Municipal Solid-State STREET LIGHTING CONSORTIUM

U.S. Department of Energy

LightFair 2013 Philadelphia

A Tour Through the Municipal Solid-State Streetlighting Consortium Resources

April 21 & 24, 2013

Edward Smalley

Director, Municipal Solid-State Street Lighting Consortium

Seattle City Light | Government and Legislative Affairs

Seattle City Light

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Quick Facts

- Street lights in the U.S.: 26.5 million
- Energy Consumption Equivalent: 1.9 million households
- Greenhouse Gas Emissions Equivalent: 2.6 million cars.
- Energy Only Costs (estimated): **$2 billion/year**
- Operation and Maintenance Costs (estimated): ***$4-6 billion/year***
- Funding: 90% taxation | 10% Coops/other
- Ownership: 60%+ private Investor Owned Utilities

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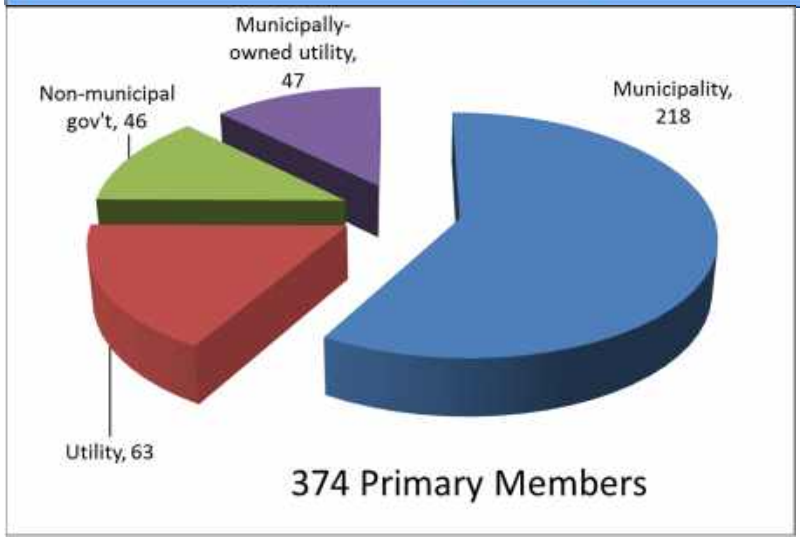
Who We Are

- The MSSLC itself is a great resource!
  - 374 member orgs
  - User-focused
  - Purpose is sharing information and tools
  - Membership is free but not required for access to most materials



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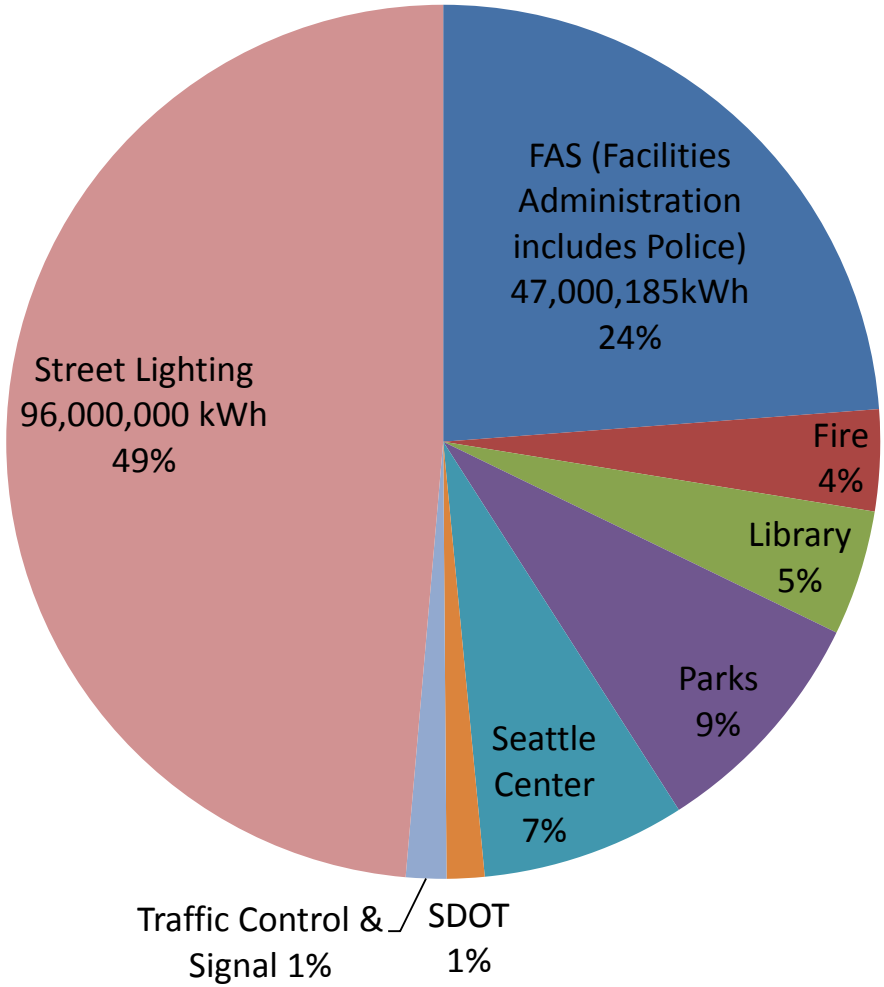
Why We Exist

City of Seattle – GF Municipal Electricity Use
Pre-LED Street Lighting Program – 197,409,782 kWh



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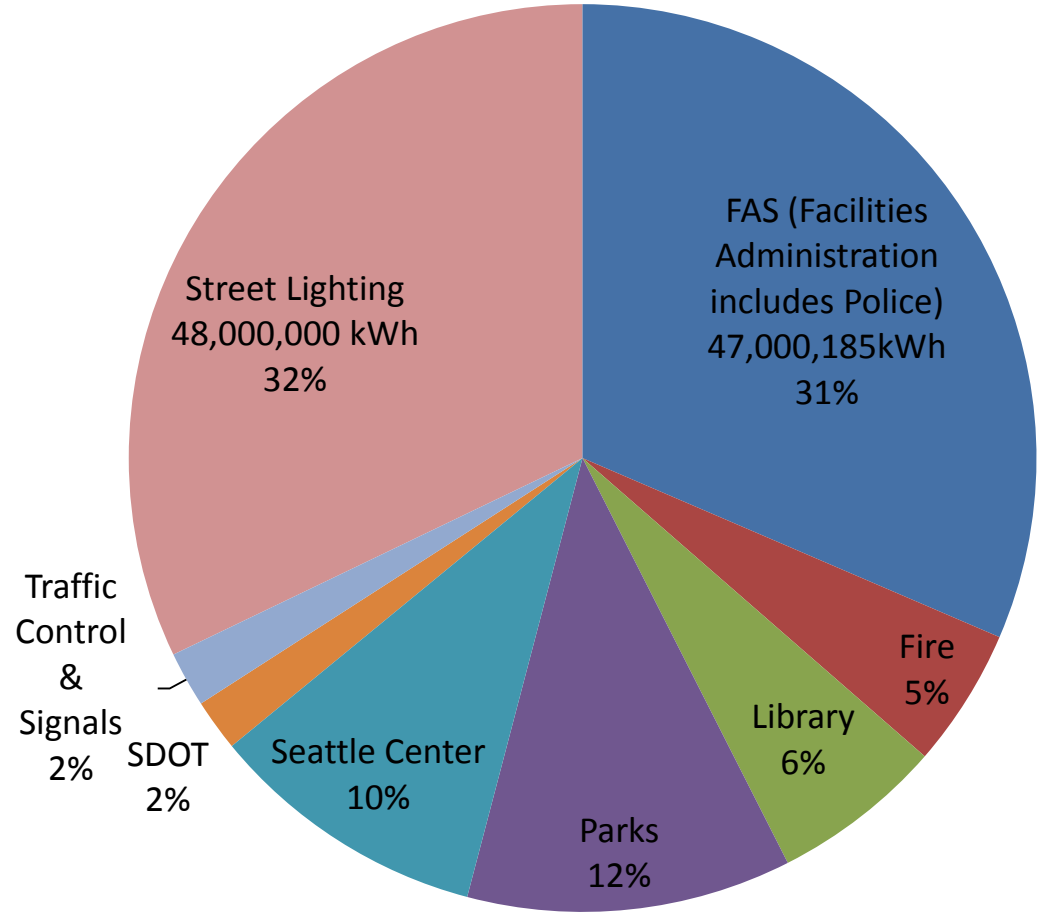
Why We Exist

City of Seattle – GF Municipal Electricity Use
Post-LED Street Lighting Program – 149,409,782 kWh



Membership

Primary membership is solicited from among interested cities, power providers, and other lighting owners and stake-holders.

Advisory members include organizations with a known history for promoting quality lighting and power efficiency.

Guests include *individual* employees of organizations that meet the requirements for membership

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Current Activities - Demonstrations

Kansas City

- Nine products on nine streets
- 100W, 150W, 250W & 400W sample replacements
- Tight adherence to earlier design criteria provides a very consistent baseline for product comparisons
- Provided preliminary feedback for the Luminaire Spec

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Current Activities - Demonstrations

West Seattle Bridge Freeway

- Vertical clearance: 140’ above water
- Span: 2 miles
- Products Evaluated: 4
- Installation: June 2013

Photo: ABKJ, Inc.

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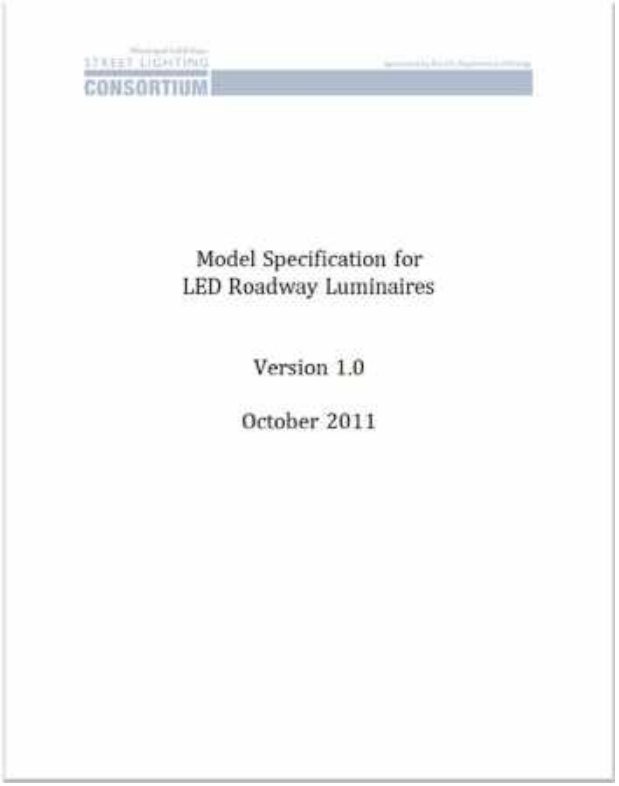
Resources – Model Luminaire Spec

Model Specification for LED Roadway Luminaires

Scope

- Municipalities, utilities, large public spaces, etc.
- Streets, roadways, and nearby pedestrian ways
- Initial and maintained quality and quantity of illumination
- Warranty coverage
- Input power, electrical immunity, housing finish, vibration, etc.
- Drivers, including lighting controls interface
- Photocontrol receptacles



Download: http://www1.eere.energy.gov/buildings/ssl/specification.html

Resources – Model Luminaire Spec

The template is composed of two separate documents:

1) The body of the specification and appendices A-E.
2) The Editor may choose ONE of two versions of Appendix A, depending on available information.
   - ❑ System Specification (application efficacy), which characterizes luminaire performance based on site characteristics such as mounting height, pole spacing, number of drive lanes, input power, and required light levels and uniformity.
   - ❑ Material Specification (luminaire efficacy), which characterizes luminaire performance without consideration of site characteristics.

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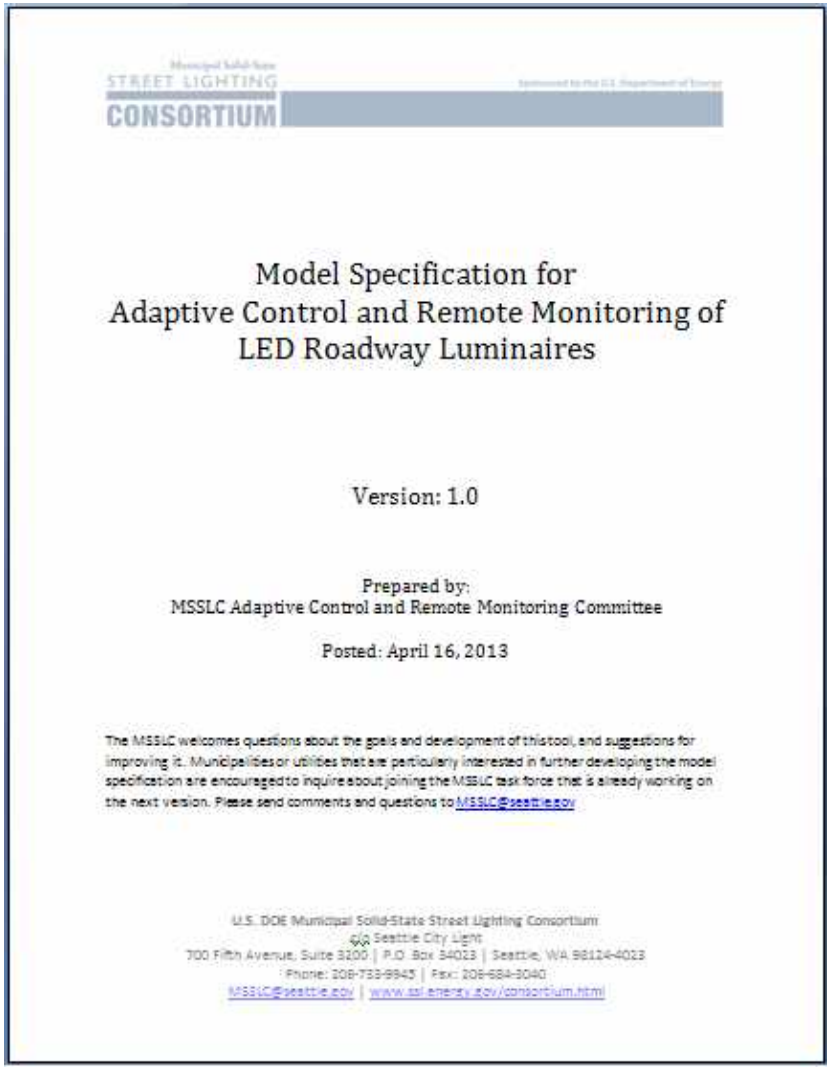
Resources - Model Controls Spec

Model Specification for Adaptive Control and Remote Monitoring of LED Roadway Luminaires

Released: April 16, 2013 – V 1.0

Download at:

www.ssl.energy.gov/consortium.html



Model Specification for
Adaptive Control and Remote Monitoring of
LED Roadway Luminaires

Version: 1.0

Prepared by:
MSSLC Adaptive Control and Remote Monitoring Committee

Posted: April 16, 2013

The MSSLC welcomes questions about the goals and development of this tool, and suggestions for improving it. Municipalities or utilities that are particularly interested in further developing the model specification are encouraged to inquire about joining the MSSLC task force that is already working on the next version. Please send comments and questions to MSSLC@seattle.gov

U.S. DOE Municipal Solid-State Street Lighting Consortium
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Resources - Model Controls Spec

- Motivation
  - Developed in response to demand from Consortium members and others
  - Potential to improve service and further conserve energy
  - Useful-to-all does not mean one-size-fits all
- Purpose
  - To compile experience gained by members
  - To establish a common language and framework
  - To serve as a checklist to minimize errors/omissions
  - To serve as a living document, undergoing continual revision
  - To allow for customization by each adopting entity

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Resources – Model Controls Specification

What is a streetlight control system?

1) Control Node | 2) Gateway | 3) Central Management System

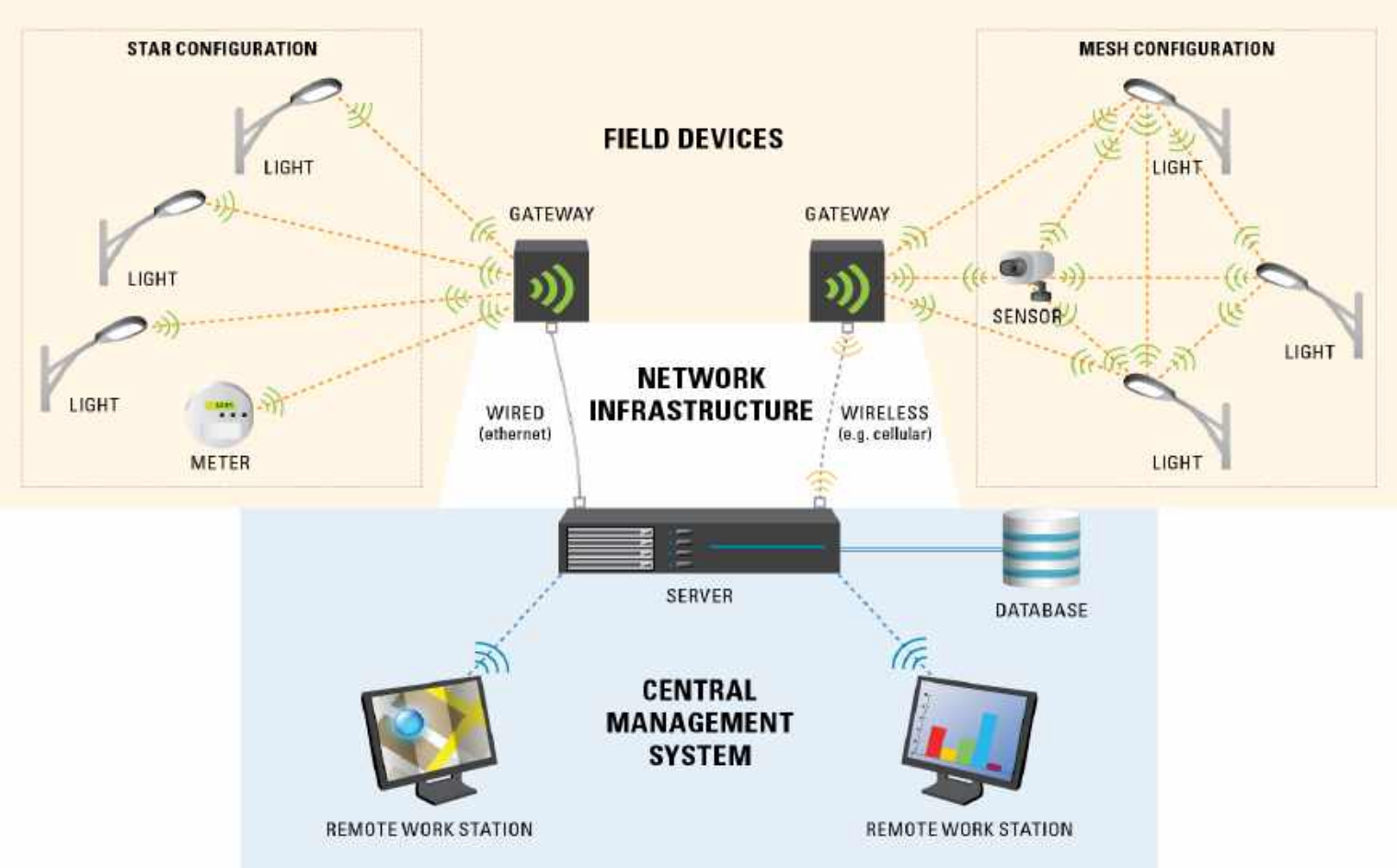

Image Credit: California Lighting Technology Center, UC Davis

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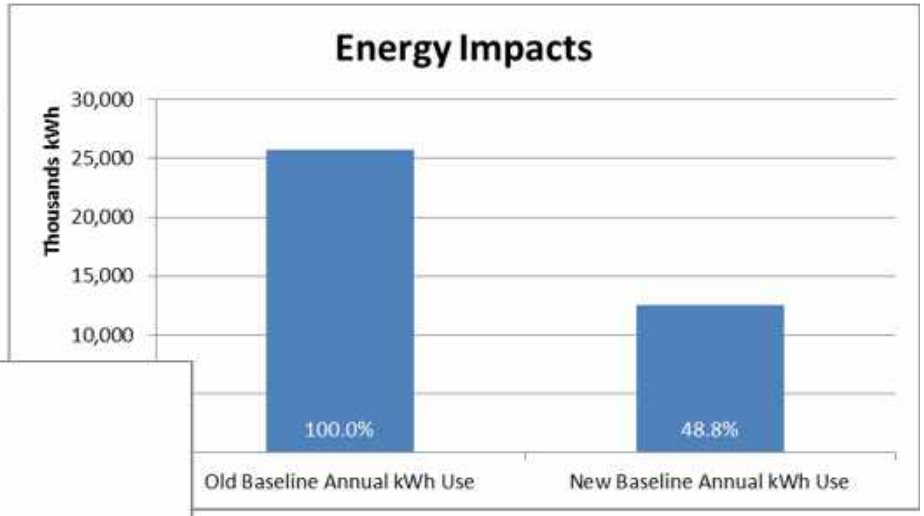
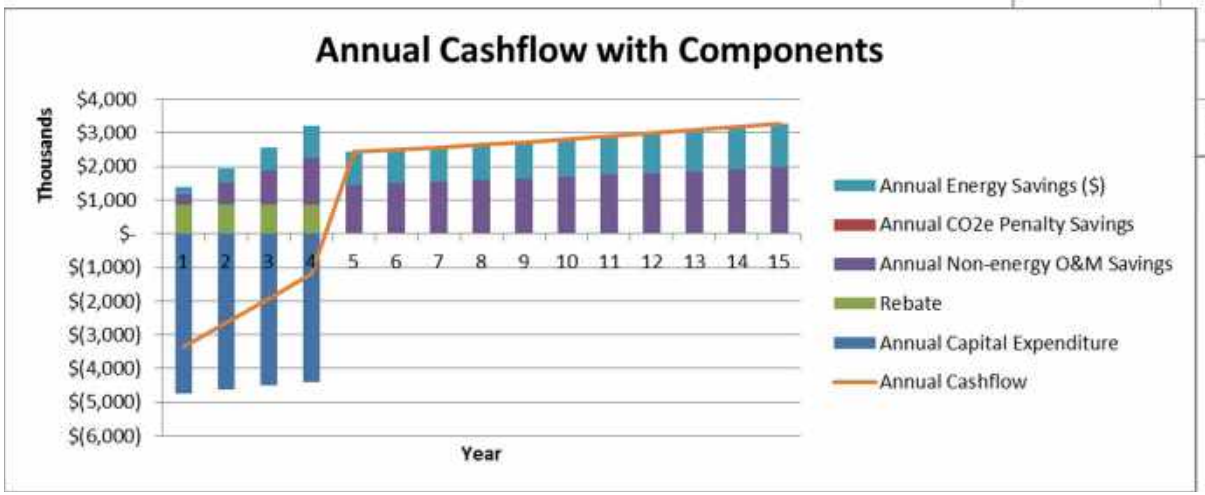
Resources – Financial Analysis Tool

Retrofit Financial Analysis Tool

- Evaluates costs and benefits of LED conversion
- Performs detailed analysis and provides numerous outputs, including:
  - Annual energy and energy-cost savings
  - Annual maintenance savings
  - Annual greenhouse gas reductions
  - Simple payback, IRR
  - Net present value





Resources – Financial Analysis Tool

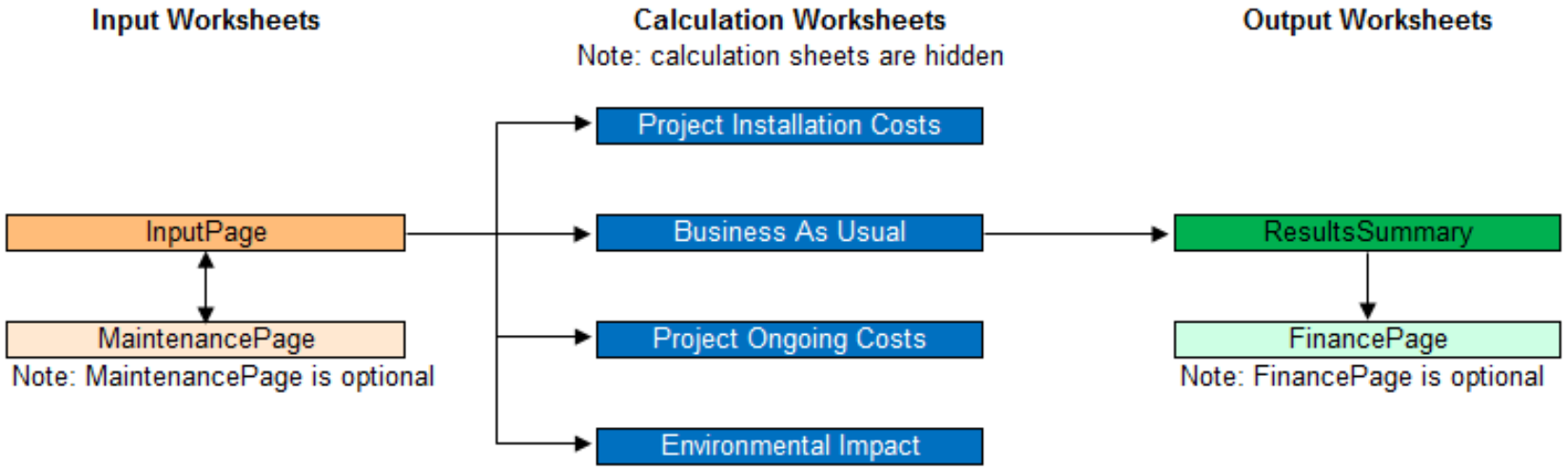
Structure and flow of tool

Input page

Maintenance page (optional)

Results summary

Finance page (optional)



Resources – Financial Analysis Tool

Contains all assumptions for project, except optional finance and detailed maintenance cost assumptions

Four sections:

1) Global project inputs affecting all analyzed fixtures

– Includes discount rate, sales tax rate, electricity rate, installation labor and vehicle rates, GHG emissions factor, and project overhead costs

2) Technology-specific inputs – section one

– Input data for all fixtures/technologies, both old and new

– Includes lamp and system watts, operating hours, fixture costs, disposal costs, rebates, and maintenance costs

3) Technology-specific inputs – section two

– Impacted fixtures only; select fixture types and quantities to be removed and installed

4) User notes and scratchpad

Maintenance page (optional)

- ✓ Used to derive maintenance costs, if not known on a $/unit/month basis
- ✓ Provides ability to obtain very detailed estimate of maintenance costs for each technology or fixture type examined
- ✓ Captures labor, vehicle and equipment costs
- ✓ Scheduled maintenance
  - Lamp
  - Controls
  - Fixture
  - Cleaning
- ✓ Emergency (unplanned) maintenance
  - Lamp
  - Controls
  - Fixture

Resources – Financial Analysis Tool

Results summary: positive NPV

# of Fixtures Installed		41,000
Implementation Period (years)		4
Analysis Period		15
Simple Payback (years)		6.0
15-Year Unlevered IRR		28.01%
15-Year Unlevered NPV ($)	$	20,945,750
15-Year Capital Expenditure ($)	$	19,006,083
15-Year Cap. Ex. $/kWh Saved	$	0.1067
15-Year Cap. Ex. $/ton CO2e Saved	$	181.8635
Annual kWh Savings		13,199,130
Annual Energy Cost Savings ($)	$	857,943
Annual GHG Savings (tCO_2e)		7,741
Old Baseline Annual kWh Use		25,769,730
Old Baseline Annual Energy Cost ($)	$	1,675,032
Old Baseline Annual GHGs (tCO_2e)		15,114
New Baseline Annual kWh Use		12,570,600
New Baseline Annual Energy Cost ($)	$	817,089
New Baseline Annual GHGs (tCO_2e)		7,373
First-Year Avg. Capital Expend. per Unit ($)	$	481
First-Year Avg. Material Cost per Unit ($)	$	300
First-Year Avg. Labor Cost per Unit ($)	$	107
First-Year Avg. Vehicle Cost per Unit ($)	$	40
First-Year Avg. Disposal Cost per Unit ($)	$	5
First-Year Avg. Overhead Cost per Unit ($)	$	29

Over 15 years, NPV of nearly $21M

Simple payback of 6.0 years

Savings and “New Baseline” values in this section are at time of full implementation of the project (4 years, in this example’s case)

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Resources – Newsletter, Case Studies

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THE LIGHT POST

Official MSSLC E-Newsletter

March, 2013 — Volume 2, Number 3

In This Issue

Director's Update

LED Street Lighting in Vermont

Consortium Webcast Recap

LED Street Lighting in the News

Upcoming Consortium Events

Consortium Director
Edward Smalley
Seattle City Light

To have your LED project featured in THE LIGHT POST contact us at:
MSSLC@Seattle.gov

Committees:

Executive Committee
Edward Smalley, Seattle City Light

Ghanshyam Patel, New York City Street Lighting Division

Tad Rocinbum, Portland Ore. Traffic Signal & Street Lighting

Michael Stevens, Georgia Power

Ed Ebrahimian, Los Angeles Bureau of

Top of The Light Post-Director's Update

While the Consortium's central focus is to provide technical assistance to municipalities, states and utilities as LED street lighting programs are considered, most LED street lighting installations have occurred at the municipal level. It is encouraging to hear that there is significant activity at the state level to convert the roadway luminaires of state highways to LED. The most recent examples include the California Department of Transportation's (CALTRANS) purchase and installation of 42,000 roadway LED units, the Washington State Department of Transportation's (WSDOT) announcement of an LED roadway project on U.S. Highway 101, the Florida Department of Transportation's (FDOT) LED installation on U.S. Highway 98, the Colorado Department of Transportation closed its bid process on March 12 for the purchase of approximately 10,000 LED streetlight fixtures for installation over the next three years, and the Alaska Department of Transportation has plans to install 800 LED streetlights in Fairbanks by this summer.

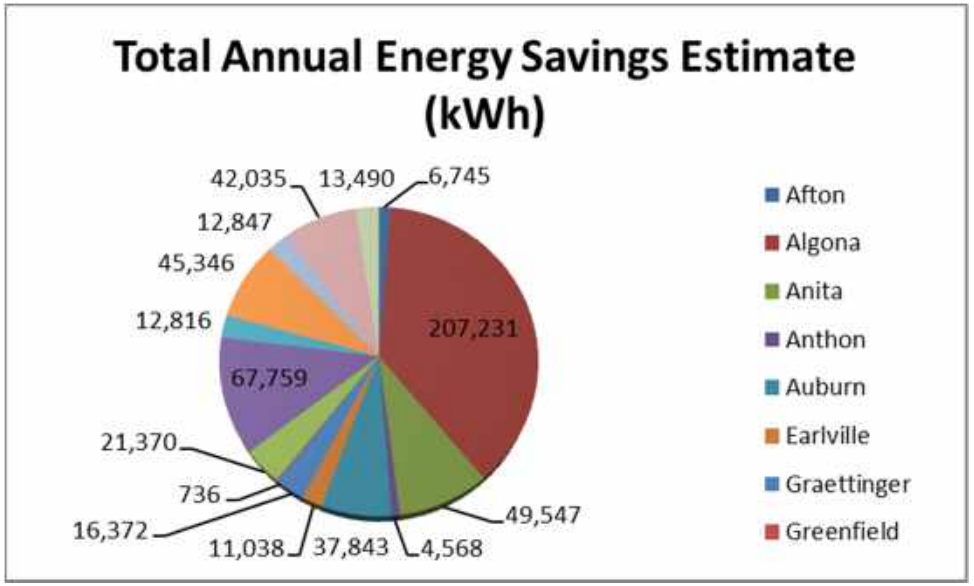
WSDOT plans to install 88 LED roadway luminaires on the Black Lake Boulevard interchange in Olympia with estimated annual energy savings of 1.7 million kWh and $75,000 in annual operation and maintenance costs. The Florida Department of Transportation has partnered with Santa Rosa County to install approximately 800 LED roadway luminaires on U.S. Highway 98. Read more about the WSDOT and FDOT programs below in "LED Street Lighting in the News."

Also, in April 2012, CALTRANS began its program of converting 67,000 fixtures to LED roadway luminaires over a two-year period with estimated energy savings of 50 percent.

The earliest of state highway installations was the I-35W Bridge in Minneapolis, Minnesota that featured LED roadway lighting on the main span of this interstate. Phase 1 of this project went online in 2006 and provided the first glimpse of how effective this technology could be in that highly challenging environment. Phase 2, involving long-term monitoring of the LED lighting is expected to yield valuable information on lumen depreciation, physical effects, and performance impacts over time. Look for updates on this installation later this year.

Together, these projects illustrate how the slow initial adoption at the state level is starting to rapidly resemble what's happening on the municipal level. As technology improves, fixture cost continues to decrease and state governments continue to identify efficiencies, perhaps other states will follow the lead of California, Washington, Florida, Colorado, Minnesota and Alaska and state-level installations will gain the momentum experienced on the municipal level.

Case Study: Iowa Association of Municipal Utilities Energy Savings Estimate



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2013 Events

Webinars:

1. March 6, 2013 - Successful Selection of LED Streetlight Luminaire: Optimizing Illumination and Economic Performance
2. May 8, 2013 – Member Case Studies: LED Street Lighting Programs

   Algona (IA), Asheville (NC), Boston (MA)
3. Adaptive Street Lighting Controls

   June 11, 2013 – Part 1: Experiences and Benefits

   June 12, 2013 – Part 2: Reviewing the Consortium's Model Specification
4. July 24, 2013 – Adapting the MSSLC Specification for LED Roadway Luminaires
5. September 18, 2013 – City of Los Angeles Case Study – over 140,000 converted!
6. TBD - Investor Owned Utilities and LED Street Lighting: Making the Case
7. TBD - Maintenance Practices: Lessons Learned From the Field

Download past events presentation: **www.ssl.energy.gov/consortium.html**

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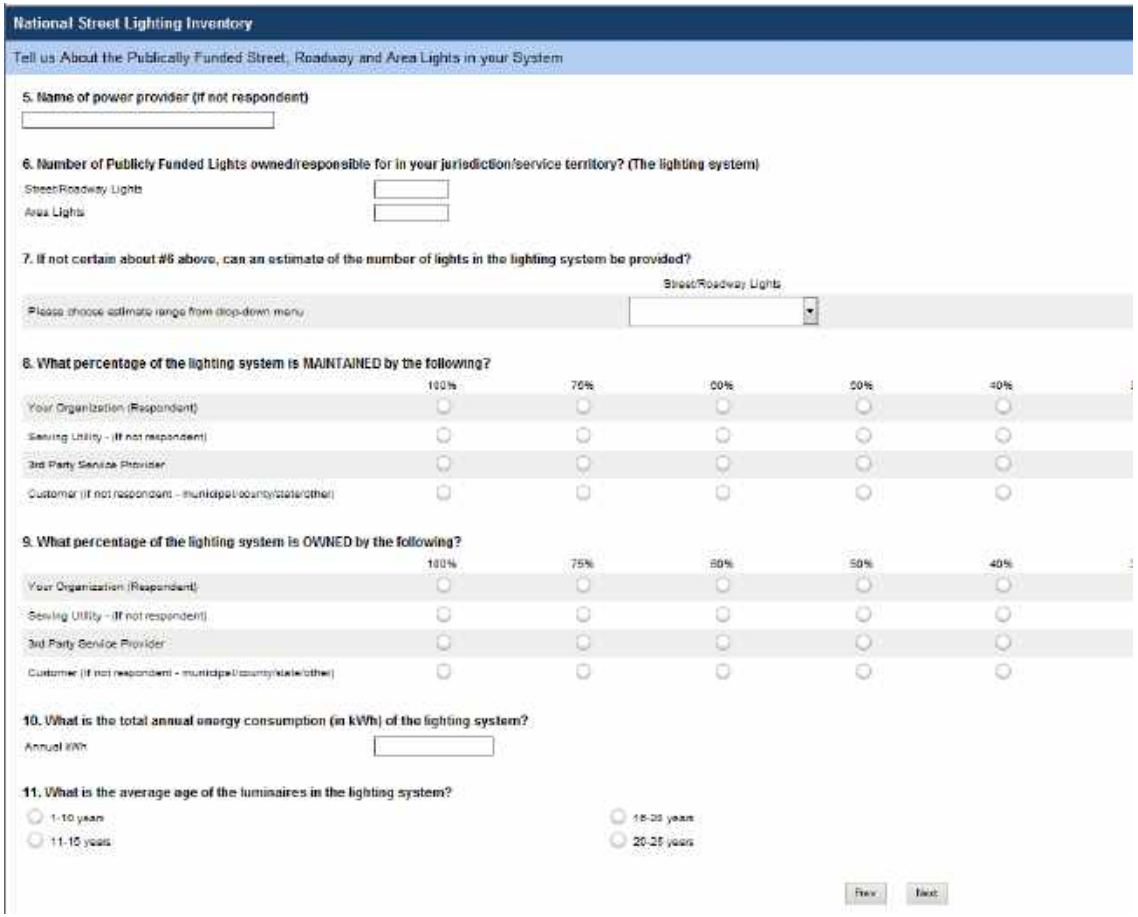
Upcoming Activities - Inventory

U.S. National Street Lighting Inventory

- Quantify size of U.S. street lighting system
- Document energy usage
- Identify ownership & maintenance models
- Establish benchmarks
- Provide basis for national and local fiscal evaluation



National Street Lighting Inventory

Tell us About the Publically Funded Street, Roadway and Area Lights in your System

5. Name of power provider (if not respondent)

6. Number of Publicly Funded Lights owned/responsible for in your jurisdiction/service territory? (The lighting system)

Street/Roadway Lights

Area Lights

7. If not certain about #6 above, can an estimate of the number of lights in the lighting system be provided?

Street/Roadway Lights

Please choose estimate range from drop-down menu

8. What percentage of the lighting system is MAINTAINED by the following?

	100%	75%	50%	25%	0%
Your Organization (Respondent)					
Serving Utility - (if not respondent)					
3rd Party Service Provider					
Customer (if not respondent - municipal/county/state/other)					

9. What percentage of the lighting system is OWNED by the following?

	100%	75%	50%	25%	0%
Your Organization (Respondent)					
Serving Utility - (if not respondent)					
3rd Party Service Provider					
Customer (if not respondent - municipal/county/state/other)					

10. What is the total annual energy consumption (in kWh) of the lighting system?

Annual kWh

11. What is the average age of the luminaires in the lighting system?

1-10 years

11-15 years

16-20 years

20-25 years

Prev Next

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Upcoming Events

2013 Annual Meeting – September 11, 2013, Phoenix, AZ

To be held in conjunction with the IES 2013 Street and Area Lighting Conference

- City of Phoenix Case Study
- NYC Future of Lighting
- Consortium Tools Tutorial

http://www.ies.org/salc/

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More information

Questions…?

www.ssl.energy.gov/consortium.html

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