LED Street Light Conversion
An Upper Tier Perspective

Capital Planning and Delivery
Transportation Services

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November 23, 2016

York Region

York Region Street Lighting

- Region owns and operates all street lights at Regional intersections and select midblock locations
- Most midblock locations are owned and operated by the area municipality
- Annual energy cost for street lighting is approximately $1.25M

York Region Street Light Inventory

- Total Number of street lights owned by YR

Total	HPS	Mercury Vapour	LED
6231	6197	14	20
	99.45%	0.22%	0.32%

- Breakdown of HPS

Total HPS	75w	100w	150w	175w	200w	250w	400w
6197	81	11	15	6	3692	2215	173
	1.31%	0.18%	0.31%	0.10%	59.58%	37.74%	2.79%

York Region HPS Street Light Inventory

Aurora	395
East Gwillimbury	409
Georgina	223
King	442
Markham	1476
Newmarket	316
Richmond Hill	782
Vaughan	1845
Whitchurch Stouffville	309
Total York	6197

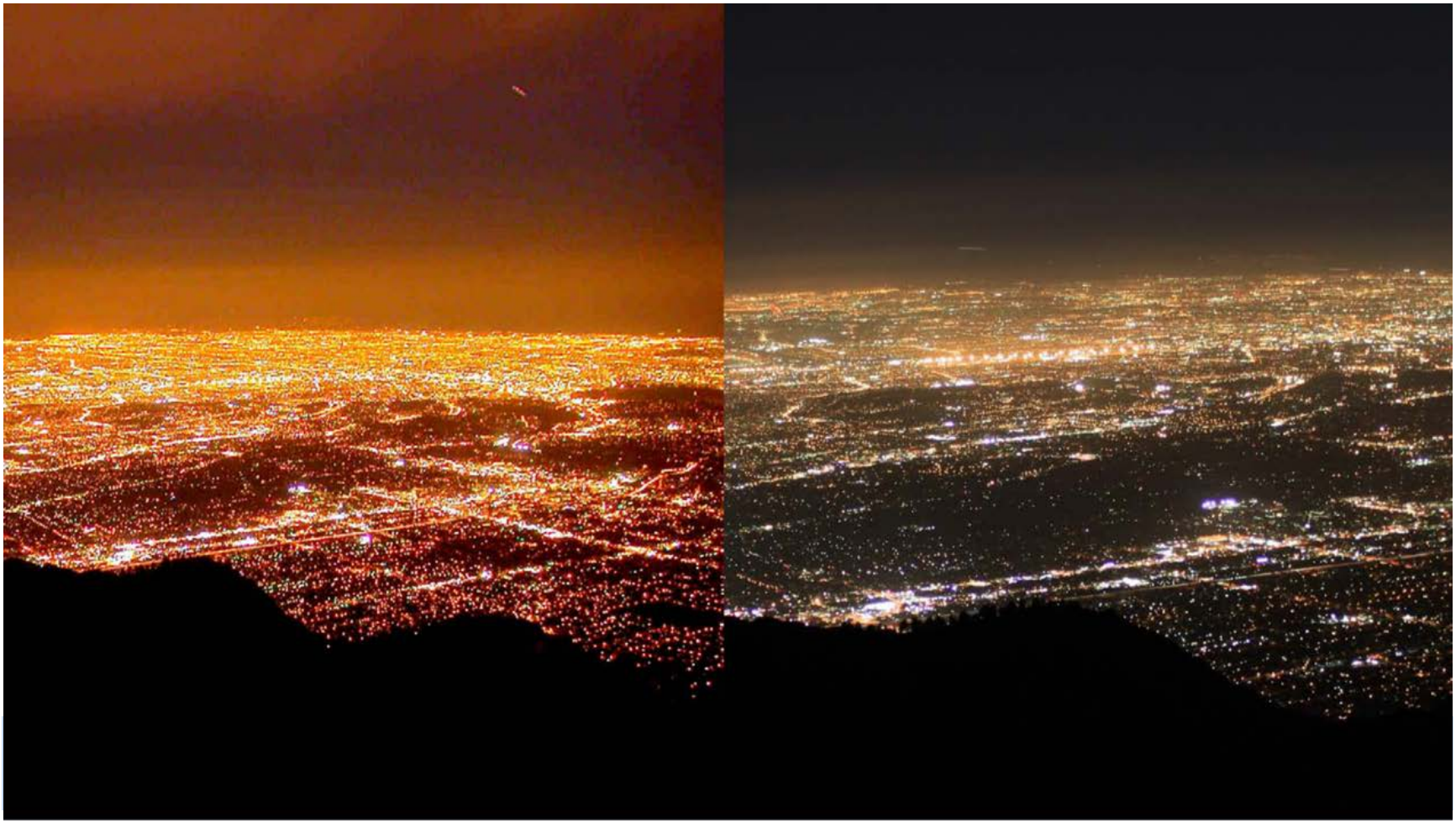
Business Case

- Due to the wattage of street lights on Regional roads, the energy reduction by converting to LED is not as significant (250 W HPS versus 165 W LED (not including the 60 W ballast))
- York Region is currently in the process of engaging a consultant to develop a business case

Benefits of LED Lighting

- Higher colour temperature is generally perceived as ‘brighter’ by observers.
- LEDs can provide better “lighting quality” when **properly designed**. LED luminaires optics are generally more uniform with less “hot spots” compared to HPS.
- Better colour rendering
- Reduced unwanted “skyglow”

City of Los Angeles – Before and After



Challenges

- Photometrics
- Energy Savings
- Aging Infrastructure
- Colour Temperature
- Technology
- Liability
- Partnership Agreements

Photometrics

- We cannot replace street lights purely for energy saving purposes without regard for light levels and uniformities
- The existing photometrics at Regional intersections may not meet current standards (“standard of the day”)
- LED replacements should meet or exceed current standards

Photometrics

- Contrary to popular belief, LED replacements produce less light than HPS measured in lumens (lm). For example;
  - 158 W LED produces 17,000 lm
  - 200 W HPS produces 22,000 lm
  - 250 W HPS produces 27,500 lm

Photometrics

- LED luminaires are optimized for energy savings with less lumen output and sharper cutoff optics with less light spill spread. Good for some applications, but generally not beneficial for intersection illumination without additional poles / luminaires
- LED luminaires do not provide the same level of boulevard lighting as HPS

Energy Savings and Payback Period

- We may encounter difficulties in establishing an agreeable payback period for intersection illumination.
- Intersections need a higher level of illumination in comparison to midblock street lighting.
- The energy savings for intersection illumination will likely not be as optimistic compared to midblock applications.

Energy Savings and Payback Period

- Rough comparison:
  - Midblock LED conversion translates to roughly 59% energy savings (126 W LED vs. 250 W HPS)
  - Intersection LED conversion translates to roughly 36% energy savings (158 W LED vs. 200 W HPS)

Aging Infrastructure

- LED street lighting replacement programs often ignore the aging circuit feeder infrastructure in which it relies upon.
- Existing branch circuits may have reached their end of life. The branch circuit cable insulations may have aged to the point of causing neutral/grounding/circuiting faults.

Aging Infrastructure

- Electronic components are generally less robust in comparison to traditional HPS magnetic ballasts. Any surges and/or lightning strikes may become problematic.

Colour Temperature

- American Medical Association recommended that LED street lights be no more than 3000K
- Blue spectrum is what concerns the AMA
- Working with our Environmental Services and Property Service to develop a standard

Technology

- The equivalent to a 250 W HPS street light is 165 W
- There is currently a LED street light available that is 382 W (NVN Navion)
- LED street lights diminish in brightness over time. Adaptive controls would allow the owner to increase the wattage as the light diminishes

Liability

- The difference between lighting a Regional intersection with HPS and LED is fundamentally different due to:
  - Colour temperature
  - Sharp cut offs
  - Street light location
- Converting from HPS to LED may require additional infrastructure

Liability

- York Region had issued a purchase order to an area municipality to replace all Regional HPS street lights with LED
- The area municipality cited liability concerns and stopped the agreement

Intersection Review: Major / Major

- In order to meet the lighting requirements recommended by ANSI/IES RP-8-14 for the major/major intersections, a total of 112 LED Luminaires of various wattages for a total connected load of 26kW will need to be installed.
- A total of 24 new concrete poles and bracket arms will need to be installed.

Intersection Review: Major / Major

- A total of 49 luminaires on poles owned by the municipality will also need to be upgraded to higher wattages.

Intersection Review: Major / Collector

- In order to meet the lighting requirements recommended by ANSI/IES RP-8-14 for the Major/Collector intersections identified in this report, a total of 99 LED Luminaires of various wattages for a total connected load of 15.6kW will need to be installed.
- A total of 22 new concrete poles and bracket arms will need to be installed.

Intersection Review: Major / Collector

- A total of 15 luminaires on poles owned by the City of Markham will also need to be upgraded to higher wattages.

Intersection Review: Major / Local

- In order to meet the lighting requirements recommended by ANSI/IES RP-8-14 for the Major/Local intersections identified in this report, a total of 293 LED Luminaires of various wattages for a total connected load of 32.2kW will need to be installed.
- A total of 67 new concrete poles and bracket arms will need to be installed.

Partnership Agreements

- York Region has nine area municipalities
- Each as expressed a desire to move forward with an LED street light conversion program
- Some providers were unable to create a separate agreement with York Region
- Others are “going alone”, but they will not wait for York Region

Other Upper Tier Municipalities

- Durham
  - Have not installed any LED lighting
  - Not convinced of the business case, yet
- Niagara
  - Completed LED conversion in Niagara Falls
  - Now specify LED street light luminares
  - Niagara now owns all street lights on Regional corridors

Other Upper Tier Municipalities

- Peel
  - Partnering with the three area municipalities
  - Boulevard lighting now falls under Peel jurisdiction
- Waterloo
  - Partnering with the seven area municipalities
  - Prequalifying venders
  - Adaptive control

VIVA Next Yonge Street

- Both HPS and LED options were able to meet the required lighting standards as per the TAC 2006 manual
- Life Cycle Cost Analysis recommended that HPS be used over LED as the present value for the HPS option is lower than the LED option

Other Points of Interest

- Disposal of HPS luminaires is problematic due to mercury content. No mercury in LED.
- Town of Richmond Hill is the only municipality in York Region with skyglow bylaws.
- Highway 407/412 interchange was recently lit using LED. Results have been well received.

Next Steps

- Continue to communicate with area municipalities as they proceed with their LED conversion programs
- Develop a business case
- Clarify opportunities and challenges
- Standardize wattage and colour temperature

Discussion

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