by either an annual lump sum fixed fee or by time & materials. For our comparison and our selection purposes, a negotiated price for the installation of the replacement LED lights is estimated to be $140 per fixture (time & materials) which is based on the GMP hourly rates. Similar to Hartford, this amount is also assumed as the incident cost for GMP service & maintenance to replace inoperative or malfunctioning lights through a time & materials arrangement.

We have selected this option because of the superior reliability of the LED fixtures. We would again recommend following the Hartford example and the experience of Anchorage, Alaska because we learned that they replaced over 4,000 lights with LED fixtures a few years ago through a municipal purchase option. Both towns have experienced little to no problems and maintenance demands have been non-existent thus far. The LED technology has proven to be very reliable and with a five year replacement warranty, Hartford chose to forgo a maintenance contract with GMP opting instead for a time & materials maintenance arrangement. Furthermore, they purchased several extra fixtures and hold them in stock. If they have a problem with a light, they would give the new fixture to GMP to replace the malfunctioning light and either fix the light themselves or purchase a new replacement.

Ultimately, the assumption of maintenance responsibility is somewhat of a gamble, particularly following the expiration of the manufacturer's standard 5 year warranty. There are a number of issues that can arise, including the need for periodic lens cleaning, responding to light orientation or location complaints, failure of the photo-cells, etc.

Following a 20 year fixture lifespan, all the lights will need to be replaced. Hartford is utilizing an annual sinking fund to cover maintenance/repair/replacement with the intention of paying cash to start the cycle all over again. All unanticipated ownership expenses noted above would be paid from the sinking fund. We are projecting a $5,000 / yr cost to cover these costs.

While there are potential long-term cost savings associated with municipal ownership, this would require the City to pay for the cost of purchasing, installing, and maintaining the fixtures in addition to other fixed charges. Efficiency Vermont has conducted an economic analysis on the relative costs of municipal ownership versus leasing (see attached "Municipal Streetlighting Economics Summary"). Sandy Gallup, Finance Director, then utilized this information to generate an actual financing analysis to purchase lights for municipal ownership based on a vendor's quote for comparable lights fixtures of about $290 each. As Sandy notes, once factor in financing, maintenance, depreciation and replacement in 20 years, the lease scenario is the better option. This analysis is presented for comparison purposes to facilitate the decision process, but is preliminary based on the best available information. Once we have developed the final list of fixtures to retain, we will ask Efficiency Vermont to finalize this analysis. Note that the payment to GMP for the un-depreciated value of the old lights being removed is included under both the ownership & lease option and indicates the financial assistance offered by Efficiency Vermont for this expense.

Determine appropriate replacement fixtures (ownership option): This step involves identifying appropriate LED replacement fixtures to achieve desired lighting levels. If the City decides to purchase the fixtures, it would need to raise the capital and order the fixtures. Ideally, a lighting design consultant would be retained to assist with the selection of the appropriate light fixture for the various lighting applications. However, this would add significant expense to the ownership option. The alternative is to select in-kind fixtures and accept that the light locations and lumen levels are reasonably appropriate. Given that lights are mounted on existing utility poles and the mounting height is fixed, our options are restricted thus reducing an important element in lighting design. Under a lease option, no consulting services will be utilized. Based on these limitations and added expense, for our comparison purposes, the committee chose not to pursue a lighting design review approach. Therefore, we will attempt to approximately match the cobra-head type light fixtures that are now in use to the extent possible to minimize potential objectionable styles and then a request for proposals would be prepared and issued for the purchase of the lights.

If the lease option is selected, GMP has informed us that they have already made a bulk order purchase at considerable savings – reflected in the reduced tariffs – and there will be no choice about fixture styles. A cut sheet with a photograph of the fixture that they are offering manufactured by BETA is enclosed. Their proposed fixture is a little different style than our existing cobra-head. Several of these lights have already been installed around town because GMP has been replacing failed or faulty mercury vapor lamps.

Remove unnecessary fixtures and replace remaining fixtures with LEDs: Once we have decided on replacement fixtures and whether the City will own or lease the fixtures, fixtures that have been deemed unnecessary will be eliminated and all remaining fixtures will be replaced with LEDs. We are of the understanding that there will be no charge for removal of lights under either scenario except reimbursement for the un-depreciated value. If we continue a lease arrangement, GMP will receive a formal notice of our decision. They have indicated that installation of the new LED lights may take up to two years but are ready to begin upon notice and may be done in much less time depending on work load and

demands for LED lights in other neighboring communities but the sooner we can notify them, the better chance of being first on their list. For City ownership, the process will take longer as we complete the light selection process, await shipment, and then make arrangements with GMP for installation.

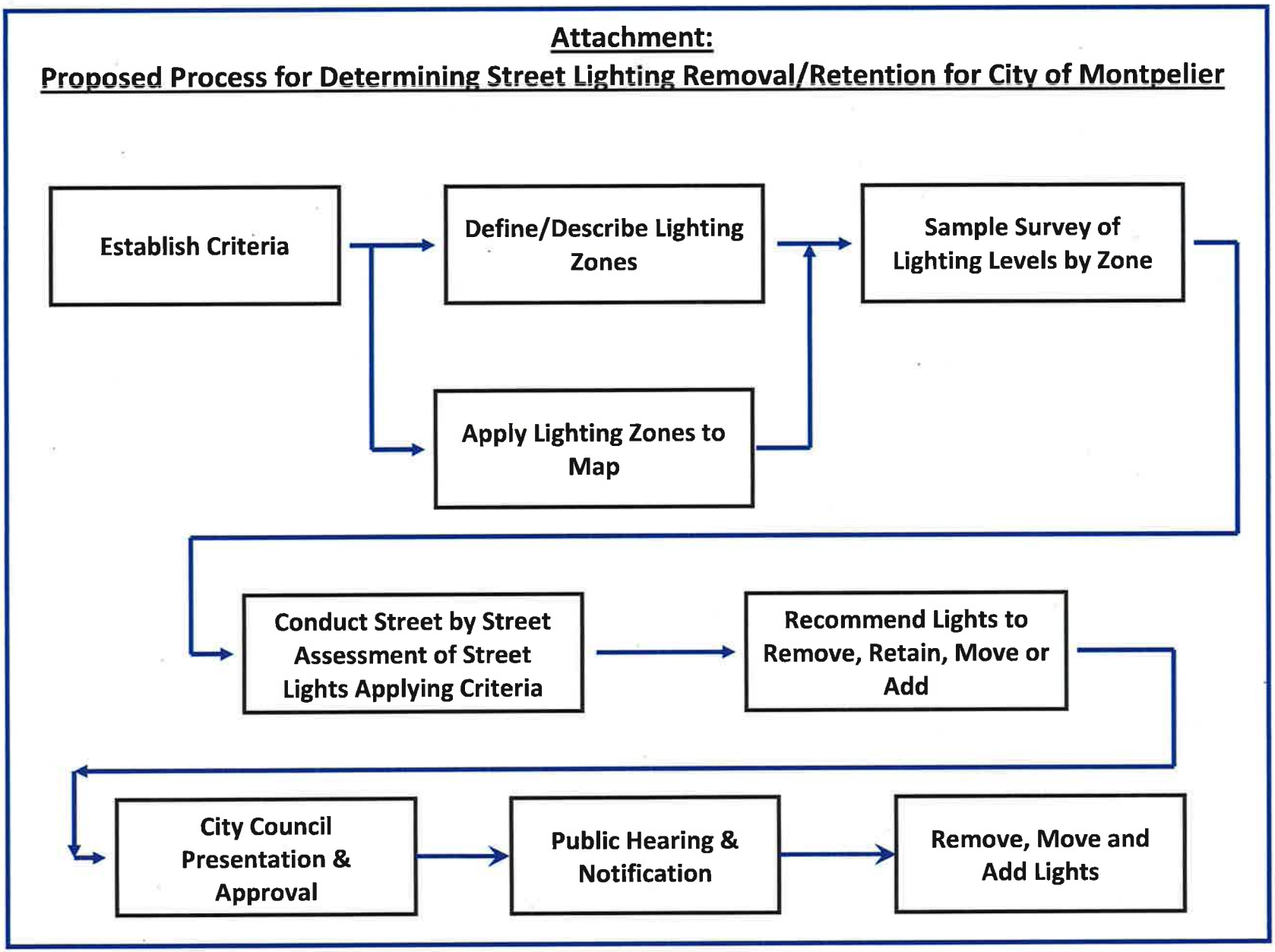
Recommendation: First and foremost, the committee urges approval of the replacement of our mercury vapor lights with new LED fixtures. Second, the committee recommends removal of 96 leased lights which the committee has found to be unnecessary and too costly to retain. Third, the committee recommends eliminating all higher wattage (175, 250, & 400 watt) fixtures and replacement with the equivalent 100 watt LED fixture which contains 20 LED bulbs and utilizing 37 watts (adjustable to 52 watts for greater lumens). Fourth and finally, we have concluded that a continued lease arrangement with GMP is the best financial option for the city. In addition to the superior economic picture, the lease arrangement removes the purchase, maintenance, and financing burden from city staff and eliminates any financial risk associated with the time & materials maintenance arrangement.

Note, that a review of LED retrofits for city owned & metered metal halide fixtures located in the downtown area and on the bike paths has not yet been undertaken. We expect this will be an entirely different and more complex process due to the fixture design and styles. A preliminary assessment will be conducted when time allows guiding the determination of whether this should be pursued.

Submitted by:
Paul Markowitz, Chair
Tom McArdle, Assistant Director, Department of Public Works

Attachment:

Proposed Process for Determining Street Lighting Removal/Retention for City of Montpelier



Streetlight Financial Analysis May 17,2012

Assumptions:

Use Heather Smith, VEIC - Ownership vs Continued Lease Calculator Worksheet - 501 Streetlights (down from 593) - as a basis for this financial calculation
Assumes Annual Savings (over current costs) for Continued Lease is $20,933
Assumes Annual Savings (over current costs) for Ownership is $33,258 before financing, maintenance and depreciation is factored in
Initial Cost of Ownership is $235,430 which includes $145,290 for cost of fixtures, $70,140 for Installation and a $20,000 contingency.
Financing term based on the estimated payback should be 10 years. Assume 3.5% interest rate.
Assume 20 year life of street light fixtures - A Sinking Fund will be established to cover cost of repairs and replacement in 20 years.
Cost of city staff to manage the ownership (arrange for repairs etc) is not factored into this analysis.

Cashflow Continued Lease vs Ownership

20 Year Analysis (using current dollars and rates)

	Total Saving over 20 yrs	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	Total
Continued Lease Annual Savings (per VEIC Worksheet)	**$ 418,660**	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	20,933	**$ 418,660**
																						$ -
																						$ -
Ownership:																						
Ownership Annual Savings before Financing (per VEIC Worksheet)	$ 665,160	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	33,258	$ 665,160
less cost of Financing 235,000@3.5% 10 yrs	$ (278,858)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)	(27,886)											$ (278,858)
less sinking fund for 20 years $235000	$ (235,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(5,000)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	(18,500)	$ (235,000)
Actual Ownership Savings with Financing and sinking fund	**$ 151,302**	372	372	372	372	372	372	372	372	372	372	14,758	14,758	14,758	14,758	14,758	14,758	14,758	14,758	14,758	14,758	**$ 151,302**

Summary:

The committee's plan for eliminating streetlights and replacing light bulbs with LED fixtures produces subtantial savings over the existing lease with GMP.
It is important to move forward as soon as possible to realize these savings.
The City has the option to take on ownership of the improved streetlights or to enter into a new lease contract with Green Mountain Power.
The annual cost savings to the City is higher for the Ownership Scenario ($33,258 as opposed to $20,933). But, once we factor in financing, cost of repairs and depreciation, the Continued Lease Scenario is a much better option.
With these additional costs factored in, the Continued Lease Scenario has a projected savings of $418,660 over twenty year compared to the Ownership Scenario's $151,302 projected savings.

Municipal Streetlighting Economics Summary

	Scenario 1: Existing Tariff MV	Scenario 2: Continued Lease LEDs	Scenario 3: New Ownership LEDs
Cost Summary			
Annual Tariff GMP Street Lighting Cost	$83,398.00	$62,465	$30,140
New Estimated Annual Maintenance Cost	$0.00	$0	$10,000
New Total Annual Street Lighting Cost	$83,398.00	$62,465	$40,140
Annual Cost Savings to City	**$0**	**$20,933**	**$33,258**
Net Installation Cost to Municipality	$0	$0	$235,430
Estimated Simple Payback (years)	0.0	0.0	7.1
Net Present Value of 10-Year Cost (2011$)	$0	$482,336	$545,382
Cost to Utility and Efficiency Vermont Incentive			
Total Undepreciated Equipment Costs Owned to Utility	$0	$54,788	$54,788
Efficiency Vermont Incentive	$0.0	$54,788	$54,788
Total Payment due to Utility		**$0**	**$0**
Energy Summary			
Baseline Energy Usage (kWh)	353,028	81,192	81,192
Total Savings (kWh)	0	**271,836**	**271,836**

Additional Considerations for Ownership

If a municipality plans on borrowing money to pay the initial cost of ownership for new streetlights, the simple payback calculation would be misleading as the net present value of the initial investment would actually be larger, and thus the payback longer

Municipalities will be responsible for all ongoing operation and maintenance costs. The maintenance values listed in this tool are for estimation only. Efficiency Vermont is not responsible for actual ongoing maintenance costs that may exceed estimates provided in this document. Efficiency Vermont recommends that Municipalities carefully consider the potential risks, costs, and resources required to take over ownership of street lighting. It is also recommended that municipalities include an additional contingency beyond the estimates provided in this document for unplanned maintenance.

Municipalities will be responsible for all customer issues associated with street light ownership, including failed street lights, customer complaints regarding brightness, glare, or location, and coordinating repairs/maintenance with GMP.

Municipal Streetlighting Ownership vs Continued Lease Calculator

Default Assumptions

Utility	GMP
Annual Streetlight Operating Hours	4380
Real Discount Rate	5%

Annual Cost to Municipality

Existing Streetlights	$83,398
Continued Lease	$62,465
New Ownership	$40,140

Ownership Installation Costs

Fixture Installation Cost (w/ flagging)	$140
Photo-sensor Cost	$0
Potential Cost for Replacement Brackets	$1,002
10% Contingency	$20,000

Additional Costs

Fixed Fee Maintenanec or Time and Materials?	Time and Materials
Annual Pole Rental Charge	$16.00
Undepreciated Fixture Costs	$54,788
Estimated Annual Maintenance	$10,000

GMP O&M Estimation Inputs

	e (hrs)	Material Cost	Labor Cost per Fixture ($)	
Lamp/Fixture	100000	0	0	*(Defaults - Labor: $217/hr)*
Driver	50000	0	0	*(Defaults - Life: 50,000 hrs, Labor:* Fixture cost
Photocell	30000	0	0	*(Defaults - Life: 20,000 hrs, Labor: $159/hr)*

0

		Annual $	Annual kWh	Total	Annual kWh	Annual	One Time Costs			Annual		
593	Totals	$83,398	353,028	501	81,192	$62,465	$145,290	$70,140	$0	$20,080	$8,016	$22,124

Existing Streetlights Inputs							
Existing Fixture Description	Existing Fixture Rate Code	Quantity of Existing Fixtures	Monthly Cost ($) per Tariff	Annual Unit Cost ($)	Total Unit Cost ($)	Unit System Watts	Annual Power (kWh)
100 MVSTOHEX light	1603	504	$10.46	$125.52	$63,262	120	264,902
100 MVTCUGRP light	1608	18	$10.46	$125.52	$2,259	120	9,461
175 MVSTOHEX light	1615	16	$16.84	$202.08	$3,233	205	14,366
250 MVSTOHEX light	1624	26	$23.36	$280.32	$7,288	290	33,025
250 SVFLOHEX light	1628	2	$24.43	$293.16	$586	295	2,584
400 MVFLOHEX light	1636	1	$34.59	$415.08	$415	455	1,993
400 MVSTOHEX light	1641	1	$34.59	$415.08	$415	455	1,993
400 MVSTOHRP light	1642	1	$34.59	$415.08	$415	455	1,993
400 SVFLOHEX light	1646	2	$32.04	$384.48	$769	460	4,030
100 MVSTOH GMP light	1819	10	$13.88	$166.56	$1,666	120	5,256
175 MVSTOH GMP light	1827	5	$17.08	$204.96	$1,025	205	4,490
250 MVSTOH GMP light	1830	3	$24.71	$296.52	$890	290	3,811
250 SVFLOH GMP light	1831	2	$25.28	$303.36	$607	295	2,584
400 SVFLOH GMP light	1836	1	$31.72	$380.64	$381	460	2,015
100 SVSTOH GMP light	1822	1	$15.60	$187.20	$187	120	526
						130	

LED Replacement Streetlight Info				
LED Replacement Rate Code	Proposed LED Fixture Description	New Quantity	Unit System Watts	Annual Energy (kWh)
1856	20LEDCOOH GMP light	412	37	66,769
1856	20LEDCOOH GMP light	18	37	2,917
1856	20LEDCOOH GMP light	16	37	2,593
1856	20LEDCOOH GMP light	26	37	4,214
1856	20LEDCOOH GMP light	2	37	324
1856	20LEDCOOH GMP light	1	37	162
1856	20LEDCOOH GMP light	1	37	162
1856	20LEDCOOH GMP light	1	37	162
1856	20LEDCOOH GMP light	2	37	324
1856	20LEDCOOH GMP light	10	37	1,621
1856	20LEDCOOH GMP light	5	37	810
1856	20LEDCOOH GMP light	3	37	486
1856	20LEDCOOH GMP light	2	37	324
1856	20LEDCOOH GMP light	1	37	162
1856	20LEDCOOH GMP light	1	37	162

Continued Lease Fields		
New Monthly Unit Cost per Tariff	Annual Unit Cost per Tariff	Total Annual Cost per Tariff
$10.39	$124.68	$51,368
$10.39	$124.68	$2,244
$10.39	$124.68	$1,995
$10.39	$124.68	$3,242
$10.39	$124.68	$249
$10.39	$124.68	$125
$10.39	$124.68	$125
$10.39	$124.68	$125
$10.39	$124.68	$249
$10.39	$124.68	$1,247
$10.39	$124.68	$623
$10.39	$124.68	$374
$10.39	$124.68	$249
$10.39	$124.68	$125
$10.39	$124.68	$125

New Ownership Fields							
LED Replacement Fixture Cost	Total Fixture Cost	Fixture Installation Cost (w/ flagging)	Photo-sensor Cost	Quantity of New Fixtures in Inaccessible Areas	O&M	Annual Pole Charge	Annual Energy Cost
290	$119,480	$57,680	$0		$16,513	$6,592	$18,194
290	$5,220	$2,520	$0		$721	$288	$795
290	$4,640	$2,240	$0		$641	$256	$707
290	$7,540	$3,640	$0		$1,042	$416	$1,148
290	$580	$280	$0		$80	$32	$88
290	$290	$140	$0		$40	$16	$44
290	$290	$140	$0		$40	$16	$44
290	$290	$140	$0		$40	$16	$44
290	$580	$280	$0		$80	$32	$88
290	$2,900	$1,400	$0		$401	$160	$442
290	$1,450	$700	$0		$200	$80	$221
290	$870	$420	$0		$120	$48	$132
290	$580	$280	$0		$80	$32	$88
290	$290	$140	$0		$40	$16	$44
290	$290	$140	$0		$40	$16	$44

GMPlight

Street	WorkNeeded	LOCATIONID	WATTAGE
Barre Street	Remove	103767	100
Barre Street	Remove	103766	100
Barre Street	Remove	103765	100
Brown Street	Remove	42167	100
Charles Street	Remove	8705	100
Charles Street	Remove	8701	100
Charles Street	Remove	112876	100
College Street	Remove	21927	100
College Street	Remove	21285	175
College Street	Remove	21284	175
Colonial Drive	Remove	114762	100
Country Club Road	Remove	8872	70
Country Club Road	Remove	8866	100
Cummings Street	Remove	45042	100
Dairy Lane	Remove	8151	100
Deerfield Drive	Remove	8159	100
Dyer Ave	Remove	21861	100
East Montpelier Road	Remove	8885	100
East State Street	Remove	17228	100
East State Street	Remove	17212	100
East State Street	Remove	17208	100
East State Street	Remove	117524	100
Elm Street	Add	45077	0
Elm Street	Add	42245	0
Elm Street	Remove	45129	100
Elm Street	Remove	45127	100
Elm Street	Remove	45106	100
Elm Street	Remove	45101	100
Elm Street	Remove	45097	100
Elm Street	Remove	45094	100
Elm Street	Remove	45183	100
Elm Street	Remove	45179	100
Elm Street	Remove	45176	100
Elm Street	Remove	45172	100
Elm Street	Remove	45168	100
Elm Street	Remove	45164	100
Elm Street	Remove	45156	100
Elm Street	Remove	45140	100
Elm Street	Remove	42221	100
Elm Street	Remove	42220	100
Elm Street	Remove	42251	100
First Ave	Remove	8758	100
Forest Drive	Remove	8927	100
Forest Drive	Remove	23624	100
Forest Drive	Remove	23622	100
Fuller Street	Move	21278	100
Gallison Hill Road	Move	103784	100
Gallison Hill Road	Remove	8573	100
Graham Terrace	Remove	42090	100

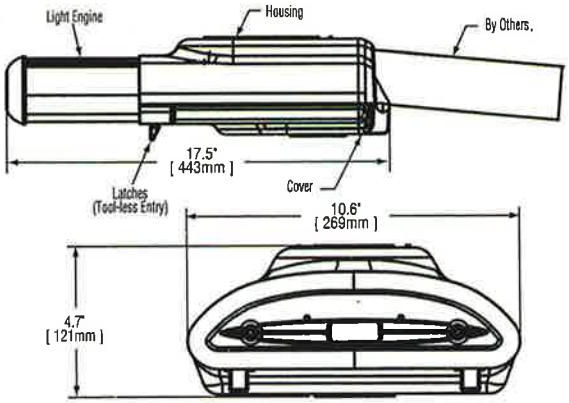
Heaton Street	Remove	17401	100
Hill Street	Remove	59549	100
Hill Street	Remove	59545	100
Hill Street	Remove	59540	100
Hill Street	Remove	59533	100
Hubbard Park Drive	Move	21104	100
Liberty Street	Remove	21935	100
Main Street	Add	21300	0
Main Street	Remove	21915	100
Main Street	Remove	21911	100
Main Street	Remove	21905	100
Main Street	Remove	17375	100
Main Street	Remove	17375	100
Marvin Street	Remove	17225	100
Mill Road	Remove	45204	100
Mill Road	Remove	45198	100
Mountainview Drive	Remove	113042	100
Mountainview Drive	Remove	113041	100
Mountainview Drive	Remove	113040	100
Mountainview Drive	Remove	2010	100
Murray Road	Remove	21875	100
N Franklin Street	Remove	104944	100
North Park Drive	Remove	45076	100
North Street	Remove	42131	100
North Street	Remove	42151	100
North Street	Remove	120508	100
Northfield Street	Remove	2091	100
Park Ave	Remove	17338	100
Pearl Street	Remove	42236	100
Pioneer Street	Remove	107196	100
Power Plant Road	Remove		0
Power Plant Road	Remove		0
Prospect Street	Remove	59521	100
River Street	Move	49541	175
Robinhood Circle	Remove	42021	0
Spring Hollow Lane	Add	21531	0
Spring Street	Remove	42174	100
State Street	Remove	940	100
State Street	Remove	59705	100
State Street	Remove	59733	175
State Street	Remove	2315	100
State Street	Remove	2312	100
State Street	Remove	2305	100
Terrace Street	Remove	8218	100
Terrace Street	Remove	8208	100
Valerie Ave	Remove	21065	100
Wheelock Street	Remove	103740	100
Woodcrest Road	Remove	21643	100

Totals			
GMP Lights	Removal	Move	Addition
607	89	4	4
National Life Drive	7	Not on GMP Inventory	

STR-LWY-2M-HT LEDway® Streetlight – Type II Medium

Rev. Date: 01/27/11

BetaLED Catalog #: STR - LWY - 2M - HT - - D - - - -



Notes:

Product	Family	Optic	Mounting	# of LEDs (x 10)	LED Series	Voltage	Color Options	Drive Current
STR	LWY	2M[1]	HT[2]	☐ 02 ☐ 03	D	☐ UL Universal 120–277V ☐ UH Universal 347–480V	☐ SV Silver[3] ☐ BK Black[3] ☐ BZ Bronze[3] ☐ PB Platinum Bronze[3] ☐ WH White[3]	☐ 700 700mA (Standard) ☐ 525 525mA ☐ 350 350mA

Factory-Installed Options

Please type additional options in manually on the lines provided above.

- ☐ 43K 4300K Color Temperature[4]
- ☐ DIM5 0–10V Dimming (525mA maximum)[5,6]
- ☐ DIM7 0–10V Dimming (700mA maximum)[5,6]
- ☐ F Fuse[7,8]
- ☐ HL Hi/Low (175/350/525, dual circuit input)[9, 10]
- ☐ N No Quick Disconnect Harness or Leveling Bubble[11]
- ☐ PD Power Door[12]
- ☐ R NEMA Photocell Receptacle[7]
- ☐ SC Door Safety Tether[13]
- ☐ UTL Utility Option[14]

For additional options, see IP66 spec sheet.

Footnotes

1. IESNA Type II Medium distribution
2. Horizontal tenon mount
3. Light engine portion of extrusion is not painted and will remain natural aluminum regardless of color selection
4. Color temperature per fixture; minimum 70 CRI
5. Control by others
6. Refer to dimming spec sheet for availability and additional information
7. This option not available with all multi-level options. Refer to multi-level spec sheet for more information
8. When code dictates fusing use time delay fuse
9. Refer to multi level spec sheet for availability and additional information
10. Sensor not included
11. Standard product features unless N option is specified
12. All connections between door and fixture are shipped unconnected from the factory; door release spring included to open door automatically when the latches are released
13. Stainless steel aircraft cable
14. Includes exterior wattage label that reflects watts for the drive current selected. The ability to exceed the selected drive current will be disabled.

LED PERFORMANCE SPECS

# of LEDs	Initial Delivered Lumens – Type II Medium @ 6000K	B U G Rating***	Initial Delivered Lumens – Type II Medium @ 4300K	B U G Rating***	System Watts 120–277V	Total Current @ 120V	Total Current @ 240V	Total Current @ 277V	System Watts 347–480V*	Total Current @ 347V	Total Current @ 480V	L_{70} Hours** @ 25° C (77° F)	50K Hours Lumen Maintenance** @ 15° C (59° F)
350mA Fixture Operating at 25° C (77° F)													
20	1,961 (02)	1 1 1	1,807 (02)	1 1 1	25	0.22	0.13	0.14	33	0.09	0.13	> 150,000	99%
30	2,912 (03)	1 1 1	2,684 (03)	1 1 1	36	0.30	0.17	0.16	43	0.12	0.14	> 150,000	97%
525mA Fixture Operating at 25° C (77° F)													
20	2,745 (02)	1 1 1	2,530 (02)	1 1 1	37	0.31	0.17	0.16	44	0.12	0.14	> 150,000	96%
30	4,076 (03)	1 1 1	3,757 (03)	1 1 1	52	0.44	0.24	0.22	59	0.17	0.16	> 150,000	94%
700mA (Standard) Fixture Operating at 25° C (77° F)													
20	3,431 (02)	1 1 1	3,162 (02)	1 1 1	50	0.43	0.23	0.21	57	0.16	0.16	> 150,000	93%
30	5,096 (03)	1 1 1	4,696 (03)	1 1 1	72	0.61	0.32	0.28	79	0.23	0.19	> 150,000	90%

* Utilizes magnetic step-down transformer

** For recommended lumen maintenance data see TD-13

*** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-07BugRatingsAddendum.pdf

NOTE: All data subject to change without notice.

Made in the U.S.A. of U.S. and imported parts.
Meets Buy American requirements within the ARRA.

STR-LWY-2M-HT LEDway® Streetlight – Type II Medium

Rev. Date: 01/27/11

General Description

Fixture housing is all aluminum construction. Standard fixture utilizes terminal block for power input suitable for #2–#14 AWG wire and operates at 700mA. Drive current is field switchable. Fixture is designed to mount on 1.25" IP (1.66" O.D.) and/or 2" IP (2.375" O.D.) horizontal tenon (minimum 8" [203.2mm] in length) and is adjustable +/- 5° to allow for fixture leveling (includes leveling bubble to aid in this process). Fixture carries a limited five year warranty.

Electrical

Modular design accommodates varied lighting output from high power, white, 6000K (+/- 500K per full fixture), minimum 70 CRI, long life LED sources. 120–277V 50/60 Hz, Class 1 LED drivers are standard. 347–480V 50/60 Hz option is available. LED drivers have power factor >90% and THD <20% at full load. Units provided with integral 10kV surge suppression protection standard. Quick disconnect harness suitable for mate and break under load provided on power feed to driver for ease of maintenance. Surge protection tested in accordance with IEEE/ANSI C62.41.2.

Finish

Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable silver powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Bronze, black, white and platinum bronze powder topcoats are also available. The finish is covered by our 10 year limited warranty.

Fixture and finish are endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117.

Testing & Compliance

UL listed in the U.S. and Canada for wet locations. Consult factory for CE Certified products. RoHS compliant. Meets CALTrans 611 Vibration Testing and GR-63-CORE Section 4.4.1/5.4.2 Earthquake Zone 4. International Dark-Sky Association approved.

Patents

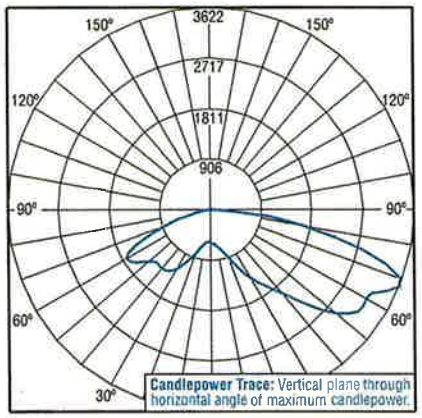
U.S. and international patents granted and pending. BetaLED is a division of Ruud Lighting, Inc. For a listing of Ruud Lighting, Inc. patents, visit www.uspto.gov.

Field-Installed Accessories

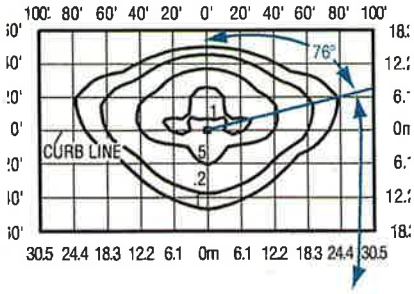
Bird Spikes for Light Engine
☐ XA-BRDSPK30

Bird Spikes Kit for Housing
☐ XA-BRDSPKHSG

Photometrics



Independent Testing Laboratories certified test. Report No. ITL64223. Candlepower trace of 6000K, 40 LED LEDway Streetlight luminaire with IESNA Type II Medium distribution. Luminaire with 6,665 initial delivered lumens operating at 700mA. **All published luminaire photometric testing performed to IESNA LM-79-08 standards.**



Isofootcandle plot of 6000K, 30 LED LEDway Streetlight luminaire with IESNA Type II Medium distribution mounted at 25' A.F.G. Luminaire with 5,096 initial delivered lumens operating at 700mA. Initial FC at grade.

LEDway® EPA & Weight Calculations

Approximate Weight 120–277V*		
20–30 LED fixture		10.5 lbs.
EPA		
Horizontal Tenon Mount		
1 fixture		0.565
EPA		
Round External Mount / Square Internal Mount Horizontal Tenons with Fixture(s)		
PT/PD-1H	Single	0.785
PT/PD-2H(90)	90° Twin	1.019
PT/PD-2H(180)	180° Twin	1.350
PT/PD-3H(90)	90° Triple	1.534
PT/PD-3H(120)	120° Triple	1.383
PT/PD-4H(90)	90° Quad	1.938

* Add 5 lbs. for transformer in 347–480V

NOTE: All data subject to change without notice.

Made in the U.S.A. of U.S. and imported parts.
Meets Buy American requirements within the ARRA.