

LED Street Light Conversion Report 2018

Bruce Trivellini, Peter Flynn, Mark Mitch, Mike French, Bill Marko and Dan

Goodenough

The Town of Henniker, New Hampshire Energy Committee

Author Note

Operational cost reductions achieved by LED Street Light Conversion

Energy Committee Chairman Dr. Bruce J. Trivellini; onlyhennikerbruce@tds.net

Executive Summary

The Town of Henniker spent **\$19,260** and used **76,798 kWh** of electricity operating municipal street lights last year. As an example of the savings available by installing LED street lights, Affinity LED Lighting of Dover, NH reported to the energy committee in April 2018 that an **annual savings of \$8,678** could be achieved.

The initial investment to convert to LED street lights would be \$16,750. With the calculated annual saving mentioned above, the **payback period** on that investment would be **1.93 years**.

Net savings would be realized in the third year. The 20-year cumulative **Return on Investment** (assuming electricity rates don't change), would be **\$156,808**.

After 20 years of operation, the LED street lights would lead to the elimination of around 569 tons of carbon dioxide emissions.

The Henniker Energy Committee **unanimously** recommends that the Town of Henniker convert all street lights to LED units, as soon as possible.

Key words...energy, street lights, LED, conversion

LED Street Light Conversion Report 2018

Background

This report focuses Streetlighting the seventy-nine High Intensity Discharge (HID) street lights fixtures to Light Emitting Diode (LED) fixtures. The decorative lamp post street lights, located in the downtown area, are not included in this report.

Recent scientific advances in LED semiconductor technology, optics, and lighting system design now enable LED lights to significantly reduce cost and increase performance over antiquated metallic halide or HID sodium vapor street lights.

LED is becoming more common in street lighting applications because it projects light more efficiently. This allows for wider coverage of a consistent light pattern which will be focused directly onto the roadway surface.

An additional benefit is that **LED** street lights are **Night Sky compliant**. Resulting in a significant reduction in light pollution.

Uniformity and consistency in the projected light pattern is one of the benefits of a well-designed street lighting system. In the past many lighting systems were designed with higher initial light intensity to account for intensity depreciation over the life of the light source. LEDs depreciate more slowly than the traditional HID fixtures.

Thus, LEDs with less light depreciation over time, less initial intensity can be designed into the application. In addition, LED systems can be built with smart technology modules. These “smart lights” can be programmed to be dimmed during the hours our roads are least used. Smart lighting will reduce the operational cost even more.

Considering higher light uniformity along with improved color rendering and high color temperature, a wider range of coverage, LEDs can reduce the wattage of fixtures required in many outdoor applications. **This significantly reduces the cost of energy and allows for lower cost of ownership over the life of the system.**

Beginning in January 2018, the Energy Committee began discussing ideas of how to reduce the cost of operating the town’s street light system. The committee’s researched revealed that the town operates seventy-nine non-metered street lights. Seventy-six are HID sodium vapor “Cobra Head” type fixtures and three are open bottomed flood light type fixtures. Eversource uses a ‘Tariff’ system to calculate the cost of operating Henniker’s street light system. *(Figure 1)*

This calculation includes a fixed price per street light head and a fixed energy charge by Kilowatt hour (kWh) by head type;

MUNICIPAL STREET LIGHTING SUMMARY					CURRENT LIGHTING (annual)			
<u>Current Lighting Description</u>	<u>Rated Watts</u>	<u>Size Code</u>	<u>Rate Class</u>	<u>Fixture Qty</u>	<u>Existing Rated Watts</u>	<u>Annual Cost Per Fixture</u>	<u>Total Annual Cost*</u>	<u>Total kWh Consumed</u>
				79				
150HPS COBRA	190	188	82	49	190	\$226.47	\$11,097	40,452
250HPS COBRA	295	153	82	27	295	\$261.29	\$7,595	34,608
50HPS SUBURBAN	65	46	82	1	65	\$129.02	\$129	282
100HPS SUBURBAN	130	40	82	1	130	\$184.87	\$185	585
175MTH FLOOD	205	188	82	1	205	\$254.17	\$254	891
				79			\$19,260	76,798

Figure 1: Affinity LED Lighting assessment of current cost of operations

In response to the new LED street light market, Eversource revised its streetlight tariff to better reflect the value of efficiency and encourage LED conversions. Applying the new tariff calculation, the LED streetlight conversion

significantly reduces operational cost. (Figure 2)

SMART READY LED (annual)				
<u>LED Rated Watts</u>	<u>Models</u>	<u>Annual Cost Per Fixture</u>	<u>Total Annual Cost*</u>	<u>Total kWh Consumed</u>
		\$3.39 per fixture per mo + \$0.0515 per rated watts per mo + \$0.10882 per kWh		
80	Affinity S801-80W-30K-TX-10-GR-M	\$127.88	\$6,266	17,032
100	Affinity S801-100W-30K-TX-10-GR-M	\$149.68	\$4,041	11,732
30	Affinity YL3-30W-30K	\$73.38	\$73	130
30	Affinity YL3-30W-30K	\$73.38	\$73	130
80	Affinity FL2-80W-30K	\$127.88	\$128	348
			\$10,582	29,372
		Annual Savings	(\$8,678)	(47,426)
			-45.1%	-61.8%
		Annual CO ² Abatement (tons)		(28.5)

Figure 2: Affinity LED Lighting Assessment of Cost of operation after LED conversion

By converting Henniker's Street Light System to LED fixtures, the town will realize a 45.1% decrease in the streetlight operational cost with an annual savings of \$8,678.00 and a 61.8% reduction in consumption.

Affinity LED Lighting, Dover:-Assessment of current streetlight operations

The Energy Committee's research and assessment of the current streetlight system was assisted by Mr. Steve Leiber, President of Affinity LED Lighting



Steve Lieber (l) JB Branagan demonstrating Affinity Cobra Head LED fixture

(Affinity) Dover, New Hampshire. In March, the Energy Committee agreed unanimously to request and received Select Board approval to allow Affinity to have access to Henniker's Eversource equipment ledger. From this access Affinity was able to guide us in understanding the actual costs associated with the operation of our Street Light System (*Figure 1*).

At our April 18, 2018 meeting, Affinity was invited to present their assessment of the current streetlight operational costs. At that time, Affinity presented their current assessment and a LED street light conversion comparison.

Affinity's LED Street Light Conversion Assessment Highlights:

Affinity LED Lighting complete assessment is attached as Appendix 1.

1. Operational cost reduction of 45.1% from \$19,260 (current) to \$10,582 (post LED conversion). (*Figures 1&2*)
2. Cost of conversion \$24,575.00-\$7,825.00 (Eversource rebate incentive)
Total cost after rebate \$16,750. (Figure 3)

UPGRADE PROJECT COSTS						INCENTIVE		
<u>Purchase Cost per Fixture</u>	<u>TOTAL COST</u>	<u>Installation Cost per Fixture</u>		<u>Total Purchase & Installed Cost</u>		TO BE VERIFIED BY EVERSOURCE		
MATERIAL COST FOR EVERSOURCE (RANDY)						Incentive / Fixture	Product Code	Total Incentive
\$198.00	\$9,702.00	\$109.48	\$5,364.70	\$307.48	\$15,066.70	(\$100)		(\$4,900)
\$211.00	\$5,697.00	\$109.48	\$2,956.06	\$320.48	\$8,653.06	(\$100)		(\$2,700)
\$129.00	\$129.00	\$109.48	\$109.48	\$238.48	\$238.48	(\$75)		(\$75)
\$129.00	\$129.00	\$109.48	\$109.48	\$238.48	\$238.48	(\$75)		(\$75)
\$269.00	\$269.00	\$109.48	\$109.48	\$378.48	\$378.48	(\$75)		(\$75)
avg \$201.59	\$15,926	avg \$109.48	\$8,649	avg \$311.08	\$24,575			
					Incentive (\$7,825)	←		(\$7,825)
					Net \$16,750			
					Simple Payback 1.93			years

Figure 3

3. Annual cost savings of \$8,678.00 results in simple payback in 1.93 years.

SIMPLE PAYBACK

Net Investment	\$16,750	<u>Payback</u>
Annual Savings	(\$8,678)	1.93 years
Monthly Savings	(\$723)	23.2 months

		Cumulative Savings	Cumulative ROI		Cumulative CAPEX Impact (10yr)	
					CAPEX	Profit/Loss
Year	1	\$8,678	(\$8,072)	-48%	(\$1,675)	\$7,003
Year	2	\$17,356	\$606	4%	(\$3,350)	\$14,006
Year	3	\$26,034	\$9,284	55%	(\$5,025)	\$21,009
Year	4	\$34,712	\$17,961	107%	(\$6,700)	\$28,012
Year	5	\$43,390	\$26,639	159%	(\$8,375)	\$35,014
Year	10	\$86,779	\$70,029	418%	(\$16,750)	\$70,029
Year	15	\$130,169	\$113,418	677%		
Year	20	\$173,558	\$156,808	936%		

*excludes current and future maintenance costs

Figure 4: Return on investment and 10-year CAPAX Impact.

4. LED streetlight conversion also realizes a significant reduction in CO₂ production;

Cumulative Operating Hours	Cumulative CO ₂ Abatement (tons)	
4,345	1	(28.5)
8,690	2	(56.9)
13,035	3	(85.4)
17,380	4	(113.8)
21,725	5	(142.3)
43,450	10	(284.6)
65,175	15	(426.8)
86,900	20	(569.1)

Figure 5 Cumulative CO₂ Abatement

Conclusions

The committee's mission is to identify new environmentally clean technologies that will reduce the Town's overall energy consumption (lowering CO2 & carbon foot print) and reduce operational costs. The Energy Committee unanimously agrees that the LED Street Light technology identified in this report does fulfill that goal.

Committee Recommendation

The committee unanimously recommends that the Town of Henniker Convert to LED street lights as soon as possible.

Also, after working with Affinity LED Lighting of Dover, New Hampshire, the committee recommends adoption of the Affinity proposal (Appendix 1) that was submitted during this assessment process.

This recommendation to contract with Affinity has been tendered to the Select Board after the following considerations:

1. Affinity demonstrated they understand the complexities of street lighting conversions and specifically, Eversource's requirements to perform the project.
2. Affinity's installation performed by highly capable crews who are experienced large-scale turnkey electrical contractors having all requisite training, certifications, equipment and insurance to safely perform the required installations.
3. Affinity demonstrated during the presentation that they are dedicated to reducing operational costs by producing high quality LED street light fixtures.
4. All product is assembled at Affinity's UL approved manufacturing facility in Dover, NH with a workforce of U.S. Veterans, producing "best-in-class" products. Further, all streetlights come with a 10-year warranty.
5. Affinity demonstrated their dedication to providing improved quality of light and lowering greenhouse gas emissions to improve air quality and public health in our local communities.
6. Affinity LED has been engaged in LED street lighting and other municipal lighting conversions since 2016, including Antrim, Bedford, Bethlehem, Claremont, Concord*, Conway, Dover, Epping, Farmington, Franconia, Gorham, Greenland, Hampstead, Keene, Lisbon, Manchester*, Milford, Merrimack, New Castle, Newfields, Newington, Newmarket, Pittsfield, Portsmouth, Rochester, Somersworth, Swanzey and Whitefield. (note * indicates municipal lighting projects in Manchester and Concord have been metered projects, and does not include their street lighting)