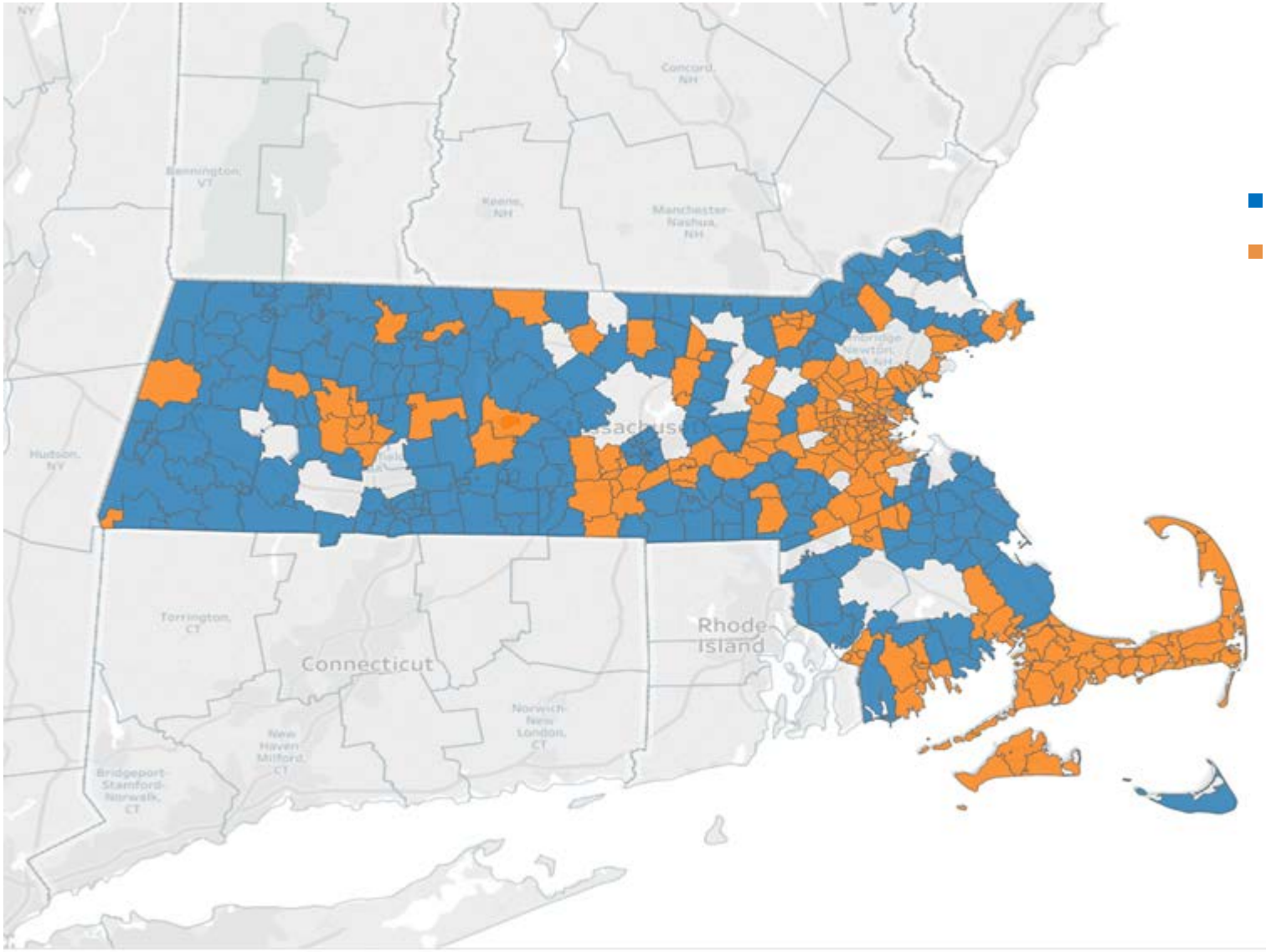
LED Street Lighting in MA

September 21, 2016

Agenda

- Introductions & Opening Remarks
  - Nelson Medeiros - Eversource
- Conversion Update and Remaining Potential
- EE Program Participation Pathways
- Typical Rates & Tariffs Example
- Case Study Highlights
  - Eversource
  - Cape Light Compact
  - Unitil
- Discussion and Questions

MA Streetlight Ownership

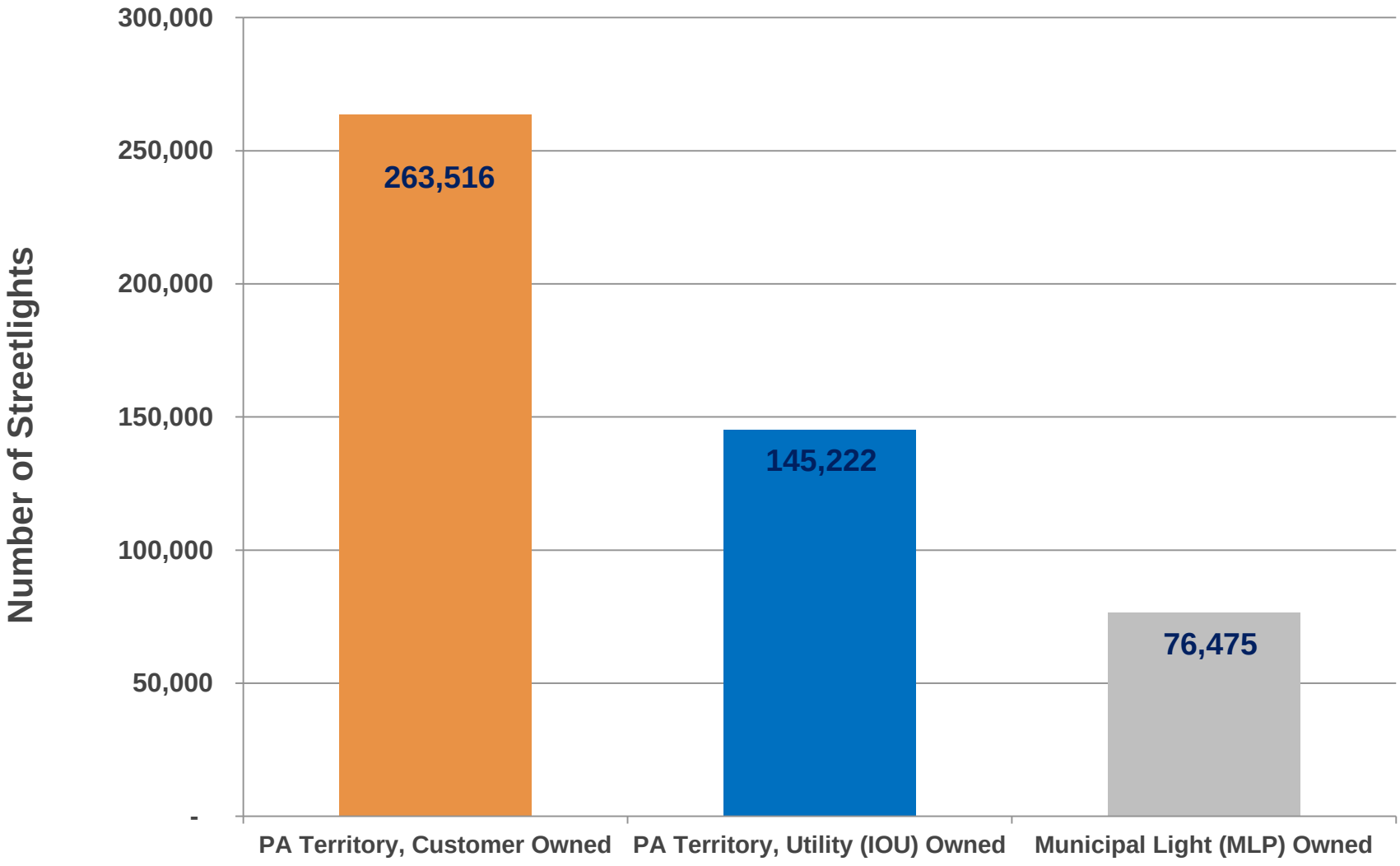


Ownership:

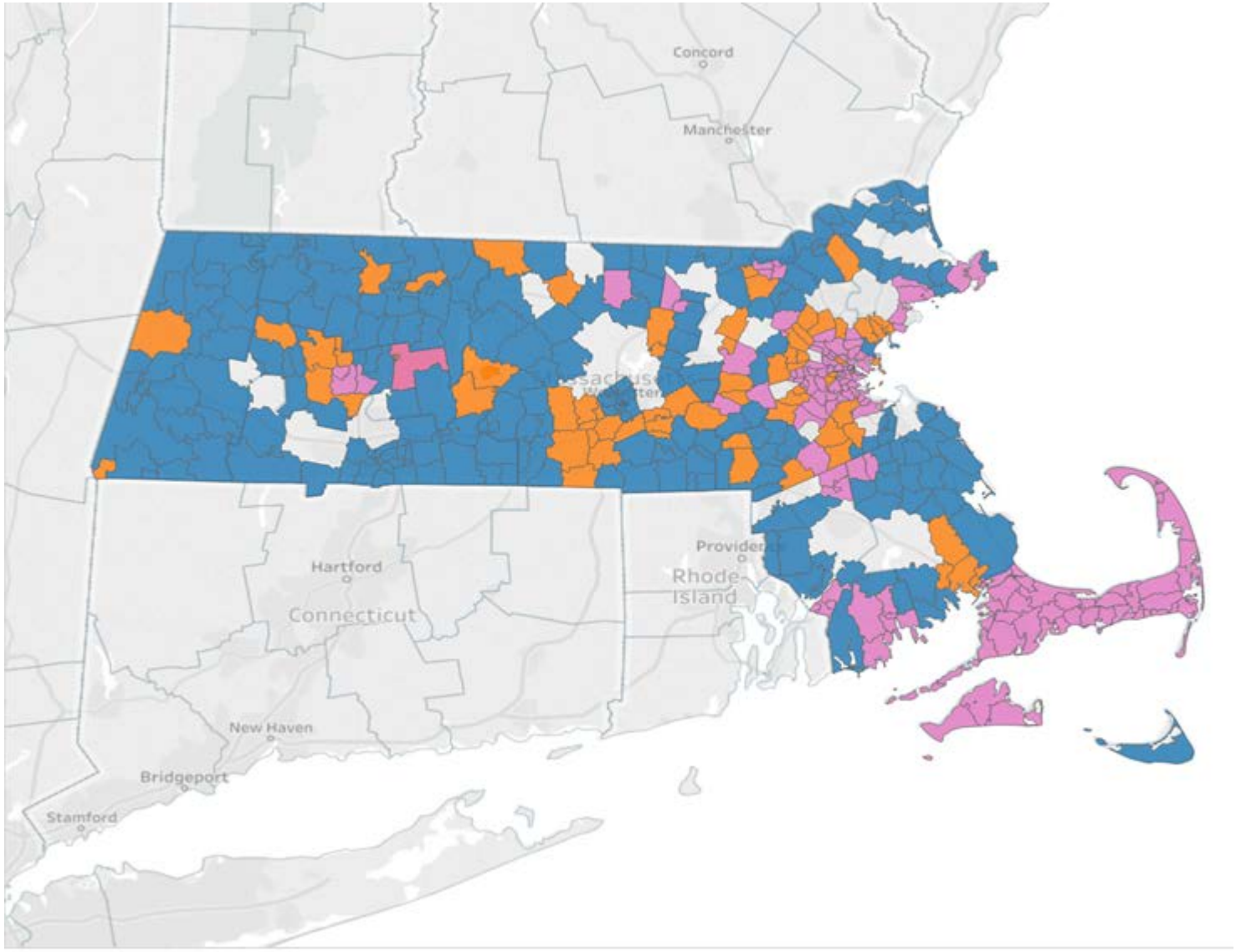
- IOU Owned
- Customer Owned

Note: Blanks are MLP towns

MA Streetlight Ownership Structure



MA Structure & LED Conversion Progress

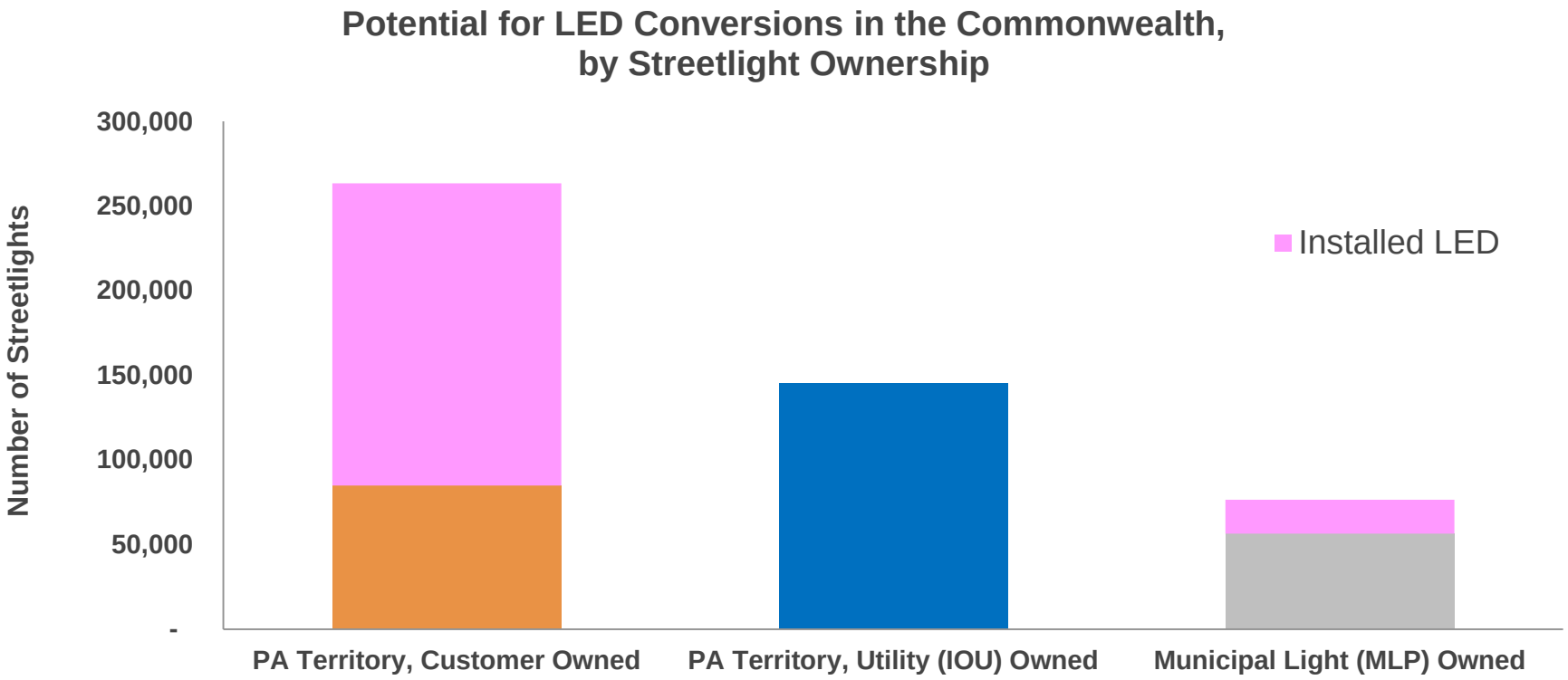


Ownership & LED Conversion:

- IOU Owned
- Customer Owned-Not LED
- Customer Owned-LED

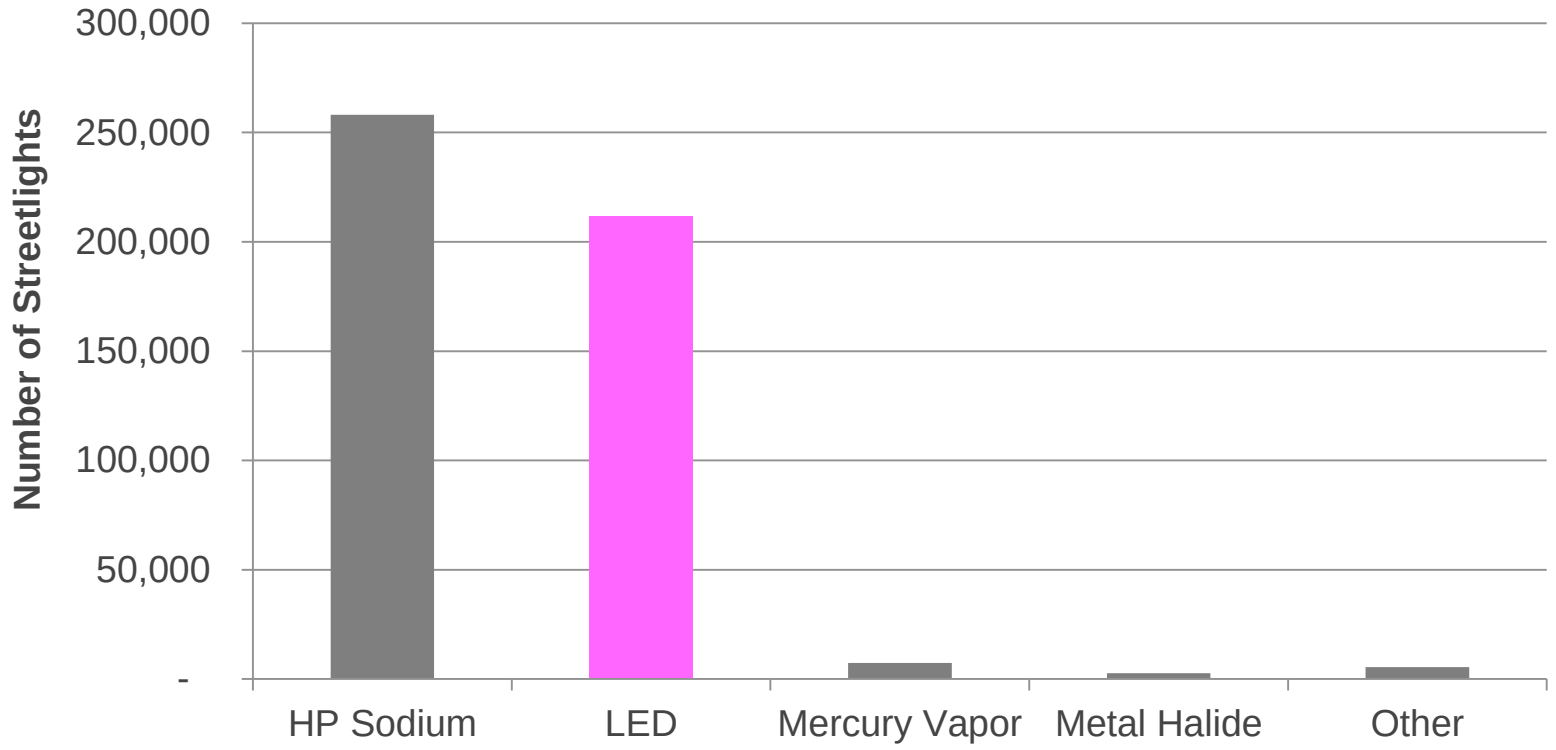
Note: Blanks are MLP towns

MA LED Conversion Progress



Ownership	PA Territory, Customer Owned	PA Territory, Utility (IOU) Owned	Municipal Light (MLP) Owned	Total
Potential	84,967	145,222	56,538	**286,727**
Installed LED	178,549	0	19,937	**198,486**
Total	**263,516**	**145,222**	**76,475**	**485,213**

Streetlight Inventory by Lamp Type Across the Commonwealth



Lamp Type	Number of Streetlights	Estimated kWh Savings for Conversion
HP Sodium	271,171	77,154,359
LED	198,486	-
Mercury Vapor	7,373	4,350,070
Metal Halide	2,722	2,123,160
Other	5,461	972,058
Total	**485,213**	**84,599,647**

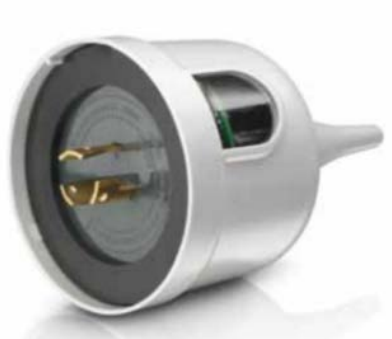
Advancing the Technology

LED Fixtures:

- DLC Standard vs. Premium Solution
  - Premium offers higher performance and greater efficiency
  - Initial cost considerations

Advanced Controls:

- Active engagement with existing and new LED conversion projects
  - Promote controls for existing projects
  - Educating business community on opportunity for advancing new technology
- Planning for future projects
  - 7 pin base for smart controls



Influencing Design Through Expertise

- **Educating customers and business partner community remains a priority**
  - LED projects are not a lumens-to-lumens replacement
  - Focus must be on a combination of both the design and fixture selection to maximize savings
    - Option to redesign location of fixtures instead of a 1 for 1 replacement
  - Area types and appropriate light levels should be analyzed (IESNA RP-8*)

- **Identify impacts of the investment by the community**
  - Energy and Non-Energy Impacts

** Illuminating Engineering Society of North America RP-8 is the national standard practice for Roadway Lighting and serves as the basis for design of fixed lighting for roadways, streets, adjacent bikeways, and pedestrian walkways.*

EE Program Participation Pathways

Financial Incentives & Technical Assistance Services

- **Fixture Purchase Options & Packages**
- **Prescriptive vs. Custom**
- **Incentives:** Projects typically reviewed as Custom Projects under the municipal programs
  - Project BCR screening results vary depending upon the scope of the project
  - Incentives leveraged for advancing new technologies
- **Technical Assistance:**
  - Financial incentives available for analyzing and optimizing advanced design strategies

Considerations for Implementation

Customer-Owned Projects:

- Purchasing Process for Street Light Assets
  - Purchase of assets follows separate process unique to each town and situation
  - Depreciated value of assets
- Higher costs related to design services
- Longer paybacks for the replacement of the remaining HPS fixtures
  - Low wattage HPS are the remaining % of potential fixture conversion
- Control costs vary based upon functionality
- Retrofit of existing fixtures to controls will require the 7-pin photocell receptacle conversion

Considerations for Implementation

Utility-Owned Projects:

- Development of an LED tariff
- Technologies approved within the tariff
- Customer authorization for utility to implement technology at the approved rate
- Engage with customer regarding implementation schedule & strategy
- Control options and time-schedule flexibility dictated by approved tariff

Rates & Tariffs

Street Light tariffs defined by equipment ownership
(Eversource example)

S-1: Utility-Owned Lights

- Fixed equipment charge plus delivery components
- Limited by the defined offerings on the tariff
- Introduction of new lights by the company require regulator approval

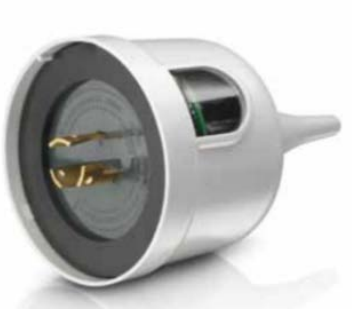
S-2: Customer-Owned Lights

- Rates based purely on delivery components
- Customer is free to introduce new technologies immediately
- Customer can make their own design choices

Case Studies

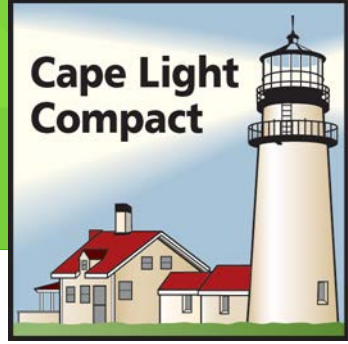
Eversource

EVERSOURCE



- Urban Community
- Scope of project: 4,871 Fixtures,
- Estimated annual energy savings via technology:
  - Fixture retrofit: 2,105,174 kWh/yr
  - Multi-Stage Dimming Controls: 1,121,850 kWh/yr
  - Customer incentive: $800,000 +
  - Approximate Project Cost: ~ $2,500,000
  - Payback ~ 5 years
- Positive Stakeholder Feedback on the design, light levels, color, and control capabilities
- Partnership enables business partners to learn and understand the various impacts and benefits of dimming controls

Cape Light Compact



OVERALL TOTALS:

- 23 Participating Municipalities
- 15,700 eligible* lights converted
- 17,000 points GIS GPS-mapped
- LED technology

PROJECT DETAILS:

- ~ $5,900,000 total
- 2013-2015 Three-Year DPU Approved Energy Efficiency Plan
- LED conversions implemented at no cost to the towns

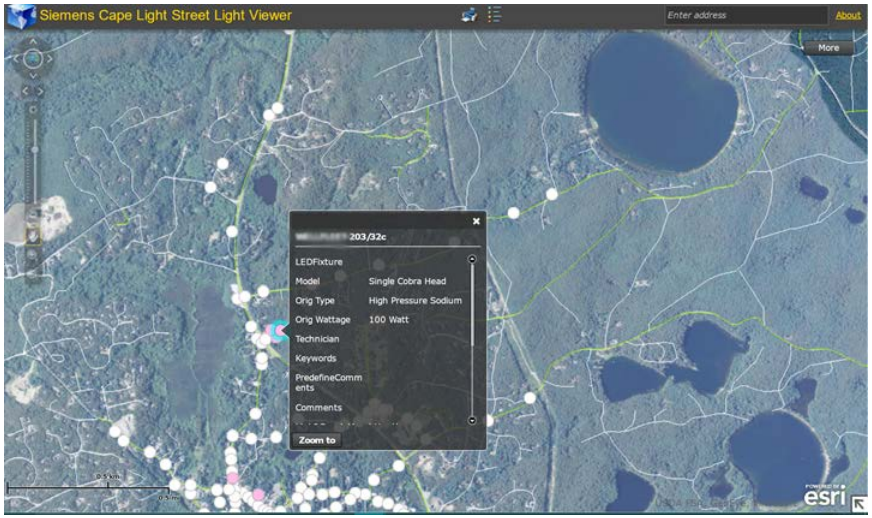
Annual Estimated kWh Savings	Annual Estimated Utility Bill Savings	Annual Estimated Maintenance Savings
3,718,530	**$496,982**	**$217,672**
(Peak Demand Reduction = 0.930 MW)		

PROJECT BENEFITS:

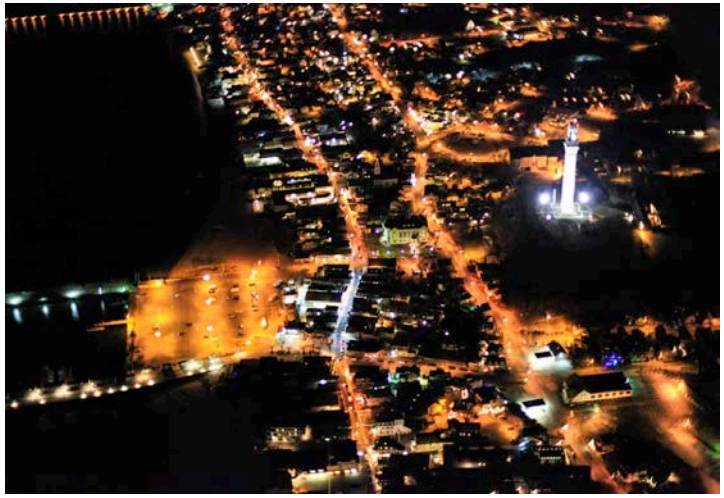
- Significant increase over planned estimates
- Combined total savings**

**Savings estimates revised based on “as installed” actuals

Photos



Provincetown Aerial Views*



Before (high pressure sodium)

After (LED)

Project Highlights

Multi-year, multi-phase, effort from early 2012 – 2015

- Demonstration project led to 6-phase full conversion project
- Mostly non-Summer work, 60-day adjustment period

Special Recognition

- Falmouth – greatest # of streetlights (2,573, not incl. admiral hats)
- West Tisbury – greatest % energy savings (87%)
- Provincetown – most engaged community in demonstration phase

Thanks and Appreciation

- So many… CLC Board members & staff, DPU/DOER, Eversource, Town Administrators, DPW/Hwy staff, Selectmen and all involved
- Siemens Team!!

Lessons Learned

Each community has its own unique needs

- Demonstration projects can be very helpful to get input
- Not all streetlights will get changed
- Timelines for project implementation approvals vary by town

Estimated savings varies based upon existing fixture

- Can help to blend savings for an overall project

Fluctuations

- These can impact savings

Unitil

- City of Fitchburg
- 3,100 Fixtures
- $1,016,000 Installed Cost
- 687,000 kWh Annual Energy Savings
- $ 77,000 Annual Energy Savings
- Payback 8 years (Unitil calculation includes incentive and maintenance savings)
- Comments: Conversion process took a long time but Fitchburg found a win-win solution to save money not spend money.

Discussion & Questions

Thank you