Adaptive Street Lighting Controls – BC Hydro Pilot Project Summary

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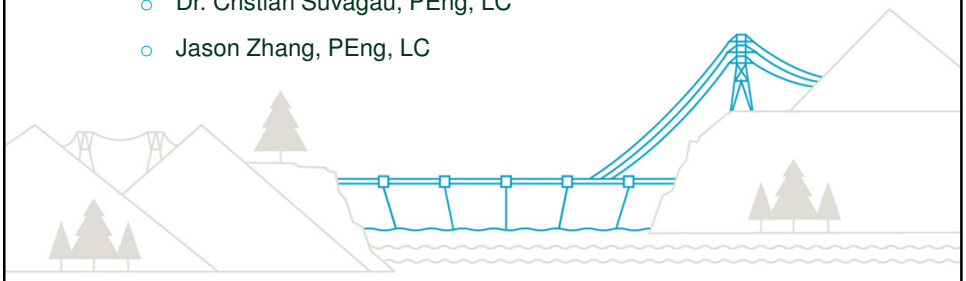

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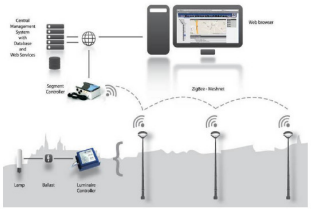
Agenda

- About Adaptive Street Light Control
- Project Background
- Scope of work
- Conclusions

About Adaptive Street Light Control (ASLC)

Major Components



- Lighting Point Controller (LPC)
- Gateway
- Central Management System (CMS)

About Adaptive Street Light Control (ASLC)

Major Functions of the ASLC System

- Control LED streetlights on/off and dim the luminous flux
- Provide the operation status of LED luminaires
- Provide the energy consumption report
- Added sensors can be considered to detect and measure vehicle speed and volumes, motion or presence of pedestrians, temperature, fires, precipitation, ground faults, ambient lighting levels, etc

Project Background

- BC Hydro currently owns and operates over 90,000 HPS street lights
- BC Hydro conducted a LED pilot project in the City of Richmond (2016-2017) with 4 lead luminaire manufacturers
- For 3 months (2016) BC Hydro tested lighting controls from five lead manufacturers

Scope of The Work

Overall Testing Scope

- Functionalities and the limitation of the CMS
- Accuracy of the software metering
- Interchangeability between nodes from different vendors on various LED streetlights
- Process and requirements of the hardware installation

Scope of The Work

Lab Testing

- Performed at PowerTech Labs
- Verify power metering accuracy with dimming controls
- Document ease of use of the CMS

Scope of The Work

Lab Testing

- Evaluate the systems' functionalities:
  - dimming levels vs. consumed power
  - scheduled-based control via command provided by the CMS
  - photocell functionality and operation
  - fixture status reporting
  - CMS fault detection capabilities (nodes, gateway failures)
  - ability of individual nodes to continue normal operation in the event of communication breakdown

Scope of The Work

Field Testing

- Collected installation survey from the installation crew
- Operated the software to understand how to set up the schedule, run the energy report and set up the dimming profile, etc
- Installed smart meters per each vendor's control group and collected power consumption data

Conclusions

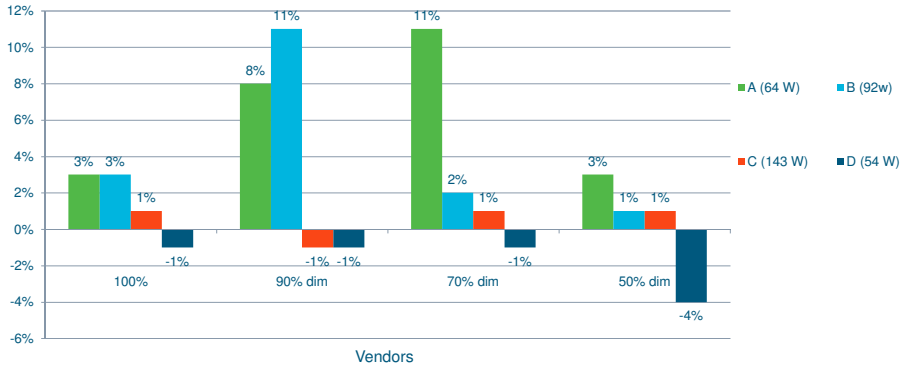
Energy Report

- All vendors can provide energy consumption reports, however with varied details
- There are minor discrepancies between energy reading of BCHydro's revenue meters and the vendors' software

Conclusions

Energy Report

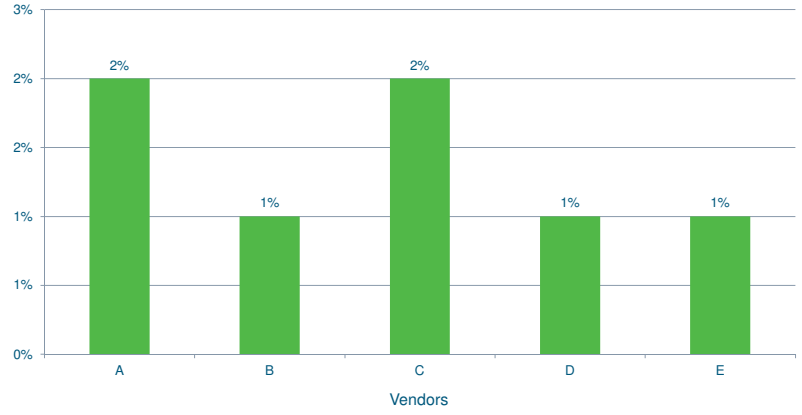
Wattage discrepancy measured in the lab (Power Meter - Software)



Conclusions

Energy Report

The **KWh** discrepancy measured in the field (Revenue Meter - Software)



Conclusions

Interchangeability Testing in The Lab

	Luminaires Dimmed to 50% Power			
Nodes	A	C	D	E
	Illuminance % change	Illuminance % change	Illuminance % change	Illuminance % change
A	57%	49%	40%	56%
B	66%	63%	52%	70%
C	66%	53%	40%	60%
D	59%	56%	52%	54%
E	53%	57%	47%	

Notes:
1. The illuminance measurement was conducted inside the lab (one fixture per vendor) under high light level environment. The measurements have been take at only one spot directly under each fixture. Dimming levels have been measured only down to 50% to address the reality of the night illumination conditions.
2. We used B nodes to control D fixtures under dimming testing already, and it controls the D fixture successfully.

Conclusions

Hardware Installation

- In general, the installation was easy
- Most of vendors integrate both gateway and modem into one unit
- Plug and play is preferred, but not all the vendors can do it now
- It would be good if all vendors would have a function that can check fixtures' status right after the installation

Conclusions

CMS Functions

- Dimming is set per power dropped, not the lighting level dropped. They are not 100% linear
- No vendor can report the detail of malfunction
- Every vendor has its own way to setup the schedule and dimming profile. It is recommended to have comprehensive training from the vendor

Conclusions

- **Recommendations**
  - At present, each vendor has its own communication network protocol from the nodes/ gateway to CMS and this further complicates the logistic of adopting ASLC for BC Hydro lease lights across so many municipalities. However, the industry is developing specifications for open IT standards and communication protocols that will allow interoperability at the CMS level so a municipality (or BC Hydro) can use a single/common user interface to monitor and interact with multiple networks/ controllers from various vendors.
  - Measurement Canada still needs to rule in favour of exempting the ASLC network metering and allow for using its own collected data for revenue metering.

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