Roadway Lighting Conference
Anchorage Alaska, Dec 08

LED and Adaptive Lighting Pilots in British Columbia

Roy Hughes, P.Eng., LC

BC hydro

The Provincial Energy Goals… BC hydro

BC Provincial Energy Commitments:

- 50% of BC Hydro's incremental resource needs met by conservation by 2020
- BC Government carbon neutral by 2010
- BC will be electricity self-sufficient by 2016

The Municipal Challenges… BC hydro

- Local government's spend significant amounts of money on excess lighting
- BC municipalities have committed to lowering greenhouse gases
- Power costs are rising faster than inflation.

A Practical Solution BC hydro

- The most immediate solution and the cleanest source of energy is "the energy that isn't used"
- Municipalities have reduced facilities energy costs assisted by Power Smart Energy Efficiency programs and Provincial incentives
- What can we do for Roadway Lighting?

Source Efficacies

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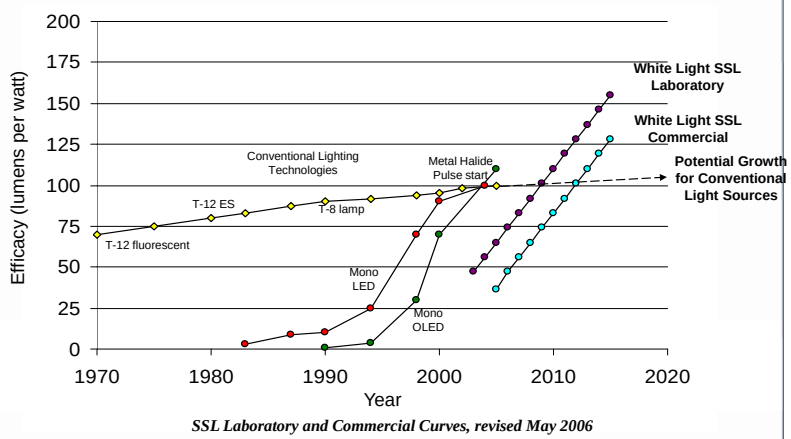
Accelerated R&D for White Light SSL



SSL Laboratory and Commercial Curves, revised May 2006

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LED Heads for Street and Roadway Lighting

Richmond:

3 -175W MH pathway luminaires, mounted at 4.5m were replaced with 42W LED luminaire

- Using the Lux Bright of California 42W LED head

Surrey:

3 -100W HPS mounted at 7.5m were replaced with the 42W LED luminaire

- Using the Lux Bright of California 42W LED head

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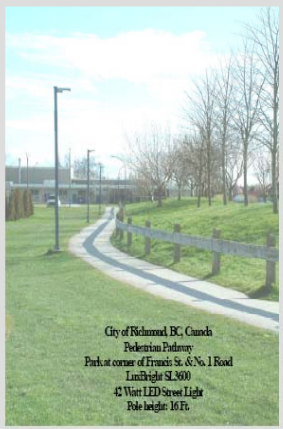

175W MH - 4.5lux ave.
42W LED - 4.1 lux ave.
As the Richmond site is a small path, the visual quality is seen to be acceptable

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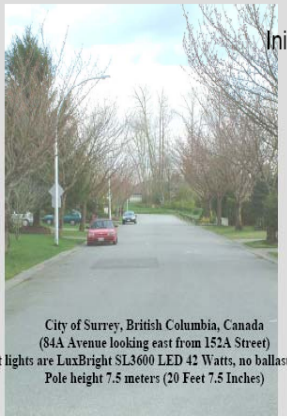
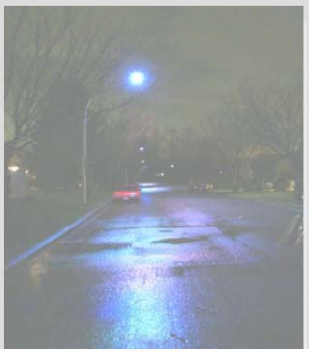


100W HPS - 5.4lux
42W LED - 1.3 lux
Initial comments indicate light levels are not sufficient



Vancouver Children's Hospital

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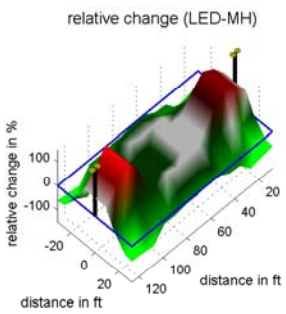
LED Parking Lot Lighting



MOT/BCH Pilot - Cole Rd Rest Area

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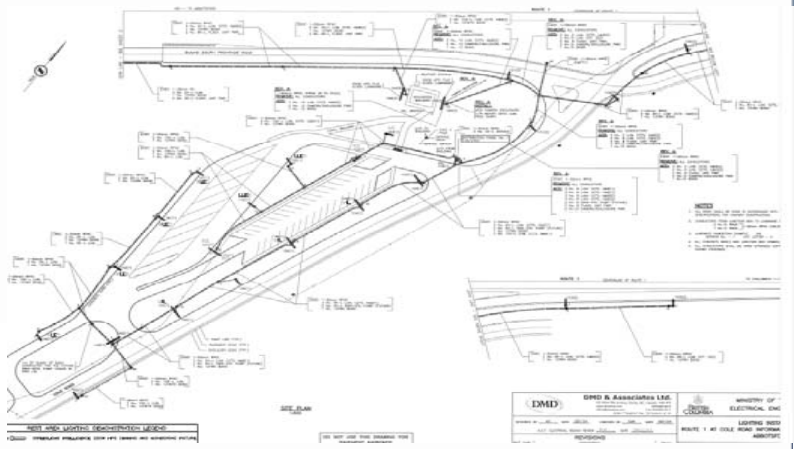

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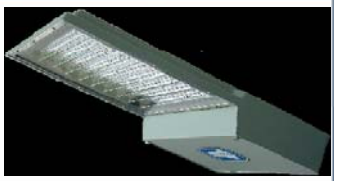
135 Watt LED

LED
Ruud Lighting Canada



125 Watt LED
replaces 200W HPS
www.leotek.com

http://www.ruud.ca/led/The_EDGE.pdf

Induction Lighting

BC hydro

100 Watt Induction Lamp

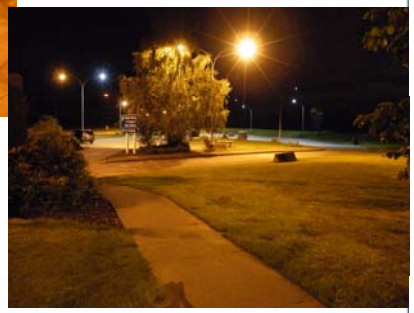
Advantages:

- Long Life - 100,000 hours
- Low Maintenance
- Excellent colour Rendering – 80 CRI
- Good efficacy – 80 lumens/watt
- Instant on and instant re-strike

miser LIGHTING INC.

Cole Road Rest Area

BCHydro



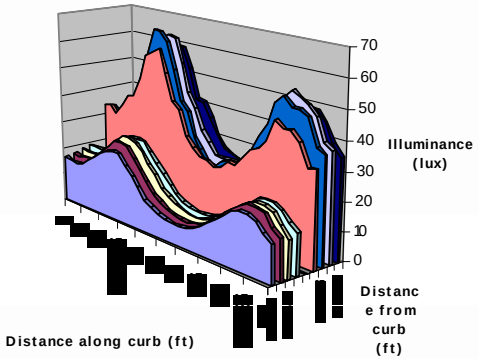
Cole Road Rest Area

BCHydro

HPS vs LLED (#1C2 and 1D2)

High Pressure Sodium & LED

- Sample #1



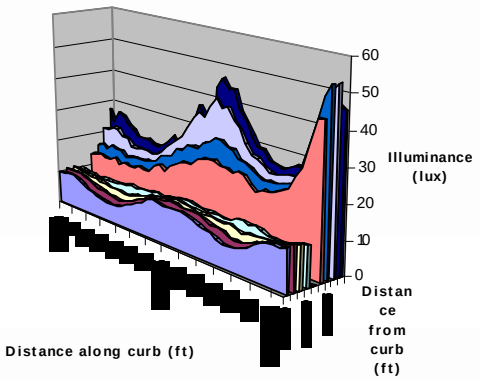
Cole Road Rest Area

BCHydro

HPS vs RLED (#1A1, 1B1, and 1A2)

High Pressure Sodium & LED

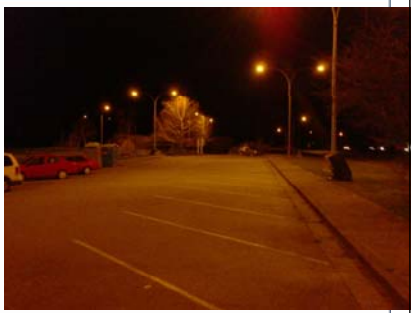
– Sample #2



Cole Road Rest Area

BCHydro

135 Watt LED



250 Watt HPS

Cole Road Rest Area

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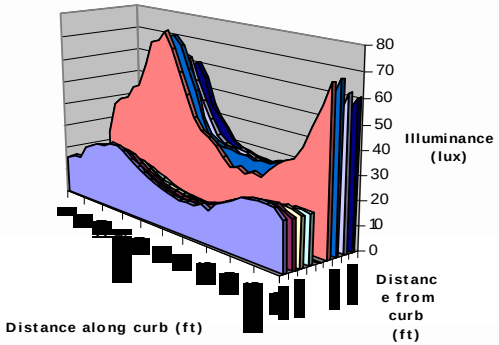
HPS vs MIL (#1A6 and 1D4)

High Pressure Sodium & Induction Lamp



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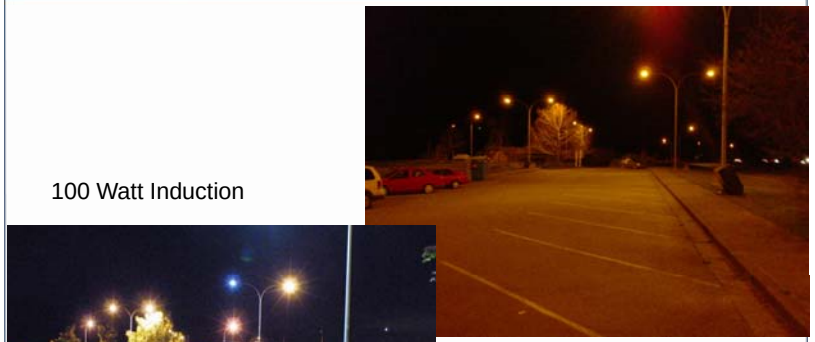
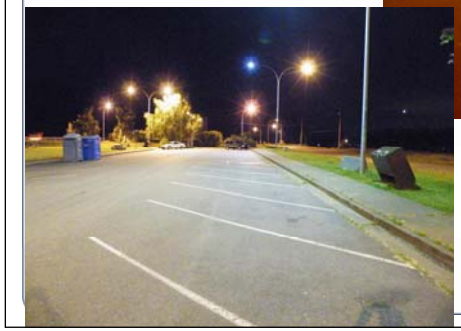
100 Watt Induction





250 Watt HPS

Cole Road Rest Area

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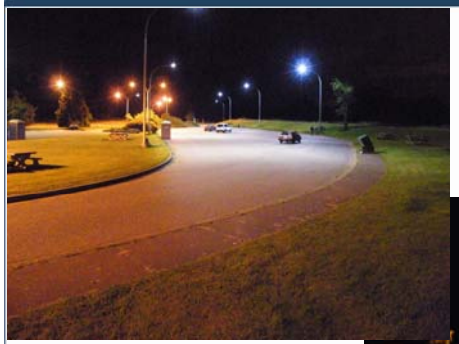

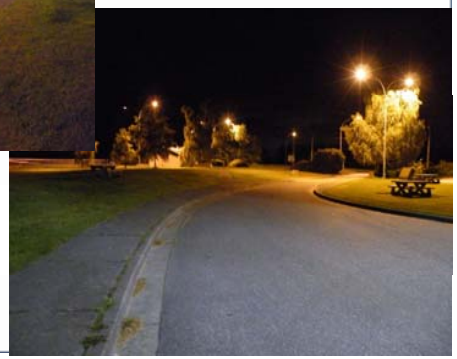

Adaptive Roadway Lighting

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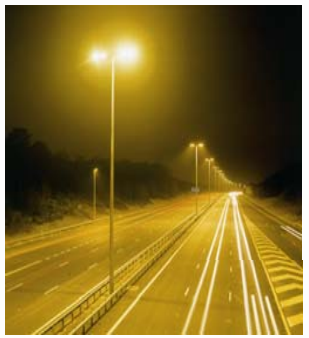

401 Highway
Toronto Ontario

1000 Watt HPS

Maple Street,
Vancouver, BC

100 Watt LED

Adaptive Lighting – Street Lighting Opportunities

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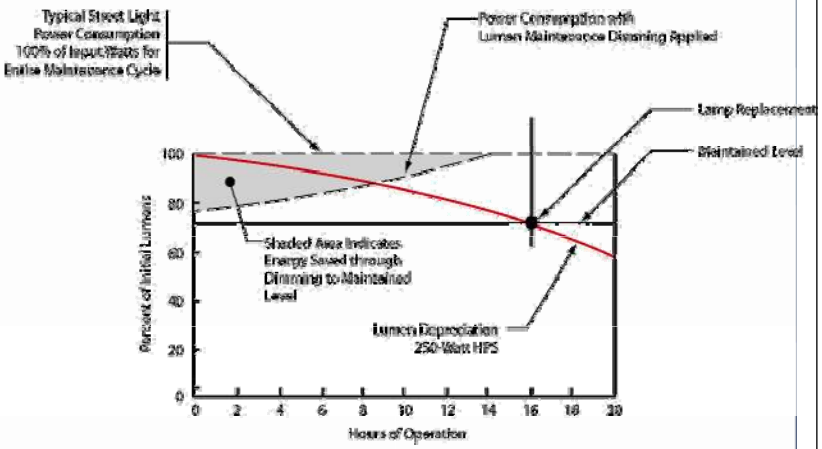
	Opportunity	Advantage
1	Reduce Lumen Output of Lamps to Maintained Levels	• Energy Savings • Obtrusive Light Reduction
2	Dim Over-Lighted Neighborhoods	• Potential Significant Energy Savings • Obtrusive Light Reduction
3	Match Lumen Output to Variable IESNA Pedestrian Conflict Levels	• Significant Energy Savings • Obtrusive Light Reduction

Opportunity - Dim to maintain design level

BC hydro



Light reduced to Maintained Levels for life of lamp - up to 26% savings

Opportunity – Reduce Lighting in Over-Lighted Areas

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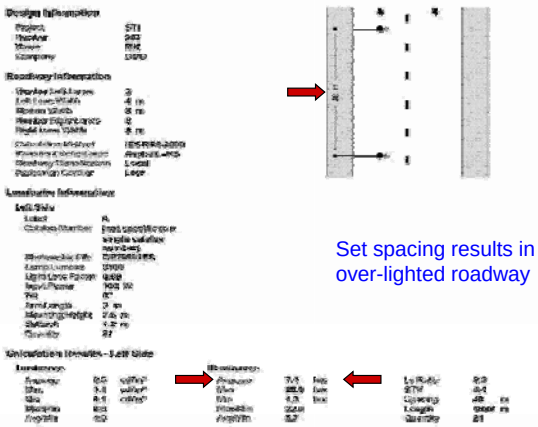

Set spacing results in over-lighted roadway

Opportunity - Match Lumen Output to Variable IESNA Pedestrian Conflict Levels

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Road and Pedestrian Conflict Area		Pavement Classification (Minimum Maintained 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_{max}/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	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	6.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	6.0	0.4

Potential Savings – 30% to 50%

IESNA Roadway Classifications
High – Medium - Low

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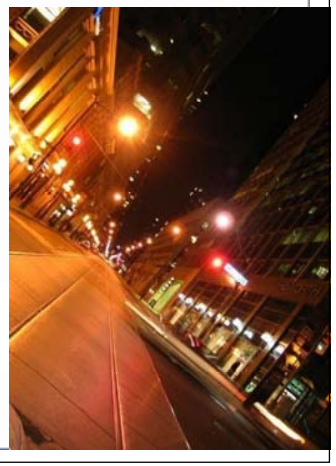
- The IESNA classifies by pedestrian activity:

- ***High*** – 100 or more pedestrians per hour
  – within a city block (200m)
- ***Medium*** – 11 to 99 pedestrians

- ***Low*** – 10 or fewer pedestrians



Adapt Lighting to the Requirements

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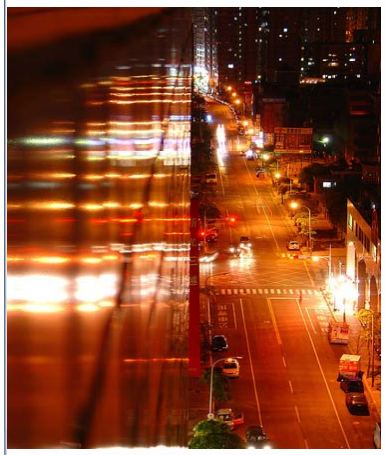

- Unless there is "***High***" activity throughout the night,
- the lower levels allow for safety and safe movement of vehicles and pedestrians.

- The potential energy savings up to **50%**

Control Types

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Adaptive Lighting Controls & Equipment

- **Static**
  – Preset schedule or time
  – Not adjustable

- **Dynamic**
  – Programmable
  – Adjustable
  – Two-way communication

Adapt Lighting Controls - static

BC hydro

photo courtesy of Night Saver

Adaptive Lighting Controls - static

BC hydro

Set it and forget it

-factory pre-set

-operates independently

-not adjustable

Night-Saver

Adaptive Lighting – dynamic

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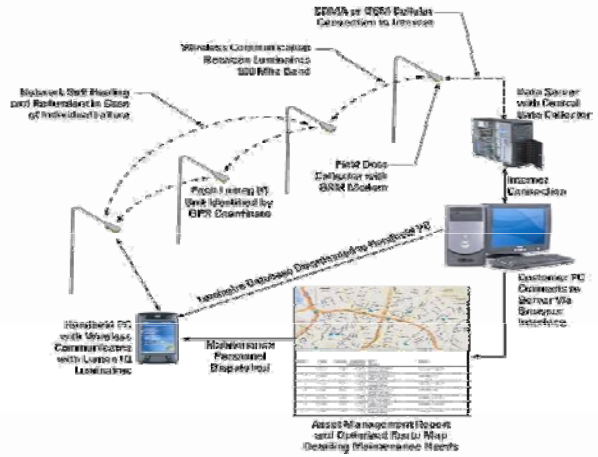
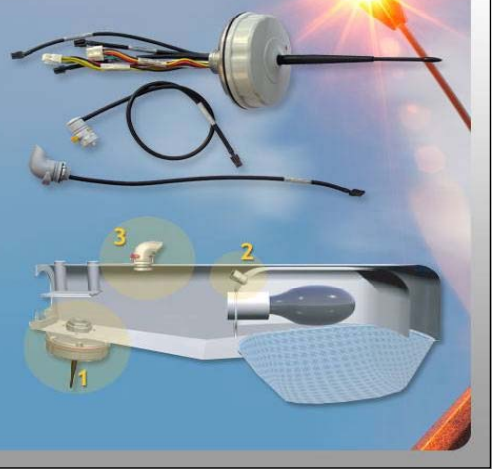


Adaptive Lighting - dynamic

BC hydro

- Microprocessor controlled
- Wireless communications
- Intelligently controls the output of the lamp to meet design specs for entire lifespan
- Easy to install on existing or new lamp fixtures



Prince George Pilot Project

BC hydro

15th Ave Prince George, BC

Project Plan:
To retrofit 171 Luminaires with Adaptive Lighting Control
2.5 km main arterial with commercial and residential roadway.
Transit line operational until 8 p.m. with varying pedestrian conflict levels.

Energy Savings Prince George Pilot

BC hydro

67 Luminaires were converted

16 luminaires were dusk to dawn controlled only
4 luminaires were dimmed to 50% - 11pm to 6am
47 luminaires were dimmed to 70% - 11pm to 6 am

Power consumption at 100% light = 312 W
Power consumption at 70% light = 232 W
Power consumption at 50% light = 187 W

Annual Savings this Project: **36,000 kWh**

Percent Savings: 26.5%

August 2005 to Sept 2006

Conclusions

BC hydro

Performance assumptions were verified through laboratory and field testing

Significant benefits and potential for owners and society:

- Dimming will Save Money and Reduce Future Infrastructure Needs
- Obtrusive Light will be Reduced
- System Streamlines Asset Management
- Energy Consumption can be Tracked for Un-metered Installations

The BC Picture

BC hydro

Why BC Hydro is considering Adaptive Roadway Lighting

There are 300,000 street lights in BC.
Estimated power consumed in a year would be approximately 360 million kWh.
Just imagine 20% reduction in off peak hours.

That's 72 million kWh hours per year

Program

BC hydro

- Program officially launched September 2008
- Currently working on infrastructure
  - Rate application approval – December 2008
  - Infrastructure implementation – August 2009
  - Rate available – September 2009

Opportunity Assessment — Initial review of opportunity
Approval to proceed to next step

Energy Study — Detailed study of energy savings potential
Study 100% paid for by BC Hydro if signed on in October

Project Implementation — Hydro incentives cover up to 60% of the installed costs of the technology.

Energy Efficient Roadway Lighting in British Columbia !

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Questions

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