

Second Report of the WWCAM Subcommittee on City  
Operations for Mitigation of Global Climate Change

Update:

# Anchorage

## Outdoor Lighting Initiative



Presented by

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On behalf of

**Municipality of Anchorage, Alaska, USA**



**WWCAM Working Group Meeting  
August, 2009 - Tromso, Norway**



WWCAM August 2009, Tromso Norway



# Global Warming: Alaska at Ground Zero



# US Mayors' Climate Protection Agreement



**Last year:** 800+ US Mayors have pledged to reduce carbon emissions 7% below 1990 levels by 2012.....**Now 967**



# Anchorage's climate protection steps



- Sustainable building ordinance
- LED outdoor lighting initiative
- City-wide recycling
- Methane capture
- Expanding public transit

# Anchorage Outdoor Lighting Initiative



Anchorage has

- 16,000 street lights
- 15,000 trail lights
- hundreds of bus stop & pedestrian lights



# Inefficient 1970's lighting technology still in use



High Pressure Sodium (HPS)

Anchorage:

Residential Street	150 watt
Collector Roadway	250 watt
Arterial Roadway	400 watt

# Next generation technologies: LED and Induction

- Potential for as much as 50% reduction in energy use.
- Few large-scale field tests of light quality and energy savings.

Photo: BetaLED



# Testing of white light technologies in Anchorage



## Issues

- Color temperature
  - white / yellow / blue
- Visibility
- Light quality
- Light pollution (to night sky)
- Light trespass (to residences)

## Methods

- Roadway test installations.
- Varying manufacturers, wattages, color temperatures.
- Electronic sensors and public questionnaire data.
- Measure energy use for 3 mo.



# Anchorage Field Testing:

## 1. Residential Neighborhoods



50 male and female residents, ages 17-71  
Two kinds of broad spectrum lighting

Local residents overwhelmingly approved white light  
over existing High Pressure Sodium

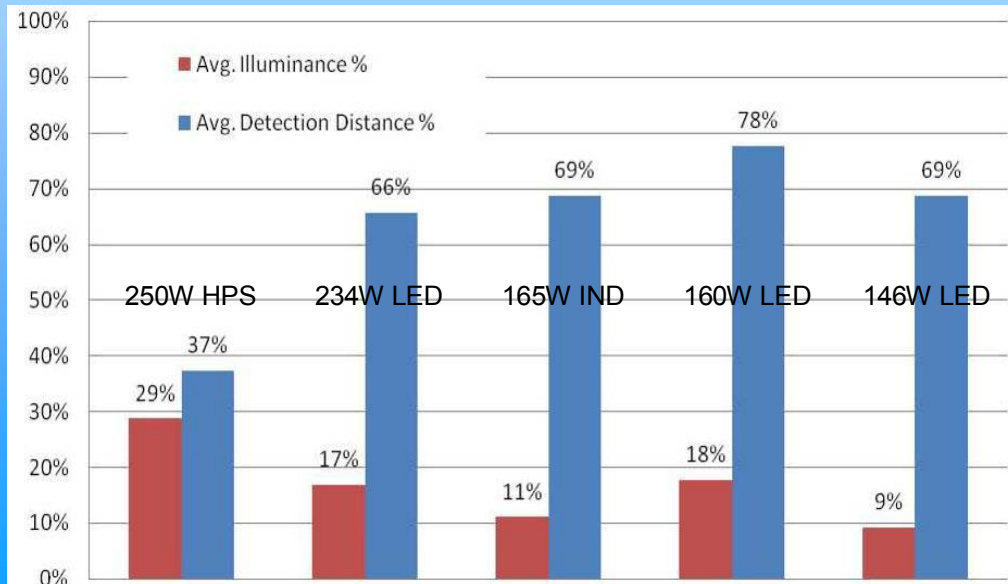
# Anchorage Field Testing:

## 2. Roadway Visibility Demonstration



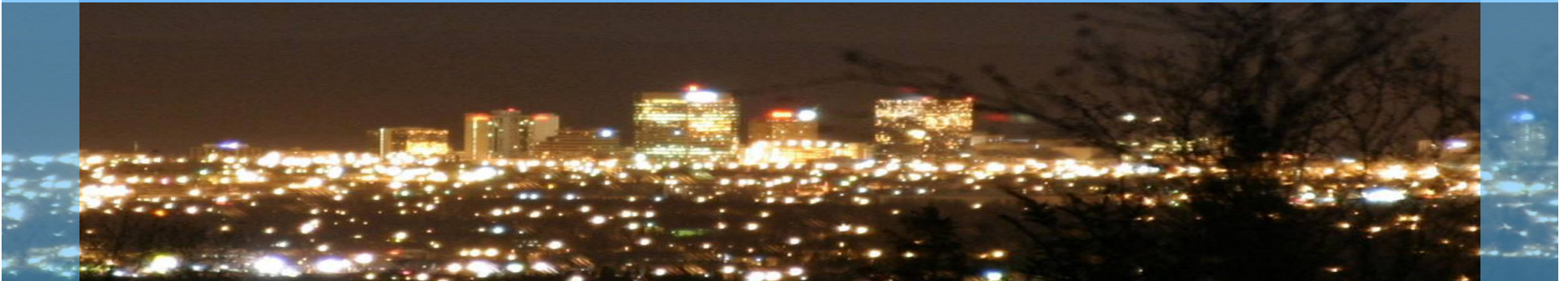
Average Calculated Illuminance as  
% of the 400W HPS System and  
Average Detection Distance as % of  
the 400W HPS System

- 120 local residents, ages 15-73
- Virginia Tech "Visibility Car"
- Dr. Ron Gibbons
- Controls companies technicians
- 5 manufacturers in study
- 2 kinds of control systems



# Field Test Results

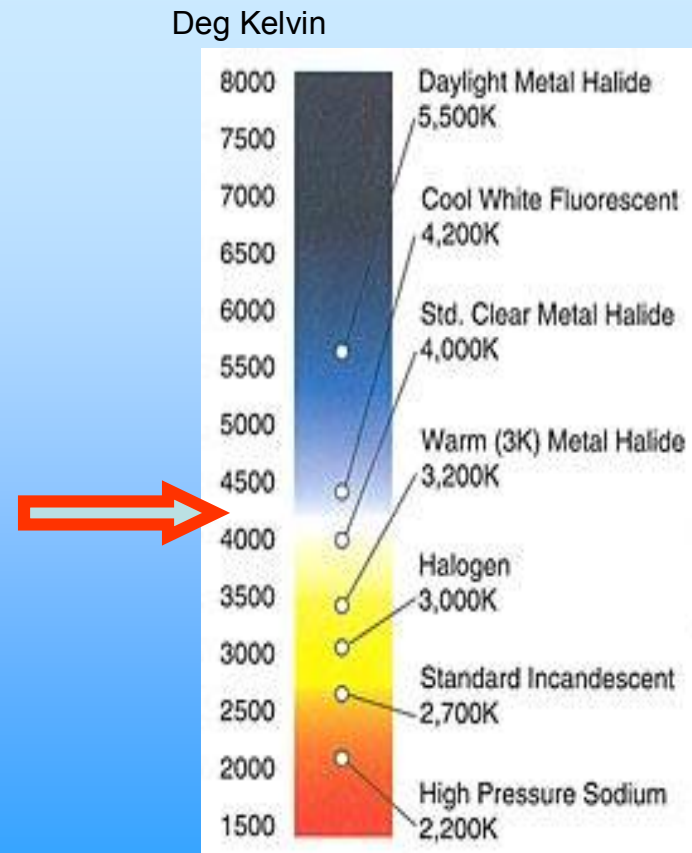
- Observers found that white light provided clearer night vision with truer color perception and greater contrast.
- Anchorage objectively established adequacy of white lighting for roadway applications.
- The Municipality adopted new outdoor lighting specifications to set white light as the new design standard.





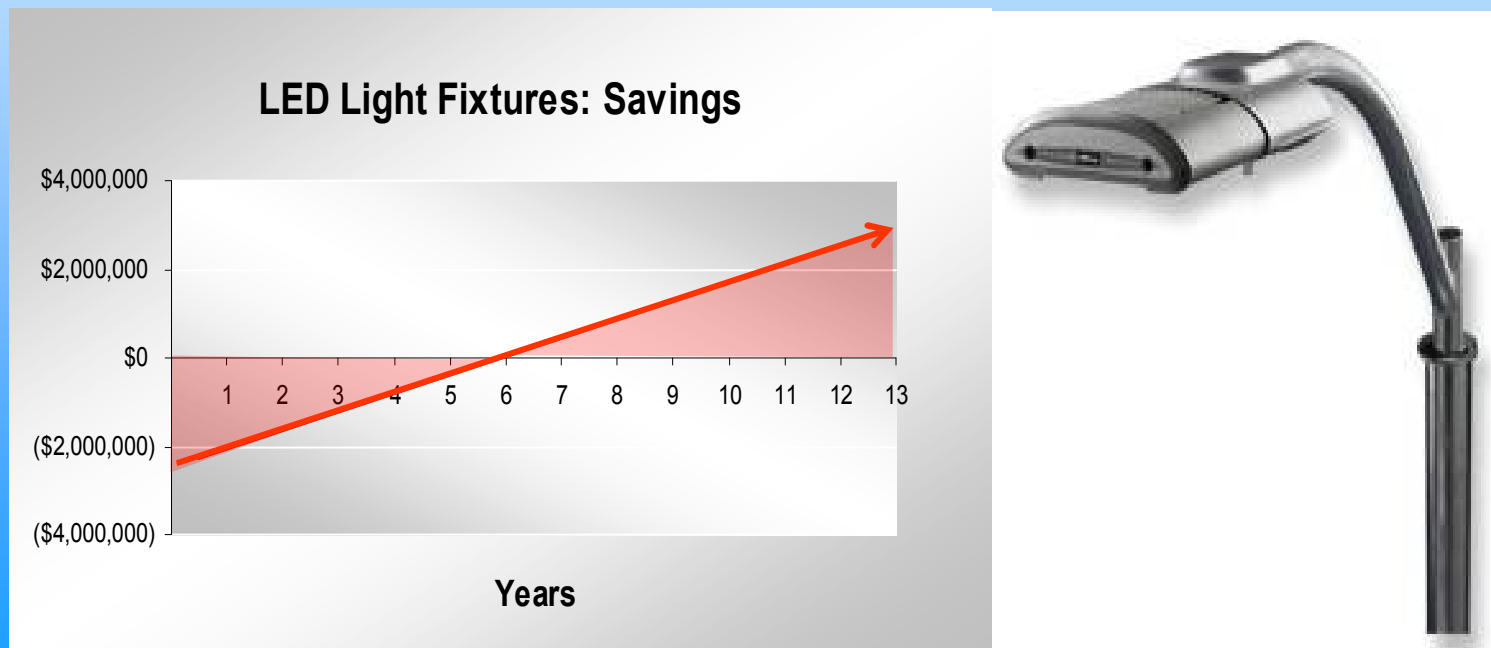
# Implementation

- Municipal policy: Convert all outdoor lights to high efficiency white light LEDs.
- Phase I: 4,000 LED fixtures have been installed.
- Chose white light at 4200 K matching the color of moonlight
- Dark-sky certified cut-off design to limit light pollution
- Side-shields to eliminate light trespass.



## Modeled savings, Phase I

Total capital outlay:	\$2,199,471
Estimated annual savings:	\$350,000
Energy use (Vs previous):	50%
Payback period:	6-7 years
Lifespan:	15-17 years



# Outcome



- Phase I in operation 9 months.
- Public reaction has been very positive.
- Energy savings have met or exceeded expectations.
- Whiter light with better uniformity creates safer conditions for motorists and pedestrians.
- Lifespan more than 7 times that of old HPS lamps will significantly reduce maintenance costs.
- Backlit shielding works to preserve character of Alaska night sky; side shields work for reducing light trespass.



# Collaborators

- Michael Barber, formerly MOA, Alaska.
- Randy Virgin, formerly MOA, Alaska.
- Clanton & Associates, Boulder Colorado
- Ron Gibbons, Virginia Tech Transportation Institute, Virginia.
- US Department of Energy.
- Data and findings are being shared with other cities across the US.



# Technical

## Phase 1 retrofit:

- All city-owned residential streets and low speed collector roads will receive lights.  
2,221 HPS 150 watt  
1,775 HPS 250 watt

## Phase 2 will retrofit:

- Parking lots (with controls)
- Parking garages (“smart lights”)
- Decorative / Historic fixtures
- 70k of Trail lighting (with controls)

## Phase 3 will retrofit:

- Utility maintained lights residential and collector lights
- High speed arterial roadways

## Specs Used for MOA LED Purchase:

- Color temperature 3500-4400 K
- LM79 and LM80 Tested.
- IESNA type II and III light distribution shielding available.
- B.U.G. Rating.
- Standard factory installed variable speed driver.
- Tool-less entry for maintenance and installation.
- Modular Design for both the LEDs and fixture driver.
- Minimum 5 year warranty on Driver, minimum 5 year on LEDs, minimum 10 year on paint and finish.
- An attractive, slim design that reduces wind and snow loading.

Installed: BetaLED Type III LEDway #30 and 40