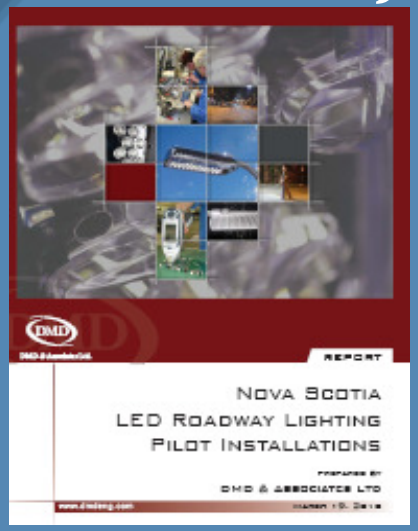
Nova Scotia LED Pilot Project



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Overview

Scope - Retrofit existing 1100 cobra head street lights with new LED street lights in 19 communities throughout Nova Scotia

Areas - Municipal roads, Halifax's Stanfield International Airport roads and parking lot and provincial highways.

Partners - LED Roadway Lighting Limited (LRL), ecoNova Scotia, Conserve Nova Scotia, and Natural Resources Canada.

DMD and Associates Ltd. - Retained to oversee, review, validate results and prepare a report.

Products

LRL Satellite Series

Cobra Head

Issues

Cost - Better quality LED street lights can be over ***$1,000*** whereas a typical cobra head luminaire is typically around ***$200.***

Light Loss Factor - LED luminaires have varying heat management systems which are a function of thermodynamics (not a typical lighting designers background). The higher the junction temperature, the higher its light loss factor. IESNA LM-80 reports defines a test method to define the rate of loss of output over time at different junction temperatures. ***This is key as it is used to define the light loss factor applied to the design***

Standardization - LED roadway luminaires are relatively new to the market and as such their is a lack of proven specifications. ***Products vary in design and optics.***

Lack of Proven Long Term Performance - As LED roadway luminaires are new to the industry, long term performance has not been confirmed. ***This leads to some level of risk to the owner.***

Flat rate lighting – Utility must develop flat rates for LED's

Testing

Standards

IESNA RP-8 or TAC were adhered to

Key elements are:
Average - Illuminance or luminance
Uniformity
Veiling Luminance

Standards

Road and Pedestrian Conflict Area		Pavement Classification (Minimum Manintained Average Values)			Uniformity Ratio	Veiling Luminance Ratio
Road	Pedestrian Conflict Area	R1 lux/fc	R2 & R3 lux/fc	R4 lux/fc	E_{avg}/E_{min}	L_{vmax}/L_{avg}
Freeway Class A		6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Freeway Class B		4.0/0.4	6.0/0.6	5.0/0.5	3.0	0.3
Expressway	High	10.0/1.0	14.0/1.4	13.0/1.3	3.0	0.3
	Medium	8.0/0.8	12.0/1.2	10.0/1.0	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Major	High	12.0/1.2	17.0/1.7	15.0/1.5	3.0	0.3
	Medium	9.0/0.9	13.0/1.3	11.0/1.1	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Collector	High	8.0/0.8	12.0/1.2	10.0/1.0	4.0	0.4
	Medium	6.0/0.6	9.0/0.9	8.0/0.8	4.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	4.0	0.4
Local	High	6.0/0.6	9.0/0.9	8.0/0.8	6.0	0.4
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

Calculations

Many wattage and distributions exist so to optimize benefits and provide the required levels computer lighting calculations must be undertaken.

Today's computer lighting design software is easy to use however a qualified electrical engineer or lighting designer should do the calculations, ***not the supplier***.

Calculations

Road Types (arterial, collector, local), Pedestrian Conflicts (high, medium, low) and pavement type (R3) defines lighting levels

Pole Heights, light loss factors, setbacks, arms lengths, luminaire wattages, pole spacing and road widths used for calculations.

Light Loss Factor (20 years) - 0.84 (LLD) x 0.90 (LDD) x 0.95 (EF) = 0.72 – Cleaning required at least every 10 years

Computer calculations undertaken using Acuity Brands "Roadway Tool". One calc was undertaken for new LED's and one for existing cobra heads.

Used absolute photometric files for all LED's.

Calculations

Approach to Combined Services		
Road Width	5.81m	5.81m
Number of Lanes	2	2
Median Width	n/a	n/a
Luminaire	150W HPS	S96M
Mounting Height	9.14m	9.14m
Arm Length	4.57m	4.57m
Setback	4.57m	4.57m
Spacing	46m	46m
Lamp Lumens	16000	Absolute
Light Loss Factor	0.72	0.72
Luminance		
Average	0.4 cd/m2	0.7 cd/m2
Avg/Min	2	1.8
Max/Min	3.5	3.2
Illuminance		
Average	7.3 lux	9.2 lux
Avg/Min	4.3	3.3
Lv Ratio	0.2	0.3

Calculations

Location	Existing Fixture	Wattage Used Per Fixture	LED Roadway Replacement Fixture	Wattage Used Per Fixture	Energy Savings	Number of Fixtures Replaced	Total Wattages	
							Before	After
Annapolis	100W HPS	137	S96M	88	36%	102	13,974	8,976
Annapolis	70W HPS	94	S48M	44	53%	10	940	440
Annapolis	400W HPS	465	S96M	88	81%	15	6,975	1,320
Annapolis	100W HPS	137	S96M	88	36%	8	1,096	704
Yarmouth	100W HPS	137	S96M	88	36%	24	3,288	2,112
HRM	150W HPS	193	S96M	88	54%	40	7,720	3,520
HRM	100W HPS	137	S96M	88	36%	14	1,918	1,232
HRM	150W HPS	193	S96M	88	54%	27	5,211	2,376
HRM	70W HPS	94	S48M	44	53%	32	3,008	1,408
HRM	70W HPS	94	S96M	88	6%	32	3,008	2,816
Yarmouth	70W HPS	94	S72M	66	30%	34	3,196	2,244
Yarmouth	250W HPS	292	S96M	88	70%	2	584	176
Bridgewater	70W HPS	94	S48M	44	53%	31	2,914	1,364
Bridgewater	70W HPS	94	S48M	44	53%	13	1,222	572
Bridgewater	150W HPS	193	S96M	88	54%	16	3,088	1,408
Wolfville	100W HPS	137	S96M	88	36%	7	959	616
Grand Pre	100W HPS	137	S96M	88	36%	3	411	264
Truro	100W HPS	137	S96M	88	36%	16	2,192	1,408
Stanfield Airport	250W HPS	292	S96M	88	70%	14	4,088	1,232
Stanfield Airport	150W HPS	193	S96M	88	54%	11	2,123	968
Berwick	250W HPS *	292	S96M	88	40%	60	4,088	2,464
Parrsboro	400W HPS	465	S96M	88	81%	20	9,300	1,760
Parrsboro	100W HPS	137	S72M	66	52%	19	2,603	1,254
Parrsboro	250W HPS	292	S96M	88	70%	11	3,212	968
Port Hawkesbury	250W HPS	292	S96M	88	70%	10	2,920	880
Richmond County	70W HPS	94	S96M	88	6%	7	658	616
Amherst	100W HPS	137	S96M	88	36%	90	12,330	7,920
Springhill	70W HPS	94	S48M	44	53%	4	376	176
Springhill	100W HPS	137	S72M	66	52%	6	822	396
St Peters	100W HPS	137	S72M	66	52%	9	1,233	594
Arachat	100W HPS	137	S48M	44	68%	9	1,233	396
New Glasgow	250W HPS	292	S96M	88	70%	17	4,964	1,496
New Glasgow	100W HPS	137	S48M	44	68%	43	5,891	1,892
Antigonish	100W HPS	137	S72M	66	52%	60	8,220	3,960
Lunenburg	100W HPS	137	S72M	66	52%	60	8,220	3,960
HRM	70W HPS	94	S48M	44	53%	10	940	440
HRM	150W HPS	193	S96M	88	54%	24	4,632	2,112
HRM	100W HPS	137	S72M	66	52%	10	1,370	660
HRM	100W HPS	137	S72M	66	52%	34	4,658	2,244
Bedford	150W HPS	193	S96M	88	54%	15	2,895	1,320
Bedford	100W HPS	137	S72M	66	52%	15	2,055	990
Dartmouth	150W HPS	193	S96M	88	54%	7	1,351	616
Dartmouth	250W HPS	292	S96M	88	70%	8	2,336	704
Dartmouth	150W HPS	193	S96M	88	54%	18	3,474	1,584
Dept of Trans IR	180W LPS	220	S96M	88	60%	48	10,560	4,224
Dept of Trans IR	180W LPS	220	S96M	88	60%	34	7,480	2,992
HRM	100W HPS	137	S96M	88	36%	1	137	88
Note: At Berwick location, LED Roadway changed 14 x 250W HPS fixtures to 28 x S6200 fixtures								
						Totals	**1,100**	**175,873**	**81,862**

Total Estimated Energy Savings 53%

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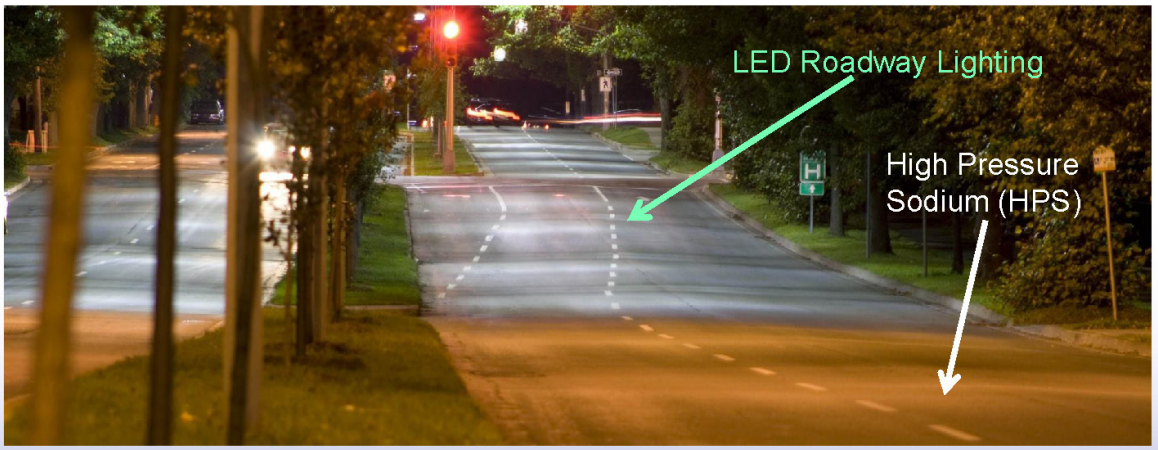
Results

An energy savings of ***53%*** will be gained from retrofitting the 1100 existing cobra head luminaires with the LRL Satellite luminaires.

If additional research funding is available, it is recommended the long term results of this pilot be measured and the results published.

Halifax, Nova Scotia (Robie St) - 55% Energy Savings



196 Watts
HPS - 150W Bulb

88 Watts
Satellite™ 96 LED-280mA

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Q & A