Saving Energy and Improving Light Quality in Street Lighting

Applications of the *SEAD Street Lighting Tool*

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Agenda

- About the SEAD Initiative and why we're working in street lighting
- Street Lighting Tool features & benefits
- Case study example
- Cooperation with LightSavers Canada
- Future directions for the tool

Super-efficient Equipment and Appliance Deployment (SEAD) Initiative

- Engage governments and the private sector to accelerate market transformation for energy-efficient equipment and appliances
- 16 Participating Governments:

Australia	Brazil	Canada	European Commission
France	Germany	India	Japan
Korea	Mexico	Russia	South Africa
Sweden	United Arab Emirates		United Kingdom
United States	*China (observer)*		

- Partners:

clasp

4E Efficient Electrical End-Use Equipment International Energy Agency

en.lighten

Berkeley Lab

APEC Asia-Pacific Economic Cooperation

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SEAD Street Lighting Tool Features & Benefits

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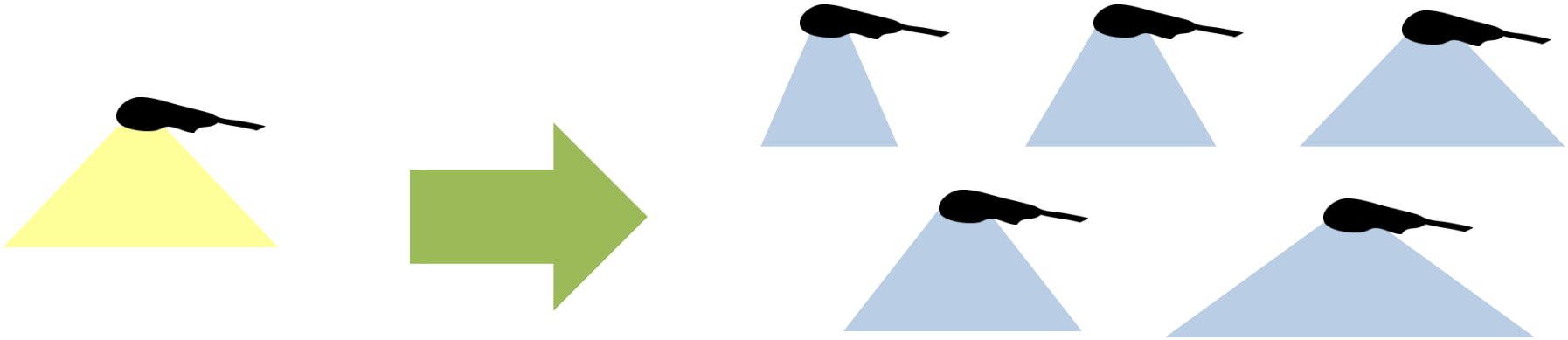
Why Make a Tool for Street Lighting?

- Problem:
  - With LED fixtures, wattage and light distribution classifications have less correlation with fixture performance on a specific road.
  - Improved light distribution means increased fixture choices.
  - Performance and energy savings depend on proper fixture selection.



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Why Make a Tool for Street Lighting?

- Solution:
  - Simplified photometric analysis
  - Integrated energy and life cycle cost analysis
  - Faster pre-screening process

This allows lighting managers to optimize fixture selection.

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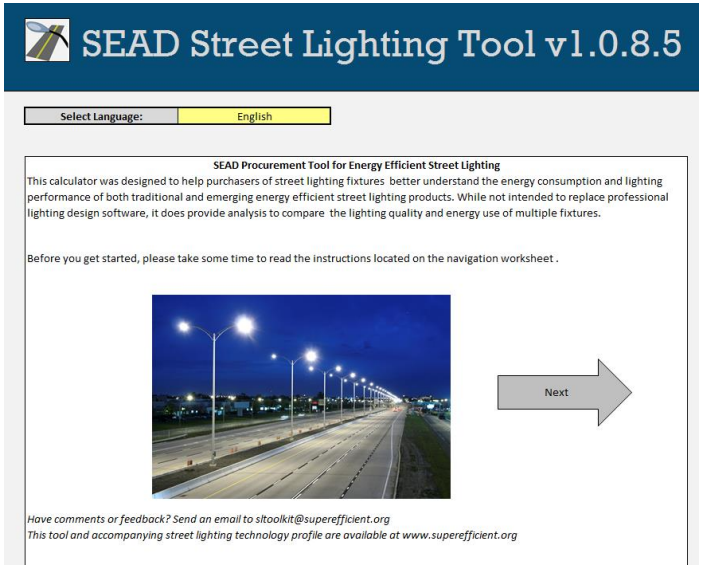
SEAD Street Lighting Tool Overview

- Free software for analyzing
  - energy use;
  - light quality;
  - and lifecycle costs

  for roadway lighting fixtures.

- The tool can be used for:
  - Batch analysis of fixtures for retrofits
  - early stage design evaluation
  - Introduction to photometric analysis for novice users



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SEAD Street Lighting Tool Overview

- Compatible with Microsoft Excel 2003 and later versions
- Available in English, French and Spanish
  - Can support additional languages if partners can help with translation
- Download the latest version directly from: www.superefficient.org/sltool

Tool Approach

1)	Simplified Road Configuration	*Only straight roads, no intersections or sloped roads, and even pole spacing. Simplifying the road calculations speeds up the analysis process.*
2)	Target Light Levels	*Identifying minimum light level targets allows the tool to filter fixtures by those that pass or fail the criteria. Illuminance and luminance both available.*
3)	Multiple fixtures	*Users can upload IES files, and then select as many as hundreds of fixtures for simultaneous analysis.*
4)	Life cycle cost	*Optionally, users can enter high-level cost estimates for fixture installation, maintenance, etc. The tool returns simple payback compared to a baseline and life cycle net present value estimates.*

How this helps with prescreening:

- **Simplified roads**: Fast input of geometry
- **Multiple fixtures:** Allows the initial calculations to do screening for you, rather than vetting each fixture individually first.
- **Integrated cost and energy analysis**: allows you to evaluate trade-off with increased energy for improved light output. Simple payback and Net Present Value calculations both provided.

Comparison to Conventional Software

If you are trying to:	SEAD Tool	Conventional Software (AGi32, Dialux, etc.)
Perform early analysis of simple or generic road segments	✓	✓
Analyze complex road geometries	✗	✓
Verify compliance with RP-8 for specific road segments	✗	✓
Analysis of a large number of simultaneous fixtures	✓	✗
Combine financial analysis with light performance	✓	✗

Sample Analysis
of an Ontario municipality

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The Road Layout

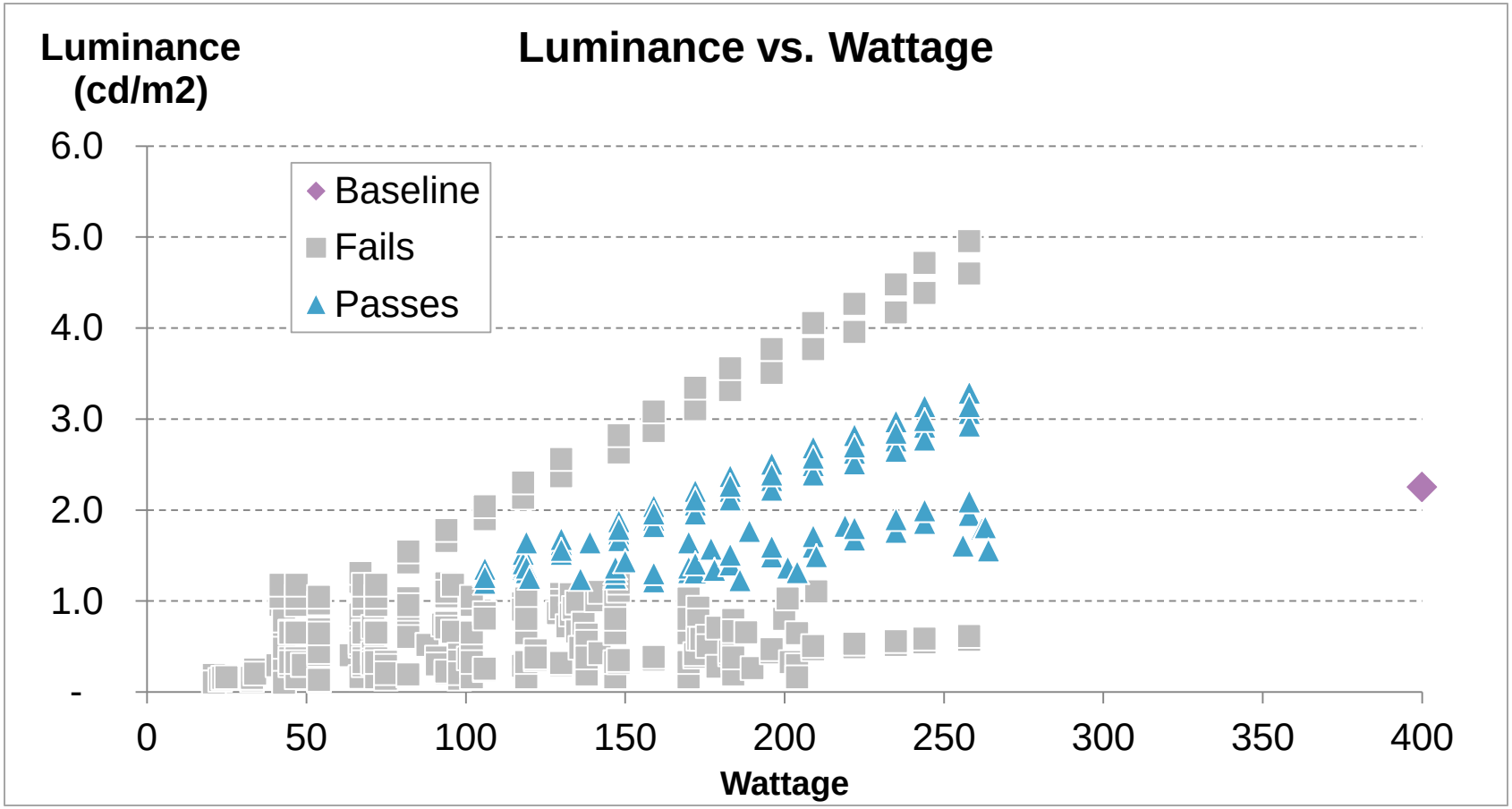
Typical 4-lane arterial road
(undisclosed location due to ongoing RFPQ process)

Description:	Value	Units
Road Geometry		
Number of Lanes	4	lanes
Lane Width	2.7	meters
Shoulder Width	0	meters
Median Width	0	meters
Light Geometry:		
Pole Placement	Single-side	
Pole Height	10	meters
Pole Spacing	28	meters
Pole Setback	0.2	meters
Arm length	3	meters

Description:	Value	Units
Luminance Target		
Road Surface Type	R3	
Average Luminance Target (Lav)	1.2	cd/m2
Overall Uniformity (U0 - avg/min)	3	unitless
Fixture Data		
Lamp Lumen Depreciation	0.73	unitless
Luminaire Dirt Depreciation	0.88	unitless
Operating hours	4380	hours

Results

Analyzed performance for 300+ fixtures from 3 manufacturers



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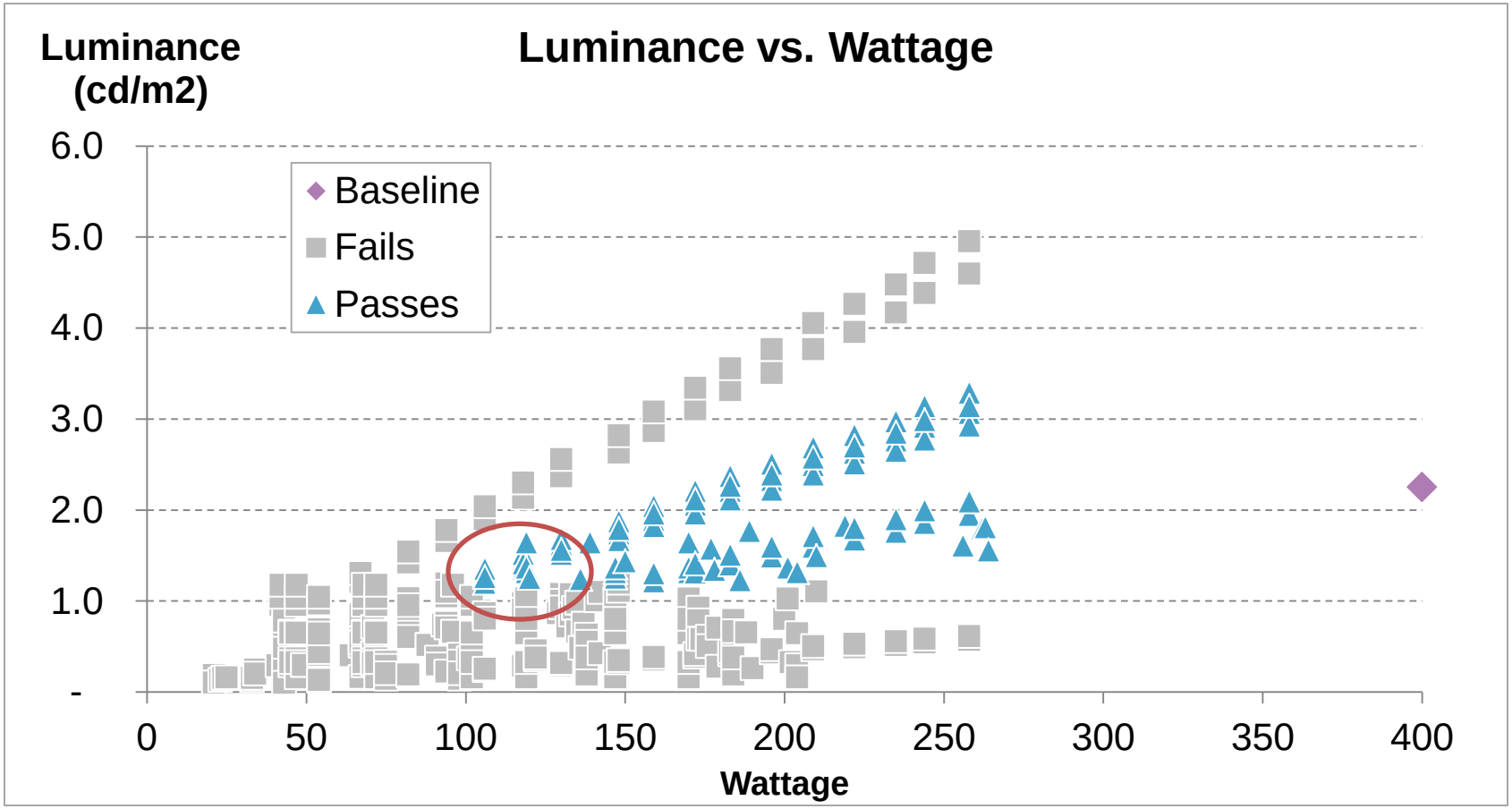
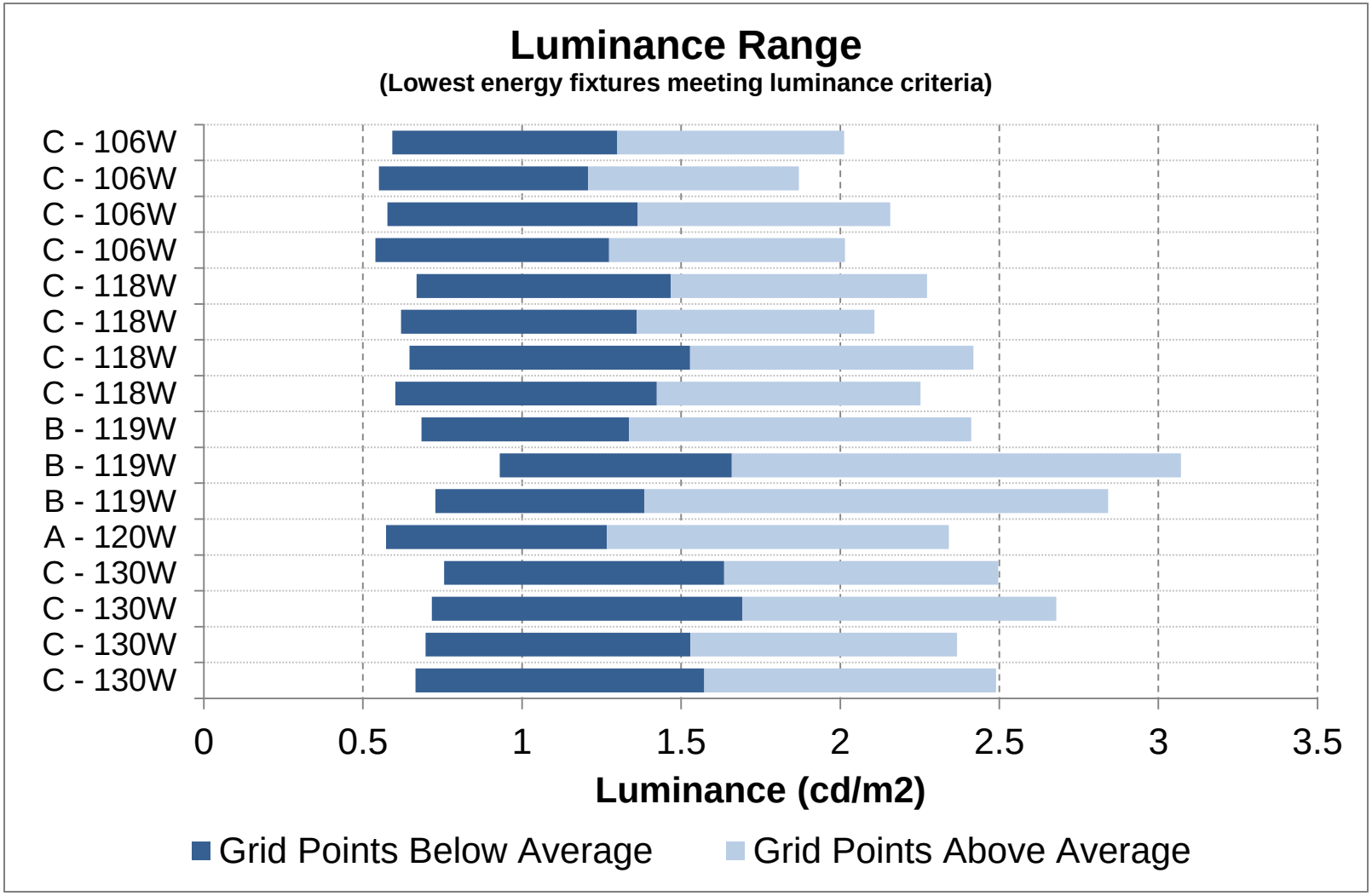


Results

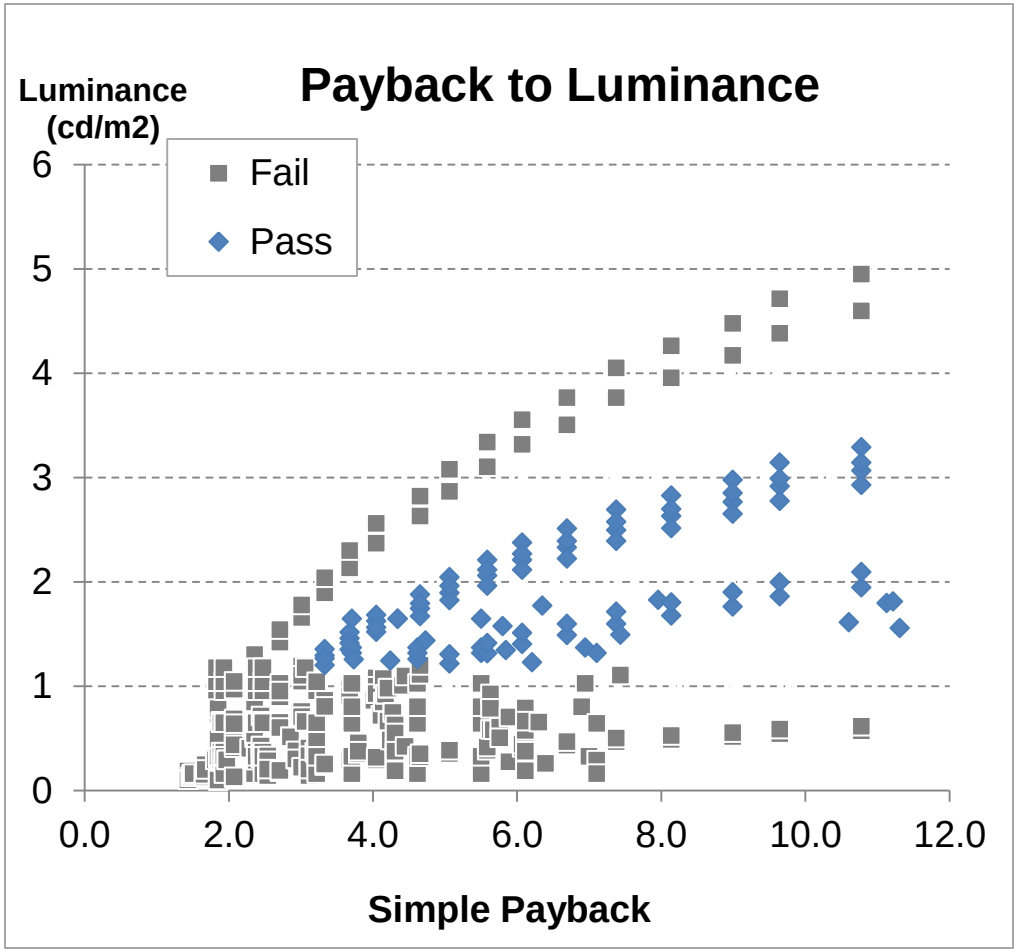

Luminance Range
(Lowest energy fixtures meeting luminance criteria)
C - 106W
C - 106W
C - 106W
C - 106W
C - 118W
C - 118W
C - 118W
C - 118W
B - 119W
B - 119W
B - 119W
A - 120W
C - 130W
C - 130W
C - 130W
C - 130W
0
0.5
1
1.5
2
2.5
3
3.5
Luminance (cd/m2)
Grid Points Below Average
Grid Points Above Average

Sample Cost Analysis

Description:	Cost/Fixture
LED Fixture Cost*	$2.8/watt + $115
Installation Cost	$100
LED Maintenance Cost	$25
Baseline Maintenance Cost	$50
Energy Cost	$0.10 / kWh

Values are illustrative and approximate

*LED fixture cost equation calculated from a limited set of sample fixture costs and should not be used for actual analysis.



Partnership with LightSavers

- Test the tool with lighting managers.
- Provide training on tool functionality.
- Obtain feedback on tool features and usability.
- Validate the tool as part of LightSavers assistance to Canadian municipalities in designing scalable strategies for street lighting retrofits.

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Tool Implementation Plan

Pilot Partnerships

- Feedback on tool utility and features
- Assurance to future users of tool capabilities

Tool Upgrades

- Improved usability
- Improved financial analysis
- CIE calculations

Tool Dissemination

- Informing potential users of the tool
- Improved training and documentation

Additional Projects

- Identification of other key barriers to SL installations
- Considering additional projects to address barriers

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