



CITY OF HAMILTON
PUBLIC WORKS
Engineering Services

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	July 7, 2016
SUBJECT/REPORT NO:	Standardization of Street Light LED Luminaires (PW16058) (City Wide)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Gord McGuire (905) 546-2424, Extension 2439 Mike Field (905) 546-2424, Extension 4576
SUBMITTED BY:	Gary Moore, P. Eng. Director, Engineering Services Public Works Department
SIGNATURE:	

RECOMMENDATION

- (a) That the General Electric (GE) Evolve LED Roadway luminaire be approved as single source standard equipment for cobra-head style street lights used for street lighting within the City of Hamilton;
- (b) That General Electric Canada be approved as the single source of supply for General Electric (GE) Evolve LED Roadway luminaires, as funded through the capital budget project ID 4041610018;
- (c) That the General Manager of Public Works and Finance & Corporate Services, or his designate, be authorized and directed to enter into and sign on behalf of the City of Hamilton, all negotiated agreements and all necessary associated documents with General Electric Canada for General Electric (GE) Evolve LED Roadway luminaires with content acceptable to the General Manager of Public Works, and in a form satisfactory to the City Solicitor;
- (d) That the General Manager of Public Works be authorized to direct the Standards and Approved Products Committee to amend Section 3 - Street Lighting of the Approved Products List to be reflective of Recommendation (a) of Report PW16058.

EXECUTIVE SUMMARY

Single sourcing on the GE Evolve LED street light has a variety of benefits to the City and it is already the most widely used LED street light in the City. Continuing the wide-scale use of the GE Evolve LED street light will further enhance the street lighting

program and ensure that the illumination of the municipal right-of-way is completed in an efficient and cost effective manner.

Permitting single sourcing of the GE Evolve LED street light will result in operational efficiencies where by it will streamline and enhance efficiency of existing maintenance practices while providing enhanced service levels.

The GE Evolve is an approved product and exceeds the City's technical and performance specifications. Through past deployment of the GE Evolve LED street light in the City it has proven to be a high performing and reliable light and has been positively accepted by staff, contractors, the public and both Horizon Utilities and Hydro One.

As an output of single sourcing, future deployment of a street lighting adaptive control system would be eased as installing such a system across a wide variety of different street light types could prove to be problematic. Single sourcing on the GE Evolve would ensure that consistency is maintained therefore protecting the successful implementation of an adaptive controls system.

The GE Evolve LED is known to staff and City consultants which reduces engineering time and costs and also enhances the quality of street lighting designs and ultimately the quality of lighting of the public right-of-way.

Through Public Works capital tenders, the 2015 High Wattage LED Incentive Project and other initiatives, the GE Evolve has shown to have a cost advantage over the other approved lights. Further cost reductions could be gained by leveraging and negotiating through a single source arrangement. Single sourcing would also enable the City to purchase direct from General Electric Canada which would further reduce purchase costs by 5-10%.

Alternatives for Consideration - See Page 10

FINANCIAL - STAFFING - LEGAL IMPLICATIONS

Financial: Single sourcing on the GE Evolve will reduce street light purchase costs for both maintenance and capital project by approximately 10-20%. Additional to the above there are other savings, particularly staff time and consultant assignment costs, which would be reduced due to gained efficiency.

Staffing: There are no attributed staffing impacts due to single sourcing.

Legal: N/A

HISTORICAL BACKGROUND

Hamilton owns and operates approximately 45,000 street lights, 40,000 being standard 'cobra-head' street lights and 5,000 decorative. 13,110 street lights are LED and the remaining is high-pressure sodium (HPS) or metal halide (MH). This report addresses only cobra-head street lights and not decorative.

Between 2009 and 2012 staff investigated and researched LED street lighting to obtain a comprehensive understanding and to determine if it was suitable for wide-scale use.

**SUBJECT: Standardization of Street Lighting LED Luminaires
(PW16058) (City Wide) - Page 3 of 11**

In this period 80 LED street lights were installed across 10 pilot locations. Early piloting identified a variety of issues and barriers however the technology matured quickly where it surpassed the performance of its predecessor.

Leveraging knowledge gained from the pilot installations and by consulting with other Municipalities and professional organizations such as the Illuminating Engineering Society of North America and United States Department of Energy Street Lighting Consortium, staff developed base technical specifications for LED street lights.

In 2012 a Downtown lighting upgrade project was selected to utilize LED street lighting and a request for pre-qualification (C11-59-21) was issued in December of 2012. The Request for Pre-Qualification (RFPQ) contained minimum mandatory requirements and measured performance based attributes. Three LED street lights were approved: the Cooper Lighting Navion, Philips Lumec Roadview and General Electric Evolve.

In Q1 of 2013 the three approved lights were added to the City's Approved Products List through the Public Works Standards and Approved Products Committee and simultaneously the use of HPS and MH street lights were restricted for maintenance thereby standardizing on the use of LED.

In 2014 the City undertook the first large scale LED retrofits where 730 street lights were replaced with LEDs via the 400W HPS to LED Street Light Conversion (ENG14.005) and Sherman Access Conversion Projects. The three approved LED products were equally represented across all project lights. Procurement of the project lights was completed through a Request for Tender (RFT) (C11-51-13) and installations were conducted by the City's street lighting maintenance contractor.

In Q4 of 2014, and in advance of the 2015 High Wattage Street Light Incentive Project (PW14119c), the City reviewed and renewed the 2012 RFPQ and issued another RFPQ (C11-82-14). The second RFPQ was revised slightly by updating the base technical specification based on lessons learned and technological advances that occurred since the first RFPQ. Three additional LED street lights were approved therefore bringing the total to six. The added street lights were the Philip Roadfocus, Cree Canada XSP/LEDway and the LED Roadway Lighting Ltd NXT.

In 2015 10,319 street lights were replaced with LED through the High Wattage Street Light Incentive Project. The project was completed via a supply and install RFT (C15-29-15 SL) in which the successful bidder was required to choose one of the six pre-approved LED street lights. Enersource Power Services Inc., the successful bidder, chose the General Electric Evolve street light which was used exclusively for all 10,319 street light replacements. The justification for the selection of the General Electric Evolve street light was a combination of price, capacity and speed to deliver.

In combination with the above noted projects and from other initiatives (such as Public Works (PW) capital construction and residential sub-division development) the City currently has approximately 13,110 LED street lights. While there were initially six approved street lights the majority are the General Electric Evolve LED street light (approximately 11,360).

**SUBJECT: Standardization of Street Lighting LED Luminaires
(PW16058) (City Wide) - Page 4 of 11**

As approved in the 2016 capital budget, Public Works (PW) will be retrofitting the remaining street lights across the City to LED. The quantity of targeted lights is approximately 27,000 which will be replaced over a 3-4 year period. To support this project there is a need to procure LED street lights. In addition to the City-wide project, the street lighting maintenance program requires the purchase of new LED street lights and/or parts in order to maintain acceptable service levels.

It is desirable and advantageous to the City to standardize on one street light type/manufacturer for a variety of reasons. The General Electric Evolve street light is the most widely used LED street light in the City and has statistically performed beyond expectations. As such, it is recommended that it be used exclusively for the 2016-2019 LED retrofit project and for all other future LED installations, inclusive of the maintenance program.

POLICY IMPLICATIONS AND LEGISLATED REQUIREMENTS

The City of Hamilton Bylaw #13-317 – Procurement Policy, Policy #14 allows for standardization.

This process aligns with the Public Works Business Plan by ensuring that equipment is maintained and completes its expected lifecycle, and costs are kept to a minimum.

RELEVANT CONSULTATION

These recommendations are the result of consultations with the Procurement Section whom provided input into the report recommendations.

ANALYSIS AND RATIONAL FOR RECOMMENDATION

Single source selection of one type/manufacturer of cobra-head style LED street lights has a variety of benefits to the City. A total of six LED street lights have been approved through two RFPQ processes, three of which are currently included on the Approved Products List. Maintaining a large list of approved LED street lights is problematic and the rationalization of the single source recommendation for the General Electric (GE) Evolve LED street light is categorized below into a) operational efficiencies, b) performance and reliability, c) technical benefits and d) cost and delivery.

a) Operational Efficiencies

There are 13,110 LED street lights installed City-wide. 11,360 are the GE Evolve street light of which 10,319 were installed as part of the 2015 High Wattage Street Light Incentive Project. The remainder of LED street lights are comprised of various other manufacturers.

Limited variation in street light equipment is advantageous from an operational perspective as it streamlines troubleshooting, repair, replacement, general maintenance work resulting in timelier and more efficient response to non-operating street lights, thereby minimizing response times, maximizing service and maintaining Council approved service levels.

Staff and the City's street lighting maintenance contractor has a high level of understanding and comfort (when compared to other installed LED lights) of the

**SUBJECT: Standardization of Street Lighting LED Luminaires
(PW16058) (City Wide) - Page 5 of 11**

operational characteristics and needs of the GE Evolve street light since it is the most prevalent LED light in the City. This understanding is beneficial as it assists and promotes efficient operational processes and procedures.

An inventory of LED street lights, both complete assemblies and parts, is required to service and replace lights for both planned and reactive maintenance. LED street light parts are not interchangeable from one manufacturer to another and the more variability that exists the greater the variability and quantity of individual inventory items are required. Having limited inventory variability is an efficient methodology for controlling, stocking and managing spare street light assemblies and parts needed for maintenance. A smaller and more defined inventory reduces staff time needed to oversee, simplifies procurement of street lights/part and ultimately lowers costs.

b) Performance and Reliability

General Electric is established as one of the leading manufacturers of LED street lighting in the North American marketplace and the GE Evolve LED street light is recognized as one of the leading street lights in the industry, awarded with the “Best-in-Class designation in the roadway lighting category by the U.S. Department of Energy. It is one of the most widely deployed street lights in North America.

The GE Evolve LED street light exceeds the City’s base technical specifications for LED street lights. The stringent base specifications were developed to ensure that the LED street lights met or exceeded constructability and operational standards and that the lights will operate reliably and maintenance free for upwards of 15 years.

Since the installation of 10,319 GE Evolve street lights in 2015, to date only 18 units have failed (an equated failure rate of 0.0017%). The anticipated failure rate was 0.02% and therefore the lights are performing far better than expected.

With the exception of the LED Roadway Ltd NXT street light, the GE Evolve street light is an ‘OEM integrated’ product (OEM – Original Equipment Manufacturer) in that all of the primary internal components (housing, LED light engine, driver and surge arrestor) are developed and manufactured by the source manufacturer (GE). The other approved LED products are not considered to be integrated as some critical primary components are not of OEM origin (most often the driver). Integration of LED street lights is a beneficial aspect as it ensures that all components are compatible and designed/manufactured to the same performance quality and objectives. OEM Integration provides a higher level of protection of long term reliability and availability of replacement components as the OEM manufacturer maintains control over component updates/revisions to make sure that they are backwards compatible with older street lights.

All of the approved LED street lights have a 10 year operational warranty. OEM integration results in a ‘one-finger-to-point-to’ model when dealing with failures within and outside of the warranty period. Since the OEM manufacturer is the originator of all internal components, troubleshooting operational issues and managing warranties is more efficient when compared to dealing with similar issues with non OEM integrated street lights. Permitting single sourcing of the GE Evolve street light eases the

**SUBJECT: Standardization of Street Lighting LED Luminaires
(PW16058) (City Wide) - Page 6 of 11**

complication with managing multiple warranties (across multiple types/manufacturer street lights) resulting in a reduction of staff time and attention. Single sourcing on one product places the City in a preferential position to negotiate custom operational warranties thereby providing additional financial protection against failures.

Allowing single sourcing of one standard street light type will assist with managing the City's energy profile with both Horizon Utilities and Hydro One. For energy billing, the majority of street lights in the City are 'flat-rate', as they are not connected to utility meters. Both Horizon and Hydro one calculate the energy consumption of the flat-rate street lights based on a) assumed operating time and b) energy consumed by the lights. The operating time is a profile regulated by the Ontario Energy Board (OEB) however the City is responsible for tracking the energy that each street light consumes. This information is delivered to the utilities at routine intervals by the City. Energy consumed by each street light type must be provided to and approved by the utilities before it can be used for billing. The City provides specification sheets and additional technical information to the utilities for each different street light type/wattage. Limiting the amount of variation in street light types simplifies this process considerably for both the City and the Utilities and therefore single sourcing on one street light type, such as the GE Evolve, would result in a more streamlined, efficient and potentially accurate billing process. The GE Evolve LED street light energy consumption information has previously been reviewed and accepted by Horizon and Hydro one.

The most important output of street lights is their ability to adequately illuminate sidewalks and roadways. Staff have a high degree of confidence in the ability of the GE Evolve LED street light for meeting the needs of the municipal right-of-way based on previous installations, specifically the 2015 High Wattage Street Light Incentive Project. As previously noted the City has approximately 11,360 GE Evolve LED street lights deployed across the City lighting a wide variety of sidewalk and roadway configurations. Staff is not aware of any areas that are insufficiently lit as a function of the performance of the street lights.

Of the six approved street lights the GE Evolve has the largest number of light output options available and therefore enabling it to accurately illuminate sidewalks and roadways from major arterials to residential locals. The variety of options also results in a noted reduction in light pollution (light trespass and sky-glow) for many applications as the light output can be matched up with the exact needs of the right-of-way better than many of the other approved LED street lights. There have been several instances on PW capital construction projects that the GE Evolve LED street light was the only street light (of the six approved) which could adequately illuminate the right-of-way despite a concerted effort to seek out acceptable alternatives for project specifications. In some cases, other approved LED street lights could light these applications but could only do so at much higher output wattages which would have resulted in higher operating (energy) costs.

Of the six approved LED street lights the GE Evolve is the only one that uses reflective optics technology for distributing light. All other approved lights utilize lensed optics. Reflective options (where light from LEDs is controlled and distributed by a specular

reflector) are shown to produce less disability glare when compared to lensed optics. Reducing disability glare for roadway users is an important consideration for lighting design and can result in a safer lit environment.

The GE Evolve LEDs and reflectors are recessed in the housing of the fixture and sealed in the optic chamber by tempered glass. Excluding the Philips Roadview, the other approved LED street lights have individual lensed LEDs which are not enclosed within an optic chamber and the lenses protrude from the bottom. The exposure of the lenses to the open environment leaves them prone to dirt adhering to the lenses and therefore reducing efficiency. The Illuminating Engineering Society reported at the 2015 Street and Area Lighting Conference that LED street lights with exposed optics present a higher level of 'dirt-depreciation' (when light output is reduced by dirt build up on the lenses) and would require more frequent routine cleaning to remove dirt when compared to LED street lights that have sealed optical chambers, such as the GE Evolve.

LED street lights are unlike HPS and MH street lights in that each manufacturer's street light is design and constructed differently resulting in wide variations in performance and appearance from one to another. Single sourcing on one LED street light type ensures that consistency is maintained across the City. Street lights work together to illuminate the municipal right-of-way and consistency is important to ensure that sidewalks and roadways are adequately illuminated. Performance differences between different types of street lights can sometimes be considerable and if consistency is not maintained along a linear run of street lights, the resultant could be unwanted dark-spots between street lights, glare issues, isolated over-illumination or light trespass. Although not important to illumination, the difference in appearance caused by non-consistent LED light types could be viewed as unsightly by the public. Permitting single sourcing of the GE Evolve LED street light would ensure that consistency is maintained across the City, especially considering that it is the most prevalently deployed LED street light.

Post completion of the 2015 High Wattage Street Light Incentive Project, which replaced 10,319 street lights to the GE Evolve LED, the City received very few complaints from the public. Most complaints were regarding the loss of inadvertent lighting of private property which the majority of the public views as a positive change. In total, Staff received less than 20 complaints, far lower than anticipated. The low complaint rate is a resultant of the GE Evolve's ability to adequately light the municipal right-of-way and demonstrates that the public is overly satisfied with the quality and distribution of light. Allowing single sourcing of the GE Evolve will ensure that public satisfaction is maintained during and after the remainder of the City is converted to LED lighting as part of the 2016-2019 conversion initiative.

c) Technical Benefits

LED street lights are much more complicated than traditional street lights. They are more optically efficient than the old style of lights and have many more distribution shapes, wattages and lumen outputs (the amount of generated light). This creates challenges for designing new or replacement street lighting systems. There is a wide variation of performance for street lights from one manufacturer to the next. This further

compounds the design complications if there are multiple approved LED street lights compared to a limited or single source selection of lights. Lighting design is conducted through a ‘trial and error’ process which relies heavily on experience and familiarity of LED street light products lines. Staff and the City’s roster consultants are most familiar with the GE Evolve LED street light as it is the most used street light in the City. This familiarity enables new lighting designs to be completed in an efficient and timely manner when compared to attempting to conduct a design using less familiar LED street lights. Single sourcing on the GE Evolve will ensure that this familiarity is maintained and that designs are conducted quickly and accurately, which when utilizing roster consultants, equates to lower roster assignment costs.

Operationally familiarity with a specific product line, such as the GE Evolve, has further benefits as performance expectations, modes of failure and general life expectancy will be well known to Staff, the roster consultants and contractors.

LED street lighting technology has and continues to develop, evolve and improve at a rapid pace. Tracking these changes to ensure the most up-to-date street light version is being designed with and installed is currently problematic across the six approved LED street light types. It is difficult for Staff and roster consultants to be aware of the latest revisions due to the quantity of approved lights. Each manufacturer updates their street lights independently of each other meaning that Staff must be constantly refreshing the knowledge base of each and every approved product. Staff and roster consultants are most familiar with the GE Evolve LED street light product line mainly due to its wide-scale use as part of the 2015 High Wattage Street Light Incentive Project. If single sourcing of the GE Evolve is permitted, Staff could continue to improve its understanding of the product line as without single sourcing, equal attention must be given to all approved products – this is a time consuming endeavour which potentially takes staff away from other core duties.

Approximately 200-400 new street lights are installed annually through residential development. Street lighting design and installation is the responsibility of developers with the oversight of City. Developers must adhere to the City’s Standard Products List for street lighting equipment, inclusive of LED street lights. Currently, the Standard Products List includes three LED street lights of which developers are free to select one of the three approved lights. Despite this, the GE Evolve LED street light is the most commonly installed light through development. Standardizing on the GE Evolve street light is not expected to have any impact on development and would have similar benefits as it does with Staff and roster consultants. Single sourcing on one street light product will result in a gained familiarity with the developer’s electrical consultants which, based on the use of the GE Evolve in developments, likely already exists. Further, standardizing on one product will mean that all new street lights installed through development construction will match lights being installed by City initiatives thereby ensuring consistency for the City’s lit environment and for the maintenance program.

Some right-of-way configurations are difficult to illuminate, even with the more advanced optics of LED street lights. The GE Evolve street light optics can be customized through

the design and selection process to better match any challenging needs of the right-of-way. This customization was used for the 2012 Downtown Hamilton Lighting Upgrade Project on James Street North between Main Street East and Hunter Street East. A high level of lighting was required on the sidewalks due to the elevated pedestrian activity in the area. Out of the three approved LED street lights, the GE Evolve was the only light that could adequately illuminate the sidewalks and was subsequently installed. The street lights used in this segment of James Street North were modified by General Electric to provide a higher than standard amount of light towards the back (sidewalk side) of the street lights via customization at the request of the City. Without the customization of these street lights, adequate lighting levels would not have been achieved and would have resulted in substandard lighting levels for sidewalks. Customization of street lights provides the City with added flexibility through the design process to meet required lighting levels in instances that are challenging. The alternative to using customized lights is to relocate or install additional street light poles which are considerably more expensive than simple light replacements.

The next progression in the evolution of street lighting, by leveraging LED technology, is adaptive control systems. Adaptive control systems are installed on street light systems and establish an independent wireless communication network across of street lights contained within the network. The adaptive control system enables the street lights to be remotely and actively controlled (turned on, off and dimmed). It also automatically monitors and reports of any issues or outages of street lights therefore alerting the City immediately as issues are found so that the appropriate action may be taken to resolve the issue. All of the LED street lights installed in the 2015 High Wattage Street Light Incentive Project are 'controls-ready' in that they have internal components that are compatible and easily able to accept an adaptive control system. This feature was included in the 2014 revised base LED street light specifications. This specification will be maintained and carried forward for the street lights to be installed as part of the 2016-2019 wide-scale conversion initiative. Single sourcing on one street light product will be advantageous to the future installation of an adaptive controls system as it would ensure that all street lights are of the same specification. Any variation between products types could potentially cause compatibility issues when an adaptive controls system is installed as the specifications and operating profiles that the adaptive controls system connects to would have inherent variability. Considering that 11,360 GE Evolve LED street lights are already deployed across the City, sole sourcing on it would ensure that the compatibility across the majority of LED street lights would exist in advance of the installation of a future adaptive control system.

d) Cost and Delivery

Most of the six approved LED street lights are priced similarly as they are all competing products in the industry. The GE Evolve LED street light is on the lower end of the cost scale across all six approved products. Evidence of this is via the selection of its use for the 2015 High Wattage Street Light Incentive Project by the awarded contractor. Additionally, the GE Evolve LED street light is the most frequently used street light for both PW capital construction and development construction of which both utilize a low-bid tendering process. Permitting single sourcing of the GE Evolve will place the City in

a more favourable position to negotiation unit pricing for new construction and for supply of lights and parts for the maintenance program. Single sourcing will also allow the City to negotiate direct purchase of street lights with General Electric Canada. Direct purchase will remove the reliance on electrical distributors which typically provide a service mark-up between 5-10%, therefore saving the City added expense. General Electric Canada does permit direct sale to municipalities and only a small proportion of the other approved LED manufacturers allow direct sale. It is the City's intention for the 2016-2019 City-wide LED retrofit to purchase all project luminaires and enabling single sourcing to the GE Evolve coupled with the ability to purchase direct from General Electric Canada will potentially save the City upwards of \$800k.

The 2015 High Wattage Street Light Incentive Project operated on a tight completion timeline due to the required eligibility completion date for the Independent Electricity System Operator (IESO) saveONenergy incentive. The installation of 10,319 LED street lights had to be fully completed within a 12 month schedule. The availability and delivery of the LED project lights was a critical component to the success of the project. The selection of the GE Evolve LED street light by the awarded contractor was a combination of pricing and delivery. GE supplied project street lights ahead of the project schedule and averaged 3 weeks delivery per 1000 lights. In Q3 of 2015 GE implemented an SAP (System, Applications and Products) standard to their production and delivery process. Since this system has been implemented, GE has increased its delivery timelines made by the City and its contractors from an average of 3-4 weeks to 1-2 weeks. When comparing the ability to deliver lights to City projects from the approved LED products, GE has completed orders and delivered lights on average two weeks faster. Single sourcing on the GE Evolve will ensure that street lights are supplied in the most time efficient manner as possible to support both PW capital construction projects and the maintenance program. Additionally, GE has shown that it is capable of supplying lights for large scale projects such as what was completed in 2015.

ALTERNATIVES FOR CONSIDERATION

An alternative to the recommendations in this report is to sustain the three approved luminaires on the Standards and Approved Products list. Another option would be to expand the list to include the other three approved LED street lights, bringing the total to six approved LED street lights.

In order to deal with the maintenance requirements of the 11,360 GE Evolve LED street lights Staff could utilize Policy 11 purchasing rules to acquire lights and parts on an as-needed basis.

When purchasing large quantities of LED street lights the City could issue RFT's on an as needed basis.

These options would prove to be time consuming and potentially more expensive in the short and long term.

ALIGNMENT TO THE 2012 – 2015 STRATEGIC PLAN

Strategic Priority #1

A Prosperous & Healthy Community

WE enhance our image, economy and well-being by demonstrating that Hamilton is a great place to live, work, play and learn.

Strategic Objective

- 1.2 Continue to prioritize capital infrastructure projects to support managed growth and optimize community benefit.
- 1.5 Support the development and implementation of neighbourhood and City wide strategies that will improve the health and well-being of residents.
- 1.6 Enhance Overall Sustainability (financial, economic, social and environmental).

Strategic Priority #2

Valued & Sustainable Services

WE deliver high quality services that meet citizen needs and expectations, in a cost effective and responsible manner.

Strategic Objective

- 2.1 Implement processes to improve services, leverage technology and validate cost effectiveness and efficiencies across the Corporation.
- 2.3 Enhance customer service satisfaction.

Strategic Priority #3

Leadership & Governance

WE work together to ensure we are a government that is respectful towards each other and that the community has confidence and trust in.

Strategic Objective

- 3.4 Enhance opportunities for administrative and operational efficiencies.

APPENDICES AND SCHEDULES ATTACHED

None