LED Street Lighting Business Case

The Township of Langley

LED streetlight illumination (right) compared to HPS (left) (source: cnn.com)

EXECUTIVE SUMMARY

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August, 2018

Acknowledgements

The author would like to thank the following individuals for their contribution, feedback, and support throughout this project.

- Karen Taylor
- Tess Rouse
- Ryan Schmidt
- Harb Chohan
- Roeland Zwaag
- Steve Magnusson
- Andy Sareen

1. Introduction

Over the past years, the Engineering Department of the Township of Langley has expended considerable effort to evaluate the latest advancements in LED street lighting technology. Recent studies have determined that the latest LED street lighting fixtures outperform existing HPS lighting fixtures and can be directly retrofitted on existing freestanding steel poles, without pole modifications.

LED streetlights have a life expectancy of 20 years, compared to the 5-year life expectancy of HPS streetlights. An LED conversion is expected to reduce streetlight maintenance costs by up to 4 times the current annual maintenance costs.

Locally, the cities of Burnaby, Coquitlam, Richmond, Surrey, Vancouver, District of North Vancouver, West Vancouver, District of Saanich, City of Kamloops and Victoria have all initiated or implemented the transition to LED street lighting.

2. Background

The Township of Langley currently owns and operates 6,538 (Township-owned) streetlights and leases 1,615 (Leased) units from BC Hydro. Majority Township-owned streetlights are High Pressure Sodium (HPS) fixtures. Township-owned streetlights refer to lights that illuminate both roadways and pedestrian sidewalks.

Combined, Township-owned and BC Hydro Leased streetlights account for over [redacted] of the Township's total energy use. Currently, the street lighting inventory consumes over [redacted] kWh of electricity and costs the Township over [redacted] annually in electricity costs.

The Township's Sustainability Charter has several goals that would support the conversion of Township street lighting to LED, including:

- making innovative green investments in infrastructure;
- providing safe and affordable transportation infrastructure;
- and providing leadership for sustainability practice and innovation.

The Township's Official Community Plan (OCP) Bylaw N^{o}. 5000 contains provisions relating to energy and climate action. A number of policies in the OCP would support the conversion of Township street lighting to LED, including:

- Policy 3.8.6 suggests considering roadway construction standards that fit within a "complete streets" strategy to reflect the needs of all users and protect and preserve the community's environment and character.
- Policy 3.10.5 suggests prioritizing infrastructure maintenance, renewal, and replacement programs and projects to reduce environmental, social, and financial risks.
- Policy 3.16.19 suggests ensuring decision making is structured to achieve energy goals and greenhouse gas emissions reduction targets, recognizing that several factors contribute to energy use in a community—in particular, the overall pattern of land use, buildings, transportation systems, and infrastructure.
- Policy 3.17.1. Support the British Columbia Climate Action Charter by developing strategies to achieve the goals of the agreement:
    - be carbon neutral in municipal operations by 2012
    - create complete, compact, energy-efficient rural and urban communities

3. Analysis and Findings

We worked to complete and analyze the Township's current street lighting inventory to develop an LED conversion plan that maximizes both performance and value. Below outlines recommendations for LED fixtures, environmental/health benefits.

3.1. LED Fixtures

3.1.1. Recommended Fixture Specifications

In 2017, Township's staff worked with Development Planning to update the Subdivision and Development Servicing Bylaw – Schedule D to update the required streetlight model to NXT LED Series, manufactured by LED Roadway Lighting. Including a 3000K color specification for residential and low volume roadways and 4000K color specification for arterial roadways and controlled intersections.

The LED conversion project aims to bring the Township's current infrastructure to the same standard we now require from new developments and to eliminate the lighting patchwork throughout the community.

Road Class	Residential Roadways	Arterial Collector	Intersections
Preferred LED Fixture	• NXT-Series • Ornamental LEDs	• NXT-Series • Ornamental LEDs	• NXT-Series • Ornamental LEDs
Color Temperature	3000K	4000K	4000K

3.1.2. Current inventory: Township-owned streetlights

Community	Roadway	Ornamental	BC Hydro	semi-total
Aldergrove	660	32	183	875
Brookswood / Fernridge	263	28	525	816
Fort Langley	14	146	158	318
Gloucester	239	77	0	316
Murrayville	737	59	75	871
Northwest Langley	272	1	10	283
Walnut Grove	1404	56	10	1470
Willoughby	1687	94	50	1831
Willowbrook	231	0	0	231
Rural	494	44	604	1142
Total	**6001**	**537**	**1615**	**8153**

3.2. LED Color Temperature

LED streetlights come in various temperatures. The temperature of the light depends on the amount of red (warm) or blue (cool) color in the output (see figure 1).

The streetlight industry has recently begun to supply LED fixtures in "warmer" 3,000K temperatures.

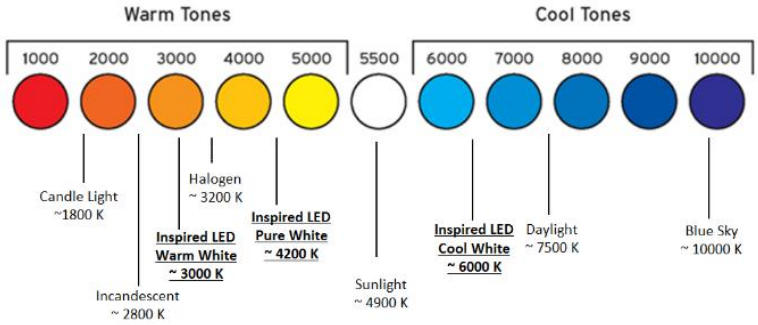

Figure 1 : LED Color Scale (source:blog.inspiredled.com)

The 3,000K warm white LED fixtures are endorsed by the International Dark Sky Association, as they minimize glare and intensity, and the American Medical Association has recently (June 2016) endorsed 3,000K LED streetlights as the preferred option for streetlight applications, for health and well-being.

3.3. LED Environmental and Health Benefits

Staff have undertaken considerable research in order to assess the environmental and health benefits of LED streetlights compared to the existing HPS lighting technology in the Township.

Currently available LED lights reduce energy consumption, maintenance costs, improve lighting quality and performance and reduce hazardous risks.

Compared to HPS street lighting, LED street lighting offers superior lighting color, making it easier for road users to see pedestrians and signs and improves drivers' ability to assess distance more accurately. LED lighting also achieves control of light concentration and improved lighting uniformity, leading to reduced road user eyestrain and fatigue as well as reduced light spillage onto neighboring houses and the sky.

3.4. Maintenance requirements/Life expectancy

HPS roadway lighting fixtures require re-lamping (bulb replacement) and cleaning every five years. LED fixtures have a life expectancy approaching 20 years and do not require bulb replacements at 5 year intervals, thereby significantly reducing maintenance frequency. In addition, with LED fixtures, cleaning intervals can be increased from 5 year intervals to 10 year intervals.

3.5. Complementary information

3.5.1. Adaptive Technologies

The recommended LED NXT fixtures include a standardized socket for the implementation of adaptive technologies (dimming, Wi-Fi, signal alerts, data collection). These adaptive technologies can be administered in the future once the technology is piloted more and costs for adding these adaptive features decreases.

3.5.2. BC Hydro

BC Hydro received approval to upgrade their 92,000 leased streetlights to LED throughout the Province over the next 5 years. The roll-out has been delayed for an additional year as they are analyzing adaptive technologies to go along with their upgrade. No decision has yet been made regarding the order of municipalities who will see the upgrades first.

3.6. Recommendations

The majority of the Township's existing inventory of HPS roadway lighting can be changed to LED roadway lighting within the next 1, 3 or 5 years by replacing the current HPS lighting opportunity replacement program with an LED Roadway Lighting Upgrade program.

Based on our findings, staff suggest the following:

- Proceed with a township-wide retrofit of standard 'cobra head' streetlights to LED technology
    - On lower volume local residential roads, utilize the slightly warmer 3000K color temperature LED fixtures to better integrate with low intensity household lighting.
    - On arterial, collector and non-residential local roads and all roads in Township Centre, utilize the 4000K color temperature LED fixtures to maximize color rendition and visibility for these higher pedestrian and vehicle volume routes.
- Implement design guidelines that will inform future outdoor lighting projects led by the Township, including for pedestrian pathways, streets and public facilities.
- Implement new requirements for buildings in residential areas and lane accesses of commercial buildings to reduce energy use and unnecessary light pollution.
- Purchase all roadway lighting fixtures from the Provincial Corporate Supply Arrangement (CSA) which will be discontinued as of May 2019.

3.7. Conclusion

LED roadway lighting offers superior light quality, lower maintenance requirements, increased life expectancy, substantial power savings and favorable public opinion when compared to existing HPS lighting. These characteristics offer a ROI payback period estimated to be less than 8 years if implemented within a one-year frame.