

Request for Decision

LED Streetlight Conversions

Presented To:	City Council
Presented:	Tuesday, Mar 31, 2015
Report Date	Wednesday, Mar 25, 2015
Type:	Referred & Deferred Matters

Recommendation

For Information Only

Background

The City of Greater Sudbury (CGS) owns all streetlights within the City and electricity is provided through Greater Sudbury Utilities (GSU) or Hydro One Networks Inc. (HONI), depending on the area serviced. GSU also provides technical support, advice, and is contracted to maintain the system including the streetlight inventory database, and the repairs and maintenance of the streetlights.

There are currently 14,627 streetlights within CGS with 60% serviced by GSU and the remaining 40% serviced by HONI. Of the current inventory, approximately 3,000 are LED.

In 2012, CGS Council approved a streetlight retrofit project that resulted in the conversion of 1,315 streetlights from high pressure sodium (HPS) to light emitting diode (LED). Advantages of the project were a reduction in green house gas emission, reduced light pollution and energy savings.

Streetlight Energy

The Ontario Energy Board (OEB) regulates the province's electricity and natural gas sectors. One of its key regulatory functions is approving delivery rates for electricity distribution and transmission, including those for GSU and HONI.

The annual streetlight energy costs have grown significantly over the last 10 years largely due to the cost of electricity. Additionally, a portion of the increase can be attributed to growth in the streetlight network.

The cost of streetlight energy can be broken into two types of charges. There are fixed costs that do not vary based on the amount of electricity consumed. There are also variable charges that are based on the amount of electricity used. The intent of converting streetlights to LED is to reduce the variable portion of the

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Report Prepared By

Shawn Turner
Manager of Financial & Support
Services
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Division Review

David Shelsted
Director of Roads & Transportation
Services
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Recommended by the Department

Tony Cecutti
General Manager of Infrastructure
Services
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Recommended by the C.A.O.

Doug Nadorozny
Chief Administrative Officer
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electricity bill.

In 2013, GSU applied for a rate structure that increased the fixed cost per streetlight fixture in order to offset the declining revenues from the 2012 LED conversions.

Use of LED Street Lights

The following are some Ontario municipalities that have started converting their streetlight network from HPS fixtures to LED:

Kingston	10,000 street lights at an estimated cost of \$4 million
Markham	12,300 cobra-style street lights in 2012
Mississauga	49,000 street lights started in 2012 at a cost of \$26 million.
North Bay	5,600 at a cost of \$2.8M
Windsor	23,000 street lights starting in mid-2014 at an estimate cost of \$14.3 million

Other large municipalities in the United States have also undertaken large scale LED conversions. However, climate and energy rates vary dramatically which renders comparisons to these projects difficult.

American National Standard Practice for Roadway Lighting (RP-8)

CGS has adopted Pedestrian Lighting Standards for pedestrian road right-of-ways based on the American National Standard Practice for Roadway Lighting (RP-8). The standard provides for a standard of illumination that is considered appropriate and provides a safe level of lighting. Some current lighting levels do not meet the RP-8 standard. Further, straight conversion of some existing HPS to LED may provide less adequate lighting due to the limited dispersion of light with LEDs. The saveONenergy Retrofit Program Ontario incentive is only allowable for the conversion of existing streetlights to their equivalent LED and would not be granted for any improvements.

Current Opportunity

CGS, through GSU, has been pre-approved for an incentive in the combined amount of \$1.85 million in order to fund the conversion of existing HPS and low pressure sodium (LPS) streetlights to LED. The incentive is a per fixture rebate defined by the wattage of the bulb being replaced. LEDs are more energy efficient and have a longer useful life than traditional HPS and LPS lights. The saveONenergy Retrofit Program Ontario is offered by the Ontario Power Authority and is only available for streetlights converted by December 31, 2015. The incentive covers a portion of the costs for converting each of the 11,288 HPS and LPS streetlights. Based on the anticipated scope to be completed in 2015, the estimated rebate that can be achieved is in the range of \$0.5M to \$1.0M.

Objective and Scope

The objective for converting existing HPS and LPS streetlights to LED would be to realize operational savings that exceed the initial capital investment within the useful life of the lights (20 years). In order to benefit from the incentive, lights would need to be installed and verified prior to December 31, 2015. A preliminary business case was developed using estimated capital costs and energy savings. This work indicated that an LED streetlight retrofit has the potential to provide operating savings (energy and

maintenance) in excess of the capital cost. At a capital cost of \$8M and only considering energy savings, it is expected that the payback period would be approximately 9 years. This does not include maintenance savings and does not take into account lost interest revenue. Upon receipt of competitively procured costs, a final business case will be prepared in order to justify the economics of the project and to ultimately make the decision to proceed.

Converting 11,288 streetlights to LED requires a significant investment of resources in a short amount of time. It is the opinion of GSU and City staff that a project of this size requires a complete turnkey solution including a project manager/consultant responsible for all aspects of the project. This would include assessment, design, supply/storage, installation and removal/disposal of old units.

Lighting design and modeling will be required to assess the lighting levels in advance of carrying out the conversion from HPS/LPS to LED, thus requiring more time and resources. Without this study, some sidewalks & roadways may have reduced lighting levels as HPS disperses light differently than the more directional LED lighting. Where it is practical and reasonable to do so, lighting levels will be brought to RP-8 standards. However, some rural areas are serviced by spot streetlights that illuminate hills, corners, and intersections. These areas will be no brought to RP-8 standards but will undergo LED conversions.

In 2012, the City converted approximately 1,300 streetlights to LED. It is unlikely that the remaining 11,288 streetlights will be able to be replaced by the end of 2015. However, it would be advantageous to complete as many installs as possible in 2015, in order to qualify for the per fixture grant as described above. As a result, the implementation would need to take place over several years with a heavy emphasis on installing as many as possible in 2015.

Risks/ Rewards

As with any large capital project there are risks and rewards. Some of the more significant risks and rewards of converting streetlights to LED are:

Risks

The most significant risk to this project is the possibility of energy savings not being realized. Electricity providers are able to adjust electricity prices and the composition of billing structures twice annually. If the City completes the conversion on the remaining streetlights, there is a risk that GSU and HONI may revise the billing structure to include a higher portion of fixed charges. This would result in the City not achieving the expected financial savings in spite of reduced electricity usage.

Secondly, the useful life of LEDs is estimated by the manufacturer to be 20 years. There is a possibility that LEDs may not last 20 years and/or the "brightness" of LEDs may not be sufficient for the City's lighting needs for the full 20 years. As the analysis of the project will rely on 20 years to justify the economics of the project, a useful life of less than 20 years would jeopardize the case for the project.

Lastly, as with all projects, management of the contract is critical to ensure timelines and budgets are met as expected.

Rewards

Initial review of other LED conversion projects indicate that converting streetlights to LED would result in annual estimated electricity reductions of approximately 37% - 60%. As a result, the City would receive a considerable financial benefit from the conversion. It should be noted that this would not translate into a one for one reduction in financial savings, as there are fixed electricity costs that would not change.

Secondly, there is a positive environmental outcome to the LED conversions such as a reduction in green

house gases.

Thirdly, annual maintenance costs are likely to decrease. The average life expectancy of the current HPS streetlights in use is approximately 5 years. The life expectancy of LEDs provided by the manufacture is approximately 20 years. As a result, the LED fixtures would not need to be replaced and serviced as often as the current HPS bulbs.

Lastly, the project supports the CGS Mission Statement of managing the resources efficiently, responsibly and effectively as well as acting today in the interests of tomorrow.

Financing

The Roads division has included draws from reserve in the 2015 Capital Budget and 2016-2017 outlook. As the project is new and estimates are drawn from limited experience in this subject matter, Roads has allocated the following amounts:

2015 - \$4 Million,
2016 - \$2 Million,
2017 - \$2 Million,

These amounts are preliminary estimates and will likely be adjusted as the results from the RFP process are received. There are also largely dependent on the amount of work that the successful bidder is able to do in a given year.

Conclusion

LED streetlight technology has improved significantly in the last few years and LED streetlights are now standard equipment for new City streetlight projects or major road reconstructions.

In order to take advantage of the saveONenergy Retrofit Program Ontario and subject to a positive business case, staff are seeking approval to procure a contract that is to include the design, supply and installation of LED fixtures in accordance with the City's Roadway Lighting Policy and Pedestrian Lighting Standards.

Preliminary estimates to Finance this project in the amounts of \$4 million in 2015, \$2 million in 2016, and \$2 million in 2017 are to be provided from the Capital Financing Reserve Fund- Roads.

Once the business case is finalized and a vendor selected, annually updates will be presented to Council on the progress of the project.

Request for Decision

LED Streetlight Conversions

Presented To: Operations Committee

Presented: Tuesday, Feb 03, 2015

Report Date Wednesday, Jan 28, 2015

Type: Presentations

Recommendation

That authority be provided to the General Manager of Infrastructure Services to complete retrofits of all C.G.S. streetlights, subject to a positive business case, as outlined in the report from the General Manager of Infrastructure Services dated January 28, 2015 and that;

It is a multi-year program with locations determined by the General Manager of Infrastructure Services and that;

Preliminary estimates to Finance this project in the amounts of \$4 million in 2015, \$2 million in 2016, and \$2 million in 2017 be provided from the Capital Financing Reserve Fund- Roads and that;

Savings from the project be credited back to the Capital Financing Reserve Fund – Roads until the capital investment has been reached and that;

The General Manager of Infrastructure Services be provided the authority to maximize the available per fixture grant in 2015 and that;

Procurement of the contract is to include design, supply and installation of LED fixtures in accordance with the City's Roadway Lighting Policy and Pedestrian Lighting Standards and that;

Staff report back to Operations Committee annually on the progress of the LED Streetlight conversion program.

Finance Implications

If approved, funding for this project is provided for in the 2015 Capital Budget and 2016-2017 outlook. Annual funding allotments will drawn from the Capital Financing Reserve Fund - Roads. The balance in this reserve fund as of December 31, 2014 is \$10 million. Approval of this initiative commits \$8 million from this reserve fund. Savings generated will be used to pay back the reserve fund until the entire amount is repaid.

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Report Prepared By

Shawn Turner
Manager of Financial & Support
Services

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Division Review

David Shelsted
Director of Roads & Transportation
Services

Digitally Signed Jan 28, 15

Recommended by the Department

Tony Cecutti
General Manager of Infrastructure
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Recommended by the C.A.O.

Doug Nadorozny
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Lighting design and modeling will be required to assess the lighting levels in advance of carrying out the conversion from HPS/LPS to LED, thus requiring more time and resources. Without this study, some sidewalks & roadways may have reduced lighting levels as HPS disperses light differently than the more directional LED lighting. Where it is practical and reasonable to do so, lighting levels will be brought to RP-8 standards. However, some rural areas are serviced by spot streetlights that illuminate hills, corners, and intersections. These areas will be not brought to RP-8 standards but will undergo LED conversions.

In 2012, the City converted approximately 1,300 streetlights to LED. It is unlikely that the remaining 11,288 streetlights will be able to be replaced by the end of 2015. However, it would be advantageous to complete as many installs as possible in 2015, in order to qualify for the per fixture grant as described above. As a result, the implementation would need to take place over several years with a heavy emphasis on installing as many as possible in 2015.

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Request for Recommendation

Finance and Administration Committee




Type of Decision								
Meeting Date	February 11, 2015				Report Date	February 11, 2015		
Decision Requested	x	Yes		No	Priority	x	High	Low
	Direction Only				Type of Meeting	x	Open	Closed

Report Title
LED Streetlight Conversions, Supplementary Report

Budget Impact/Policy Implication		Recommendation	
x	This report has been reviewed by the Finance Division and the funding source has been identified.	<p>That authority be provided to the General Manager of Infrastructure Services to complete retrofits of all CGS streetlights, subject to a positive business case, as outlined in the report from the General Manager of Infrastructure Services dated January 28, 2015 and that;</p> <p>It is a multi-year program with locations determined by the General Manager of Infrastructure Services and that;</p> <p>Preliminary estimates to finance this project in the amounts of \$4 million in 2015, \$2 million in 2016, and \$2 million in 2017 be provided from the Capital Financing Reserve Fund – Roads and that;</p> <p>Savings from the project be credited back to the Capital Financing Reserve Fund – Roads until the capital investment has been reached and that;</p> <p>The General Manager of Infrastructure Services be provided the authority to maximize the available per fixture grant in 2015 and that;</p>	
<p>If approved, funding for this project is provided for in the 2015 Capital Budget and 2016-2017 outlook. Annual funding allotments will be drawn from the Capital Financing Reserve Fund – Roads. The balance in this reserve fund as of December 31, 2014 is \$10 million. Approval of this initiative commits \$8 million from this reserve fund. Savings generated will be used to pay back the reserve fund until the entire amount is repaid.</p>			
x	Background Attached	x	Recommendation Continued

Recommended by the Department
<p>Tony Cecutti General Manager of Infrastructure Services</p>

Recommended by the C.A.O.
<p>Doug Nadrozny Chief Administrative Officer</p>

Report Prepared By	Division Review
 Tony Cecutti General Manager of Infrastructure Services	

RECOMMENDATION CONTINUED

Procurement of the contract is to include design, supply and installation of LED fixtures in accordance with the City's Roadway Lighting Policy and Pedestrian Lighting Standards and that;

Staff report back to Operations Committee annually on the progress of the LED Streetlight Conversion Program.

BACKGROUND

Please refer to attached supplemental information.



MEMO

TO: Mayor and Council

FROM: Tony Cecutti, General Manager, Infrastructure Services

CC: Doug Nadorozny, CAO

RE: LED Street Light Retrofit Rebate Opportunity, 2015
Supplement to Staff Report to Operations Committee,
February 3, 2015

DATE: February 10, 2015

Please find attached supplemental information to our February 3, 2015 staff report regarding an opportunity to obtain a rebate from the Ontario Power Authority. The report provides information that is supplementary to our original report, and should be read in conjunction with that information.

Two key requests came out of the discussion at Operations Committee, summarized as follows. Staff was asked to provide any additional information that formed the basis of the numbers in our staff report and substantiated the business case study to date. Secondly staff was asked to provide a summary of the information available to date on the 2012 LED street light retrofit program.

LED Streetlight Project Supplementary Information

Background

This supplementary information is provided in response to the Operations Committee request on February 3rd, 2014 for additional financial data regarding Light Emitting Diode (LED) streetlights.

In November 2014, the City was advised that it could receive a per fixture rebate for converting current High Pressure Sodium (HPS) streetlights to LED. The amount of the rebate varies depending on the wattage of the bulb being replaced. In aggregate, this rebate is approximately \$1.85M if all streetlights were retrofitted to LED. City staff met internally as well as with Greater Sudbury Utilities (G.S.U.) staff and LED providers in an attempt to complete a preliminary business case that would provide sufficient information to suggest that a conversion of this magnitude is feasible and to satisfy staff that it had the potential to be a worthwhile endeavor.

Table 1 below was calculated by City staff in conjunction with G.S.U. staff and indicates the projected energy savings (kWh) if the City were to retrofit all existing streetlights to LED. The total streetlights and energy savings are divided between the two energy distributors based on the number of lights in their respective jurisdiction. As can be seen, the estimated electricity savings are approximately 37%. This analysis is based on replacement of current wattages with equivalent LED wattages. It has been suggested by product providers that some wattages may be able to be reduced upon conversion, thereby increasing the rate of energy savings. However, this would need to be determined through a design of the streetlight network to ensure adequate lighting is provided.

Table 1
Electricity Consumption

	GSU	HONI	Total
Number of Fixtures	6,232	5,056	11,288
Electricity Before Retrofit (kWh)	6,978,431	4,944,943	11,923,374
Estimated Electricity Savings (kWh)	2,496,966	1,942,972	4,439,938
Estimated Energy Reduction	35.80%	39.30%	37.20%

This savings in energy was then translated into a potential cost reduction based on the rates of the City's two energy distributors –G.S.U. and Hydro One Networks Incorporated (HONI). Table 2 below illustrates the expected energy savings based on the above analysis and returns a payback period based on an estimated capital cost.

Table 2
Pay-Back (Years) for Conversion (Estimated)

Estimated Capital Costs	GSU	HONI	Total
Material Costs	3,000,000	2,000,000	5,000,000
Installation	1,500,000	1,000,000	2,500,000
Design	120,000	80,000	200,000
Management/Contingency	180,000	120,000	300,000
Total Estimated Capital Cost	\$4,800,000	\$3,200,000	\$8,000,000
Less: Rebate	\$1,109,809	\$744,661	\$1,854,470
Net Capital Cost	\$3,690,191	\$2,455,339	\$6,145,530
Estimated Reduction in Hydro Costs	\$285,512	\$378,232	\$663,744 *
Pay-Back (Years) after Rebate	13	6	9 **

Notes:

*Based on replacement of equivalent wattage LED at current hydro rates.

** Does not include maintenance savings as City currently has a fixed price contract with G.S.U. ending March, 2015. Lost interest revenue is also not included.

Further, preliminary work on this project also reviewed the sensitivity of the project to various capital cost structures. Table 3 below displays the results of this analysis.

Table 3
Sensitivity Analysis
Pay-Back (Years) after Rebate

Realized Capital Cost Scenarios	GSU	HONI	Total
\$6M	9	4	6
\$8M	13	6	9
\$10M	17	9	12
\$12M	21	11	15

As is evident in Table 3, the payback period differs among the various energy distributors. This is largely a result of the billing structure at each utility. G.S.U. maintains a higher percentage of their bill devoted

to a fixed charge, whereby HONI charges are proportionately more variable. As a result, savings on energy consumption are more fully translated into financial savings at HONI and in turn reduce the payback period of expended capital.

There are still some issues that remain to be factored in to the above analysis. These include maintenance savings, wattage replacement, confirmed capital cost, number of lights to be replaced and design that would indicate if there are any additional lights needed. This will be dealt with as follows:

Maintenance costs: As the life expectancy of an LED is approximately 4 times longer than an HPS light, it is reasonable to expect some savings in the maintenance of streetlights. Currently, G.S.U. is under a fixed contract to provide maintenance to the entire streetlight network. This contract expires at the end of March, 2015. Staff will be reviewing the requirements to ensure that the City benefits from reduced maintenance to current and future LED conversions.

Wattage replacement, confirmed capital cost and number of lights: These will all be confirmed upon receipt and award of a competitively procured contract.

The business case for this project will be continually updated as the above information is received and evaluated to ensure that the City is receiving an adequate payback on its capital investment.

2012 Experience

At the Operations Committee on February 3rd, 2014 a request for additional information regarding the 2012 LED conversion program was made. Table 4 below summarizes the results of this capital investment. As can be seen, the capital cost was significantly lower than the estimated cost by approximately \$200,000 resulting in a reduced cost per fixture after the \$245 rebate.

Table 4
2012 Streetlight Conversions-Capital Cost

	Per Report	Actual
# Fixtures	1,315	1,319
Capital Cost	1,250,254	1,050,006
Incentives (\$245/fixture)	(322,175)	(323,155)
Net Capital Cost	928,079	726,851
Cost per Fixture	706	547

Table 5 below depicts the operating results of the 2012 LED conversions. This capital investment has not yielded the expected operating savings in maintenance or energy costs. The expected maintenance savings were not realized as maintenance was already under a fixed contract with G.S.U. and the contract was not successfully renegotiated. Energy costs were not reduced by the expected amount as a result of a change in billing structure at G.S.U. In May, 2013 a revised billing structure which included a large increase in fixed costs reduced potential energy savings by approximately \$16,000 in 2013. This structure has been carried forward and reduced anticipated savings by approximately \$25,000 in 2014.

These reduced savings result in a payback period of 25 years, assuming \$38,572 savings in year one and \$28,816 annually after that. Upon successful renegotiation/procurement of a new maintenance contract, the payback period will be revisited and adjusted to reflect savings as a result of these conversions.

Table 5
2012 Streetlight Conversions

	Per Report	Actual Savings	
		2013	2014
Maintenance Savings	36,729	0	0
Energy Savings	55,000	38,752	28,816
Total Savings	91,729	38,752	28,816
 Payback Period	 10.1		25

Summary

In summary, the opportunity to benefit from LED conversions may exist well into the future. However, the City is faced with the opportunity to benefit from an additional rebate program that has the potential to offer an approximate 20-25% discount on the capital cost of replacement. Typically the City will have a more defined case for a project of this magnitude, however there are still a number of issues that need to be dealt with and it was determined that to deal with them sequentially would reduce the ability of the City to maximize the per fixture rebate. These issues already identified include maintenance costs, design of streetlights, number and wattage of replacements achievable in 2015 and dialogue with the City's energy distribution partners in regards to rate structures. This more parallel program of implementation alongside design and analysis is being recommended in order to receive maximum benefit of the rebate program.