

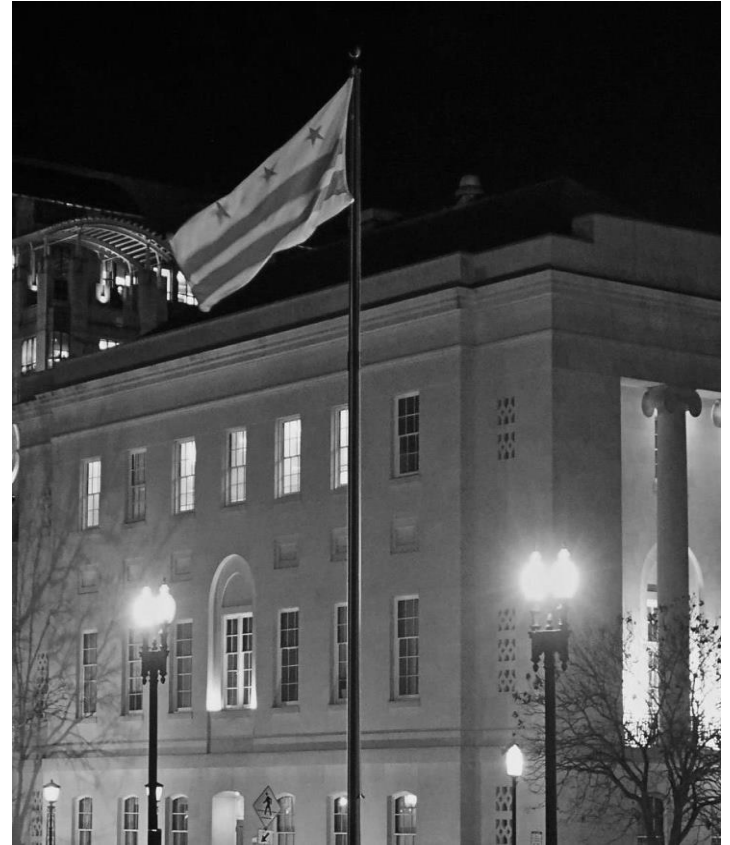
d.

District Department of Transportation



Presentation Agenda

- LED Streetlight Background
- Current Streetlight Projects
- Pathway Forward



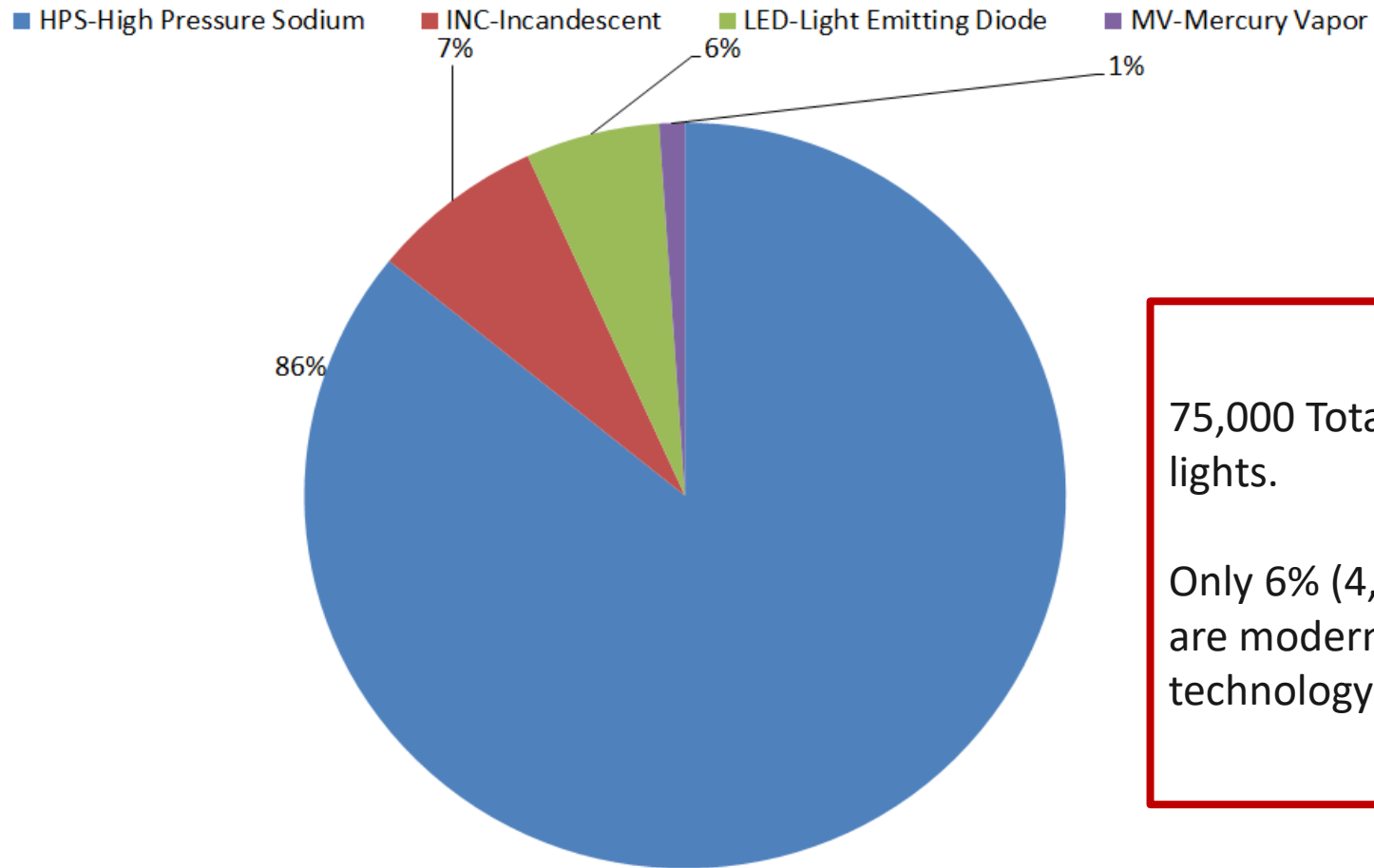
LED Streetlight Background

Why LED Streetlights?

- Enactment of the Energy Independence and Security Act of 2007
 - Requires 25% greater efficiency for light bulbs
 - Manufacturers began moving away from incandescent bulbs
- DDOT began researching lighting alternatives focusing on alley lighting with most non-energy efficient lights
- LED becomes more promising technology
- In 2010 DDOT commissioned a lighting study including a public opinion survey of 143 residents on sample LED lights
 - 94% preferred LED to high pressure sodium lights
 - 90% felt LED streetlights improved visibility in streets and alleys
- In 2011 the District received a \$1.1 million grant from the US Department of Energy to reduce its carbon footprint

LED Streetlight Background

Streetlight Inventory



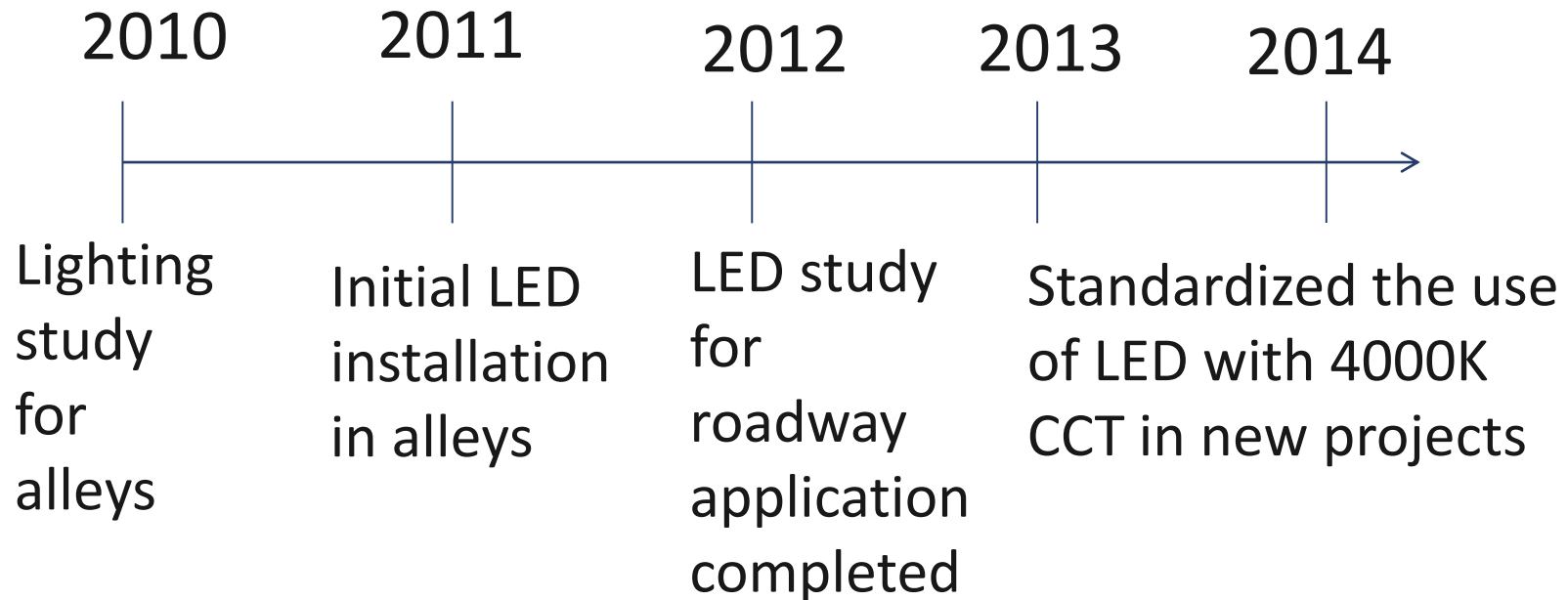
75,000 Total lights.

Only 6% (4,200) are modern (LED technology).

LED Streetlight Background

LED Deployment

The Evolution of LED Implementation



LED Streetlight Background

Initial LED Deployment: 5000K

- Timeframe: January 2011 to June 2012
- Purpose and Criteria
 - Improve safety through better visibility
 - Replace incandescent and mercury vapor lights
 - Reduce energy consumption by at least 50%
 - Reduce carbon footprint
 - Reduce operation and maintenance cost

LED Streetlight Background

Establishing 4000K as the DDOT Standard

- Timeframe: 2013 to present
- Purpose and Criteria
 - All benefits of 5000K
 - Increased efficiency
 - Better control of light pollution and trespass
 - Higher color rendering index (CRI) for better object recognition and detection
 - Improved lighting coverage and uniformity
 - Geared for adaptive control (dimming control)
 - Longer warranty period (10 years)

Current Streetlight Projects

- Mt. Pleasant Street from Columbia Road to Park Road, NW (Historic District)
- Massachusetts Avenue from 6th Street NE to 19th Street SE (Historic Street)
- Pennsylvania Avenue, SE from 2nd Street to Barney Circle
- Citywide LED Conversion

Pathway Forward – Ongoing Research

CCT Multi-City Analysis

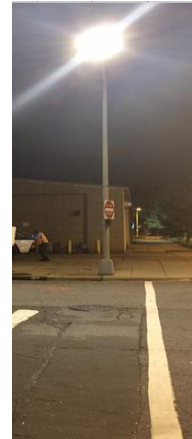
| | 5600-6000K | 5500K | 4000K | 4000K and 3000K | 3200K | 3000K | 2700K |
|-----------------------------|------------|-------|-------|-----------------|-------|-------|-------|
| Seattle | | | X | | | | |
| Philadelphia | | | X | | | | |
| Montreal | | | | X | | | |
| Arlington | | X | | | | | |
| City of Baltimore | X | | | | X | | |
| City and County of Honolulu | | | | X | | | |
| Washington D.C. | | | X | | | | |
| Phoenix | | | | | | | X |
| Los Angeles | | | X | | | | |
| Tuscon | | | | | | X | |
| San Jose | | | | X | | | |
| Chicago | | | | | | X | |
| New York | | | X | | | | |
| San Diego | | | | X | | | |

Pathway Forward – Ongoing Research

DDOT Evaluation of 3000K & 4000K LED fixtures for Roadway Lighting



Luminaire Power: 215 Watts
Luminaire Type: Cobrahead (Cutoff)
Nominal CCT Rating: 4000K
Location: H Street NW between 17th Street and 18th Street (5 Lane, One Way, Minor Arterial)
Mounting Height: Approx. 30'



Luminaire Power: 185 Watts
Luminaire Type: Cobrahead (Cutoff)
Nominal CCT Rating: 3000K
Location: K Street SW between Half Street and South Capitol Street (4 Lane, Two Way, Local Roadway)
Mounting Height: Approx. 30'

| Point of Observation | CCT (K) Range |
|--|---------------|
| Standing in the Street | 3259 - 4143 |
| Walking your dog on the sidewalk | 2627 - 3533 |
| 2 nd floor room 10' from the sidewalk | 2607- 2891 |

| Point of Observation | CCT (K) Range |
|--|---------------|
| Standing in the Street | 2783 - 2998 |
| Walking your dog on the sidewalk | 2579 - 3087 |
| 2 nd floor room 10' from the sidewalk | 2328- 2940 |

Streetlight A – Approved Fixture

Streetlight B - Under Evaluation

Pathway Forward – Ongoing Research

DDOT Evaluation of 3000K & 4000K LED fixtures for Roadway Lighting



Luminaire Power: 100 Watts
Luminaire Type: Post-top
Nominal CCT Rating: 4000K
Location: 37th Street NW between U Street and Whitehaven (Approx. 35' wide 2-Way, Local Roadway)
Mounting Height: Approx. 16'



Luminaire Power: 100 Watts
Luminaire Type: Post-top
Nominal CCT Rating: 3000K
Location: K Street SE between Half Street and First Street (Approx. 35' wide 2-Way, Local Roadway)
Mounting Height: Approx. 16'

| Point of Observation | CCT (K) Range |
|--------------------------------------|---------------|
| Standing in the Street | 2349 -3537 |
| Walking your dog on the sidewalk | 2506 - 3449 |
| 2nd floor room 10' from the sidewalk | 3201- 3388 |

| Point of Observation | CCT (K) Range |
|--------------------------------------|---------------|
| Standing in the Street | 2619 - 2902 |
| Walking your dog on the sidewalk | 2677 - 2890 |
| 2nd floor room 10' from the sidewalk | 2375- 2691 |

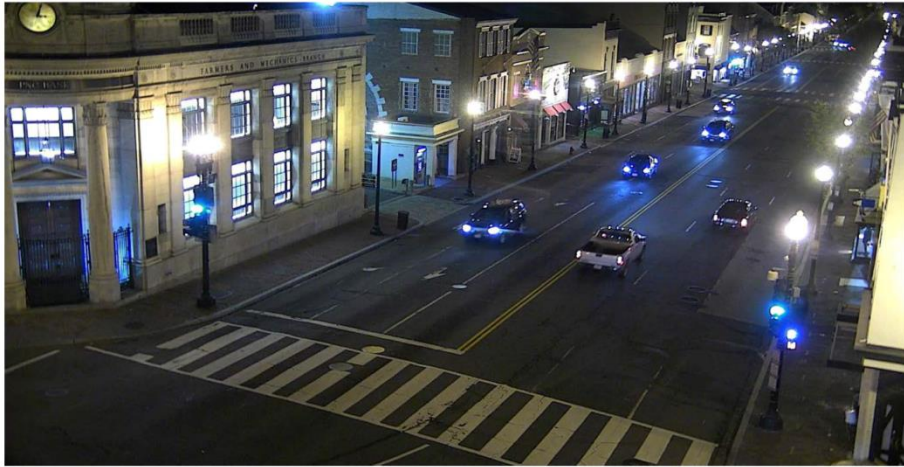
Streetlight C – Approved Fixture

Streetlight D – Under Evaluation

Pathway Forward – Ongoing Research

MPD Preliminary Review of CCTV Camera Images

LED - HS Wisconsin Ave and M St NW - Banana Republic (PTZ Cam)



NON LED – 4D GA Avenue & New Hampshire Ave NW (PTZ & FIXED Cam)



Pathway Forward – Ongoing Research

MPD Preliminary Review of CCTV Camera Images

LED – 5D Bladensburg & Maryland Ave NE (6000 & PTZ Cam)



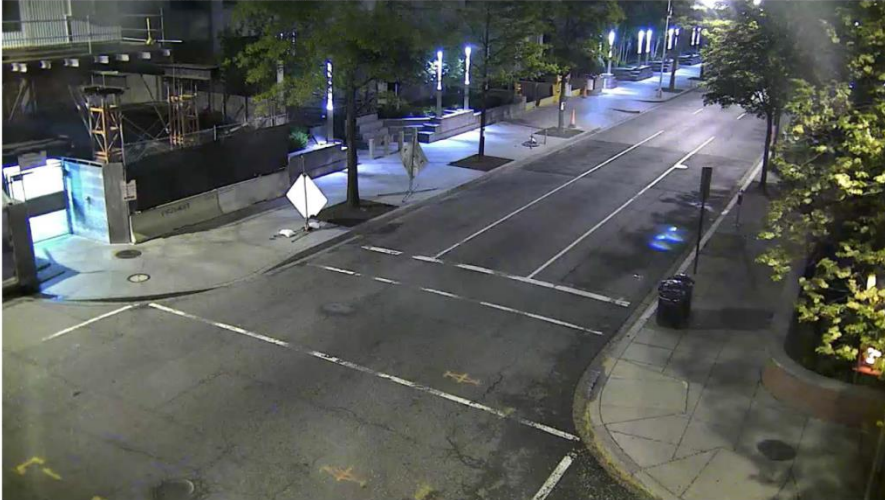
NON LED - 5D 3700 block of 10th St NE (PTZ Cam)



Pathway Forward – Ongoing Research

MPD Preliminary Review of CCTV Camera Images

LED - 2D 20th and H St NW (PTZ Cam)



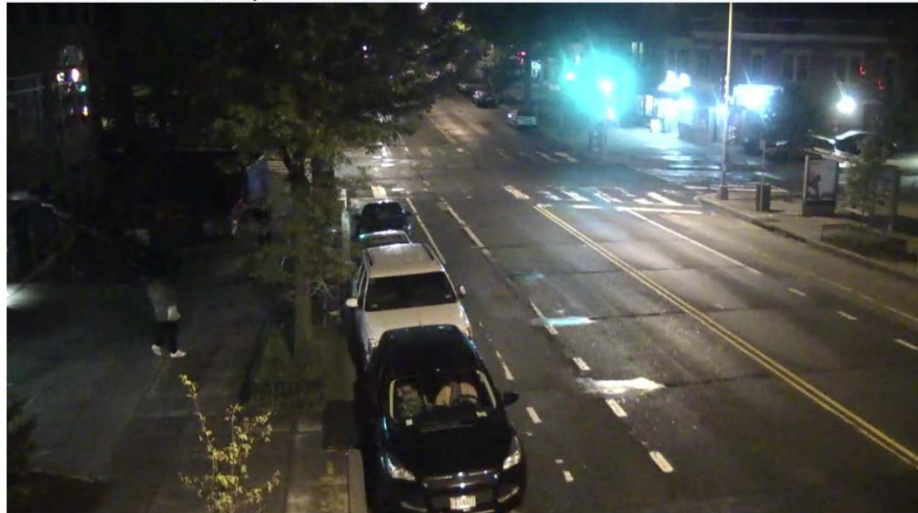
NON LED - 1D 100 block M St NW (By First Place NW) (Fixed Cam)



Pathway Forward – Ongoing Research

MPD Preliminary Review of CCTV Camera Images

LED - 4d 14th & Quincy Street NW (PTZ & FIXED Cam)



NON LED - 4D 14th St & Parkwood Pl NW (Fixed Cam)



Pathway Forward – Ongoing Research

AMA and Academia

- American Medical Association (AMA)
 - Glare can be magnified by improper color temperature of the LED, such as blue-rich LED lighting
 - 3000K lighting has been better received
 - The report is not comprised of consensus based guidelines like in the medical literature
 - The conclusions are meant to support/encourage mindfulness of light pollution. There are unique circumstances affecting each locality
- Lighting Research Center at the Rensselaer Polytechnic Institute in New York
 - Photopic illuminance has very limited utility for characterizing how light stimulates the retina
 - When assessing risk, must consider the ‘use cases’

Pathway Forward – Ongoing Research

Government

- D.C. Government:
 - DOH - “AMA does not oppose the installation of LED street lights or state that they are a public health hazard and should not be used.”
 - DOH - “the AMA report advises that any jurisdiction...consider the potential human and animal health impacts as well as the economic and energy benefits.”
 - DOEE – “Replacing the District's streetlights with LED lights is consistent with the District's energy reduction goals outlined in Sustainable DC...which recommends replacing all street and public lighting with high-efficiency fixtures.”
- U.S. Department of Energy Response:
 - “These issues are neither new nor restricted to LED technology.”
 - “The potential for undesirable effects from exposure to light at night emerges from evolving research, the implications apply to all light sources... phones, computer displays, and other such devices.”

Pathway Forward – Procurement

- DDOT is moving forward simultaneously on two tracks
 - Citywide LED Conversion Contract
 - Streetlight Public-Private Partnership



Questions?