REGIONAL LED STREET LIGHTING
ASSESSMENT AND STRATEGIES

Northeast Energy Efficiency Partnerships (NEEP)
Wednesday, March 11, 2015
1:30-3pm
PRESENTATION SUMMARY

1. Regional LED Street Lighting Assessment and Strategies
   
   *Brian Buckley*, Northeast Energy Efficiency Partnerships
   Policy Research and Analysis Associate

2. Cities Leading the Way: Pittsburgh, PA
   
   *Jim Sloss*, Energy and Utilities Manager
   Pittsburgh Office of Sustainability and Energy Efficiency

3. Cities Leading the Way: Baltimore, MD
   
   *Ted Atwood*, Energy Division Chief
   Baltimore Department of General Services
NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS
“Accelerating Energy Efficiency”

MISSION
Accelerate the efficient use of energy in the Northeast and Mid-Atlantic Regions

APPROACH
Overcome barriers to efficiency through Collaboration, Education & Advocacy

VISION
Transform the way we think about and use energy in the world around us.

One of six Regional Energy Efficiency Organizations (REEOs) designated by U.S. Dept. of Energy to work collaboratively with them in linking regions to DOE guidance, products
LED Street Lighting Assessment and Strategies for the Northeast and Mid-Atlantic
AGENDA

1. Opportunities
   1. Forest through the Trees
   2. The Basics
   3. Cost Savings
   4. Additional Benefits
   5. Advanced Controls

2. Conversion Considerations
   1. Technical
   2. Regulatory
   3. Financial

3. Regional Analysis
   1. Past/Future
   2. Qualitative Estimates
   3. Actions in the Region

4. Regional Strategy
   1. Provide Publicly Accessible Solutions
   2. Engage and Support Stakeholders
   3. Make Progress Visible

5. Resources
OPPORTUNITIES: FOREST THROUGH THE TREES...

WORKING TOGETHER for VICTORY

Anthracite is a "Fighting Fuel"

AMERICA NEEDS IT NOW!

Energy Efficiency

Municipal "Cash Cow"

To Re-Lamp
Table 2-5. Retrofit/Replacement Projects: Current Expected LED Street Light Simple Paybacks*

<table>
<thead>
<tr>
<th>Fixture Type</th>
<th>Light Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (&lt;50W)</td>
</tr>
<tr>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>Decorative</td>
<td>14.2</td>
</tr>
<tr>
<td>Decorative kit</td>
<td>9.7</td>
</tr>
<tr>
<td>Cobrahead</td>
<td>3.6</td>
</tr>
</tbody>
</table>

*Assumes no program administrator incentives. Does not account for cost of money.
OPPORTUNITIES: COST SAVINGS

Cost Savings

- Street Lighting accounts for 20-40% of a municipality’s electric utility costs
- Energy Cost-Savings (reduces consumption by 50%+)
- Maintenance Cost-Savings (~$50/lamp/year)

Table 4: SCL Example of LED Street Light Cost Reduction over 4-Year Period

<table>
<thead>
<tr>
<th>LED Street Light Cost Reductions over 4-Year Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>2009</td>
</tr>
<tr>
<td>Seattle (Purchases of 2,000+ Units)</td>
</tr>
<tr>
<td>$369</td>
</tr>
<tr>
<td>Los Angeles</td>
</tr>
<tr>
<td>$432</td>
</tr>
</tbody>
</table>
OPPORTUNITIES: ADDITIONAL BENEFITS

Additional Benefits

- Reduced Light Pollution at Night
- Lighting Quality
- Great Perceived Security
- Extended Lifecycle
- Reduced Carbon Emissions
- Can Incorporate Advanced Controls
OPPORTUNITIES: ADVANCED CONTROLS

Traditional Controls
- Three-prong
- Photocell
- Unmetered
- Fail in the “on” position
- Do not offer dimming

Advanced Controls
- Seven-prong
- Contain a meter
- Allow for dimming
- Potentially act as wireless hotspots
- Can alert to failed lamps
- Emergency Alert

(Image Credit: California Lighting Technology Center, UC Davis)
NAVIGATING BARRIERS
### Table A7: Central Maine Power HPS/LED Rate Comparison

<table>
<thead>
<tr>
<th>Lumen Rating</th>
<th>Watts (Nominal)</th>
<th>Input Watts</th>
<th>Annual Rate Per Light</th>
<th>Lumen Rating</th>
<th>Watts (Nominal)</th>
<th>Input Watts</th>
<th>Annual Rate Per Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,600</td>
<td>50W</td>
<td>65</td>
<td>$131.88</td>
<td>4190</td>
<td>50</td>
<td>50</td>
<td>$248.64</td>
</tr>
<tr>
<td>5,670</td>
<td>70W</td>
<td>95</td>
<td>$130.68</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,550</td>
<td>100W</td>
<td>130</td>
<td>$140.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14,400</td>
<td>150W</td>
<td>195</td>
<td>$166.32</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25,600</td>
<td>250W</td>
<td>300</td>
<td>$228.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45,000</td>
<td>400W</td>
<td>465</td>
<td>$290.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Energy Savings**: 4200 hrs
**Distribution Charge Difference**: $118

### Table A12: Unitil HPS/LED Rate Comparison

<table>
<thead>
<tr>
<th>Lumen Rating</th>
<th>Annual Rate Per Light</th>
<th>Lumen Rating</th>
<th>Annual Rate Per Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,300</td>
<td>$117.48</td>
<td>3,850</td>
<td>$101.64</td>
</tr>
<tr>
<td>9,500</td>
<td>$139.80</td>
<td>6,100</td>
<td>$120.48</td>
</tr>
<tr>
<td>20,000</td>
<td>$208.20</td>
<td>10,680</td>
<td>$150.96</td>
</tr>
<tr>
<td>50,000</td>
<td>$295.92</td>
<td>20,000</td>
<td>$243.24</td>
</tr>
<tr>
<td>140,000</td>
<td>$607.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Energy Savings**: $0.08/kWh
**4200 hrs**
**$24/ lamp**
REGIONAL ANALYSIS: WHERE HAVE WE BEEN?
Can our Region Lead the Nation on Street Lighting?
REGIONAL ANALYSIS: WHERE HAVE WE BEEN?
Region Led the Nation in Street Lighting Advancements

Philadelphia, 1751
Ben Franklin advocates for street lighting, designs four pane fixture

Baltimore, 1817
first gas street lights in the country

NYC’s Broadway, 1880
Electric Arc Lamp
REGIONAL ANALYSIS: WHERE ARE WE HEADED?

42% of cities using EECBG funding installed street lights

NYC commits to full conversion by 2017

Boston has already converted 2/3 of street lights

Rhode Island OER and Portland, M.E. already partners
### Table 1: Northeast and Mid-Atlantic Potential Savings and Cost Estimates

<table>
<thead>
<tr>
<th>Measure</th>
<th>Annual Energy Savings (MWh)</th>
<th>Annual Energy Cost Savings ($ Million)</th>
<th>Annual Maintenance Savings ($ Million)</th>
<th>Total Annual Cost Savings ($ Million)</th>
<th>Total Installed Cost ($ Million)</th>
<th>Simple Payback Period (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED Retrofit</td>
<td>1,622,036</td>
<td>$123.43</td>
<td>$247.86</td>
<td>$371.3</td>
<td>$1,392.96</td>
<td>3.75</td>
</tr>
<tr>
<td>Advanced Controls</td>
<td>141,035</td>
<td>$10.79</td>
<td>---</td>
<td>$10.79</td>
<td>$148.71</td>
<td>13.78</td>
</tr>
<tr>
<td>Retrofit and Controls</td>
<td>1,763,071</td>
<td>$134.22</td>
<td>$247.86</td>
<td>$382.09</td>
<td>$1,541.07</td>
<td>4.03</td>
</tr>
</tbody>
</table>

### Table 2: State-by-State Savings and Cost Estimates

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Municipal Street Lights</th>
<th>Annual MWh Savings (LED Retrofits &amp; Controls)</th>
<th>Annual Energy Cost Savings ($ Million)</th>
<th>Annual Maintenance Savings ($ Million)</th>
<th>Total Annual Cost Savings ($ Million)</th>
<th>Total Installed Cost ($ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>1,386,000</td>
<td>566,111</td>
<td>$36.8</td>
<td>$69.30</td>
<td>$106.1</td>
<td>$431.05</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>1,070,109</td>
<td>358,674</td>
<td>$25.1</td>
<td>$53.50</td>
<td>$78.61</td>
<td>$332.80</td>
</tr>
<tr>
<td>Connecticut</td>
<td>312,140</td>
<td>104,621</td>
<td>$12.56</td>
<td>$15.60</td>
<td>$28.16</td>
<td>$97.08</td>
</tr>
<tr>
<td>New Jersey</td>
<td>763,137</td>
<td>255,784</td>
<td>$21.74</td>
<td>$38.16</td>
<td>$59.9</td>
<td>$237.34</td>
</tr>
<tr>
<td>Maryland</td>
<td>527,237</td>
<td>176,716</td>
<td>$10.6</td>
<td>$26.36</td>
<td>$36.96</td>
<td>$163.97</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>496,000</td>
<td>166,247</td>
<td>$14.96</td>
<td>$24.80</td>
<td>$39.76</td>
<td>$154.26</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>91,363</td>
<td>30,623</td>
<td>$2.76</td>
<td>$4.56</td>
<td>$7.32</td>
<td>$28.41</td>
</tr>
<tr>
<td>Delaware</td>
<td>77,940</td>
<td>26,124</td>
<td>$2.35</td>
<td>$3.90</td>
<td>$6.25</td>
<td>$24.24</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>71,000</td>
<td>23,797</td>
<td>$1.9</td>
<td>$3.55</td>
<td>$5.45</td>
<td>$22.08</td>
</tr>
<tr>
<td>Maine</td>
<td>65,887</td>
<td>22,084</td>
<td>$2.03</td>
<td>$3.29</td>
<td>$5.50</td>
<td>$20.49</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>65,297</td>
<td>21,886</td>
<td>$2.19</td>
<td>$3.26</td>
<td>$5.45</td>
<td>$20.3</td>
</tr>
<tr>
<td>Vermont</td>
<td>31,037</td>
<td>10,403</td>
<td>$1.04</td>
<td>$1.55</td>
<td>$2.59</td>
<td>$9.65</td>
</tr>
</tbody>
</table>
APPENDIX A EXAMPLE: MASSACHUSETTS

Massachusetts Street Light Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Street Lights</td>
<td>496,000</td>
</tr>
<tr>
<td>Percent Region’s Total Street Lights</td>
<td>10 percent</td>
</tr>
<tr>
<td>Annual Street light Energy Usage</td>
<td>305 GWh</td>
</tr>
<tr>
<td>Annual Potential Energy Savings</td>
<td>152.5 GWh</td>
</tr>
<tr>
<td>Annual Potential Energy-Cost Savings</td>
<td>$13.7 Million</td>
</tr>
<tr>
<td>Annual Potential Maintenance Cost-Savings</td>
<td>$24.8 Million</td>
</tr>
<tr>
<td>LED Conversion Installed Costs</td>
<td>$139.4 Million</td>
</tr>
<tr>
<td>Annual Potential Lighting Controls Energy Savings</td>
<td>13.7 GWh</td>
</tr>
<tr>
<td>Annual Potential Lighting Controls Cost Savings</td>
<td>$1.2 Million</td>
</tr>
<tr>
<td>Lighting Controls Installed Cost</td>
<td>$13.9 Million</td>
</tr>
</tbody>
</table>

Massachusetts Utilities by Percent Residential Customers

<table>
<thead>
<tr>
<th>Utility</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts Electric Co. (National Grid)</td>
<td>43%</td>
</tr>
<tr>
<td>NSTAR</td>
<td>34%</td>
</tr>
<tr>
<td>Nantucket Electric Co.</td>
<td>5%</td>
</tr>
<tr>
<td>Combined Municipal</td>
<td>14%</td>
</tr>
<tr>
<td>Fitchburg Electric and Gas (Unitil)</td>
<td>5%</td>
</tr>
<tr>
<td>Western Massachusetts Electric Co.</td>
<td>7%</td>
</tr>
</tbody>
</table>

Table A12: Unitil HPS/LED Rate Comparison

<table>
<thead>
<tr>
<th></th>
<th>HPS Rate</th>
<th>LED Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual Rate Per Light</td>
<td>Annual Rate Per Light</td>
</tr>
<tr>
<td>Lumen Rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,300</td>
<td>$117.48</td>
<td>$101.64</td>
</tr>
<tr>
<td>9,500</td>
<td>$139.80</td>
<td>$120.48</td>
</tr>
<tr>
<td>20,000</td>
<td>$208.20</td>
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<tr>
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<td>$295.92</td>
<td>$243.24</td>
</tr>
<tr>
<td>140,000</td>
<td>$607.08</td>
<td></td>
</tr>
</tbody>
</table>

Table A13: Notable Conversion Projects (Massachusetts)

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Light Compact</td>
<td>Present</td>
<td>Has Coordinated the Conversion of 15,000 Street lights in 20 municipalities including Hyannis, Dennis, Harwich, Chilmark, Chatham, Orleans, Brewster, Wellfleet, Truro, Provincetown, Mashpee, Cotuit, Edgartown, Oak Bluffs, Barnstable, Sandwich, W. Barnstable, Yarmouth, Falmouth, and Bourne. Conversions planned in Cohasset, Tisbury, and West Tisbury.</td>
</tr>
<tr>
<td>Cambridge</td>
<td>Present</td>
<td>Replacing all street, park, and decorative lights with LED Fixtures, plus wireless controls for street lights.</td>
</tr>
<tr>
<td>Fitchburg</td>
<td>March 2014</td>
<td>Considering Conversion</td>
</tr>
<tr>
<td>Holyoke</td>
<td>December 2013</td>
<td>Completed Second Year of Three Phase Project to Convert all Street lights to LED.</td>
</tr>
<tr>
<td>Greenfield</td>
<td>May 2013</td>
<td>Invitation to Bid for Conversion of 416 Fixtures to LED.</td>
</tr>
<tr>
<td>Newton</td>
<td>May 2013</td>
<td>26 pilot lights converted with plan to convert all 8,400 lights.</td>
</tr>
</tbody>
</table>
REGIONAL ANALYSIS:
LEADING THE PACK AND MOVING AHEAD

LEADING THE PACK

Vermont
• 2011 law requires all investor owned utilities to offer a utility-owned LED tariff

Massachusetts
• MAPC facilitating RFQ process, DOER targeting street lighting for energy savings

MOVING AHEAD

Connecticut
• 2014 Conference of Municipalities RFQ for purchase assistance, LED conversion, maintenance management services

Rhode Island
• 2013 legislation requires dimmable LED tariff and sets up conversion process- regulatory proceedings are still pending

New Hampshire
• City of Manchester intervention gains advantageous PSNH LED tariff
• Customer Contributed Rate EOL
COORDINATED REGIONAL STRATEGY
COMPARSED TO US DOE PROJECTIONS

REQUIRES COMMITMENT TO CONVERSION PROGRAM BY
30 MAJOR AND 50 MEDIUM CITIES IN NEXT FIVE YEARS
COORDINATED REGIONAL STRATEGY
OVERVIEW

Regional Strategy to Achieve 30% LED Street Light Conversion by 2020

Provide Publicly Accessible Solutions
- Create Regional On-Line Resource Center
- Facilitate Access to Existing Financial Solutions & Expertise
- Develop Additional Regulatory Policy and Tariff Solutions

Engage & Support Stakeholders
- Stakeholder Outreach & Engagement
- Participant Recruitment
- Education and Technical Assistance

Make Progress Visible
- Regional Street Lighting Scorecard and Map
- Estimate Achieved Street Lighting Energy, Cost, and Carbon Savings
- Track Market Penetration & Milestones for Market Transformation
COORDINATED REGIONAL STRATEGY
EXISTING RESOURCES/STAKEHOLDER INITIATIVES

**US Department of Energy Better Buildings Challenge**
In exchange for technical assistance and strategic partnership with financial institutions (et.al.), partners agree to **reduce portfolio energy usage by 20% over the next 10 years.**

- **Outdoor Lighting Accelerator**
  The US Department of Energy’s Outdoor Lighting Accelerator program provides municipalities with the tools and guidance necessary to complete a goal of replacing all lights system-wide within two years.

**Efficiency Vermont Conversion Guide**
Step by step Guide for improving Efficiency in Municipal Street and Public Space Lighting

**Municipal Solid State Street Lighting Consortium (MSSSLC)**
Shares technical information and experiences related to LED street and area lighting demonstrations, standing as an objective resource for evaluating new products on the market intended for those applications.

**MODEL TOOLS AND SPECIFICATIONS**

- **Streetlight retrofit financial analysis tool** to help municipalities determine cost-savings of a potential conversion
- **Model Specification for LED Roadway Luminaires, V2.0**
- **Model Specification for Networked Outdoor Lighting Control Systems V2.0**
NEEP RESOURCES... AND MORE

Regional Roundup

Public Building Operation and Maintenance Guide

Opening at NEEP-High Performance Buildings Associate

Better Buildings Summit

MAY 27-29, 2015

Don't miss out - register today!
INNOVATION & PERFORMANCE
LED Streetlights

Jim Sloss – Deputy Director of Administration
City of Pittsburgh
• PGH owns roughly 40,000 streetlights
  a) In 2010 these fixtures consumed roughly 2,300,000 kWh per month.
  b) The City was paying nearly .07 cents/kWh

Mission

• Replace all HPS Streetlights with a more efficient LED fixture.
Pittsburgh Business Districts
  – 6,000 HPS

Funding
  – $900,000 in state grants
  – Green Trust Fund

Price per kWh
  – .045
Pittsburgh Neighborhoods
- 34,000 HPS Cobraheads

Funding
- Estimated cost of 15-20 million
- GESA
- State and Federal Grants
- Green Trust Fund

Project Scope
- Fixtures
- Installation
- Controls
kWh
  – Projected savings nearly 14 million kWh per year

Maintenance
  – Reduce yearly maintenance contract by 90%

Savings
  – kWh = $1,000,000
  – Maintenance = $1,100,000
Thank you
Lighting Projects

Since 2006 - retrofitted or replaced:

- 37,083 traffic light fixtures with LEDs
- 11,115 street lights with LEDs
- >130 fire stations, parking garages, administrative buildings, courthouses, and police stations with more efficient lighting solutions
Traffic Lights:
Completed in 2006

Replaced 37,083 traffic light fixtures with LEDs

- Reduced annual energy bill from >$1M to $300K
- Payback of <8 years – including all costs

Baltimore City Department of Public Works
Street Lights:
Completed in 2013

Replaced **11,115** street lights with LEDs

- **Annual savings:**
  - $650K from energy
  - $1M from maintenance
What’s Next

- 6,500 street light replacement
  - Focus on high crime areas
  - Increase brightness without increasing cost with LEDs
Lessons Learned

- Working with the public utility
- Lower overhead, better competition, and save sales tax by financing the project without an ESCO
Questions/Comments?