City of Los Angeles

"Changing our Glow for Efficiency"

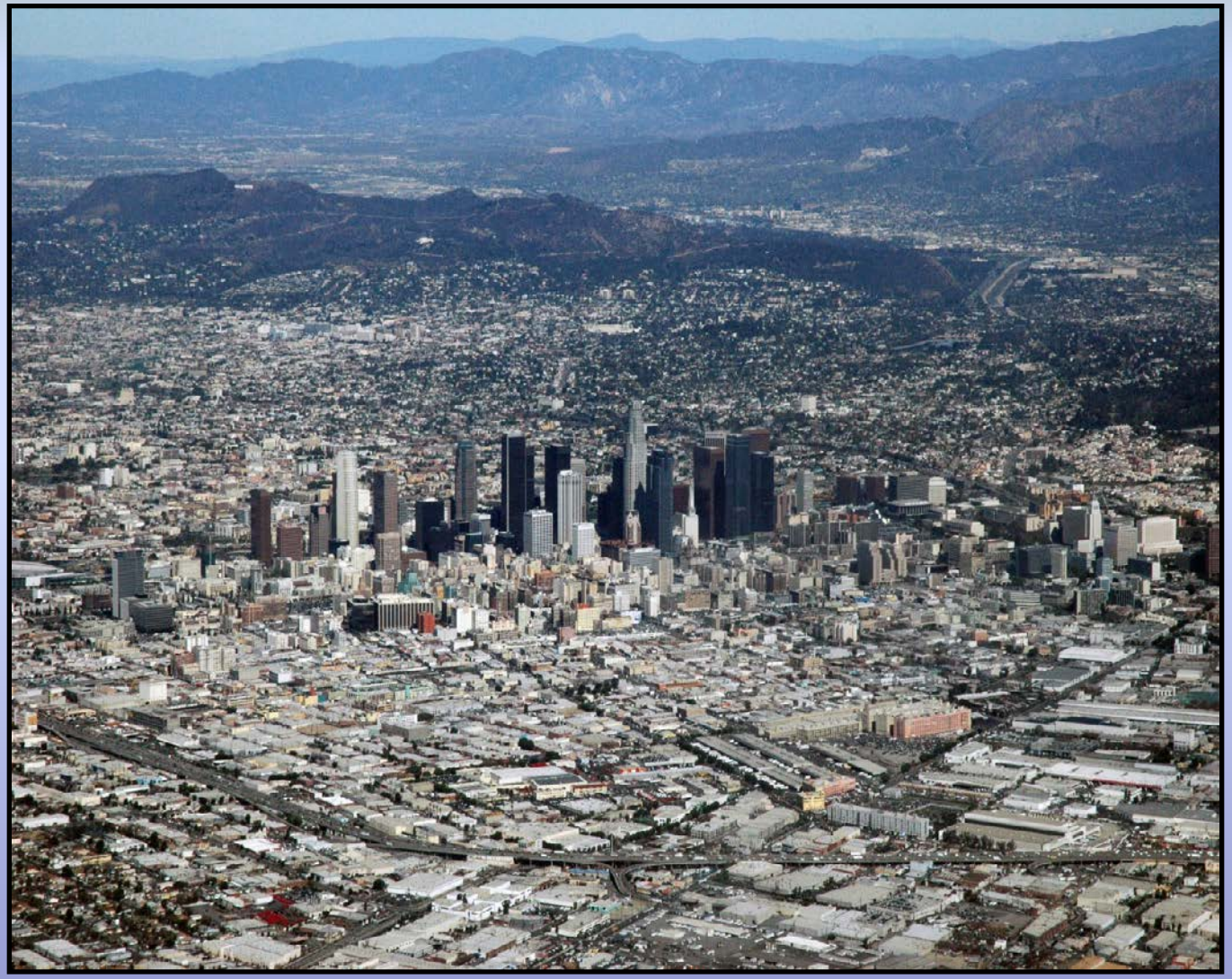
DOE Solid-State Lighting R&D Workshop

Long Beach, CA

January 2013

City of Los Angeles Facts

- ✓ 2nd largest City in the USA
- ✓ 472 sq mi
- ✓ 6500 miles of streets
- ✓ Population of 4 Million
- ✓ $7.2 Bi. City Budget for 2012
- ✓ Power Utility owned by the City

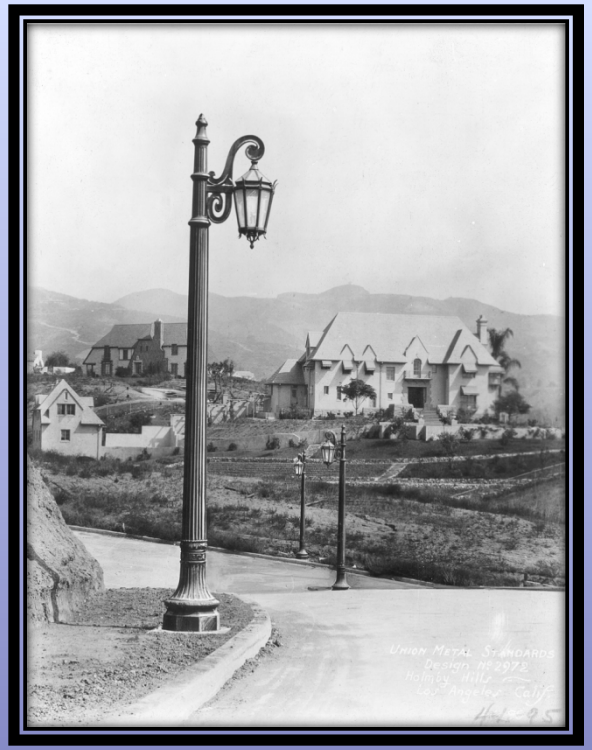


BUREAU OF STREET LIGHTING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

Bureau of Street Lighting

- One of five Bureaus in the Department of Public Works, Est. in 1925

- 210,000 streetlights with over 400 different styles



- 4500 miles of streets are illuminated

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"BRIGHT LIGHTS - SAFE NIGHTS"
CITY OF LOS ANGELES

Bureau of Street Lighting Operations

- **Street Lighting Maintenance Assessment Fund**

- **All maintenance and engineering work In-House 214 Employees**

- **$25 Mil. Annual Budget – Appropriation for FY 12/13**

Operational Challenges for Bureau of Street Lighting

- Energy Usage -190 million kWh/year (2008)
- Energy Cost - $16 million/year (2008)
- No meters. Energy calculated from GIS system, nominal wattage, kWh price per time of use
- Proposition 218 & frozen Assessments

City of Los Angeles – LED Program

"Mayor's Green Initiative for City of Los Angeles"

City of LA - LED Program

- Convert 140,000 streetlights to LED
- Install Remote Monitoring System
- Timeline – 4 years
- Total Cost - $57 million
- Loan $40 million
- City crews
- Program payback – 7 years
- Launched – February 2009

LED Program Goals & Benefits

- Reduce energy consumption by 60%
- Energy Savings – 68,000 MWh/year, $7.5 million/year
- Maintenance Savings - $2.5 million/year;
  Longer life of LED fixtures (10-15 yrs.)
- Environment - Reduce 40,500 tons of CO2/year
- White Light, perception of improved lighting/visibility/dimming capability

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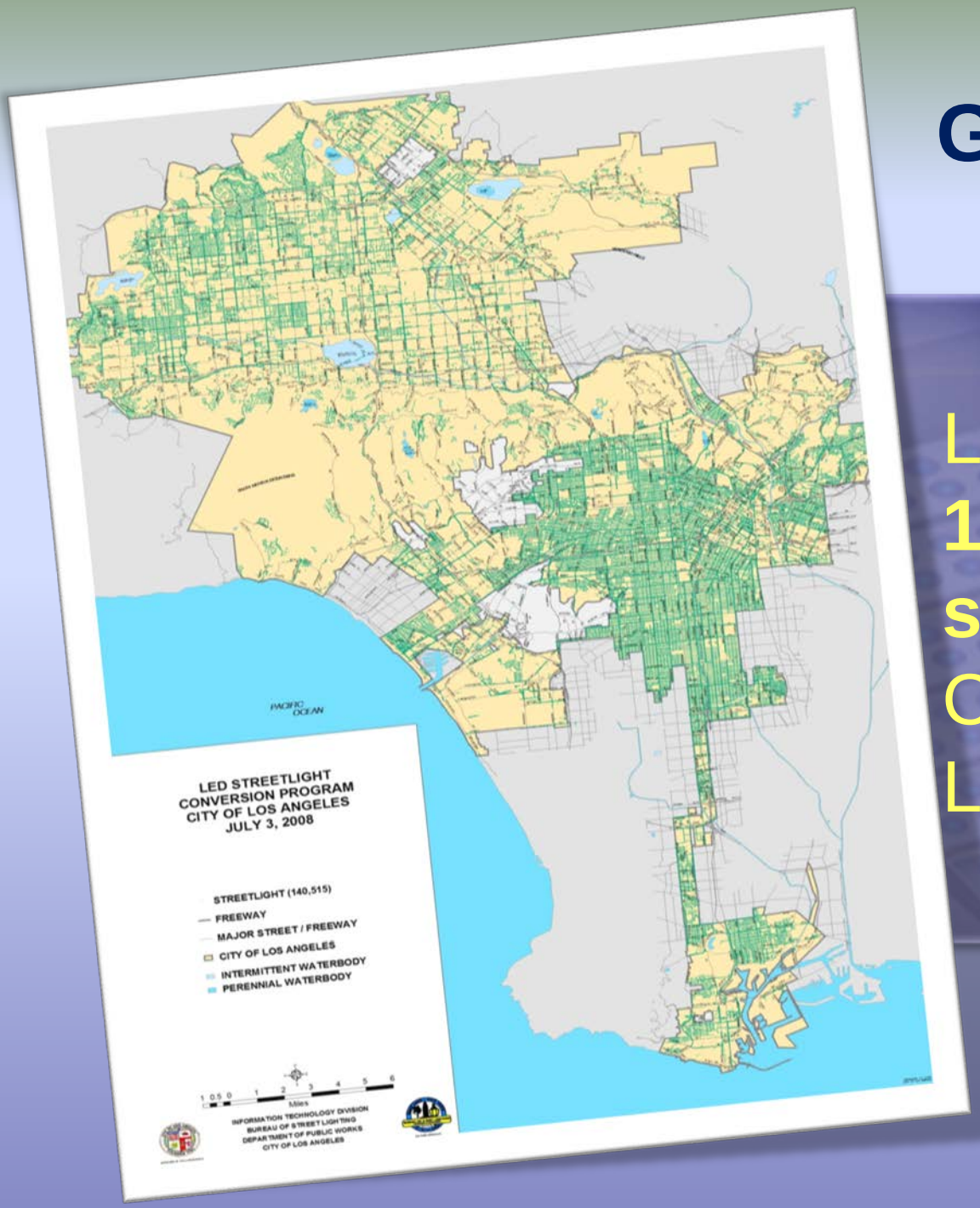
Program Geographic Area



LED Conversion of **140,000 streetlights** in the City of Los Angeles

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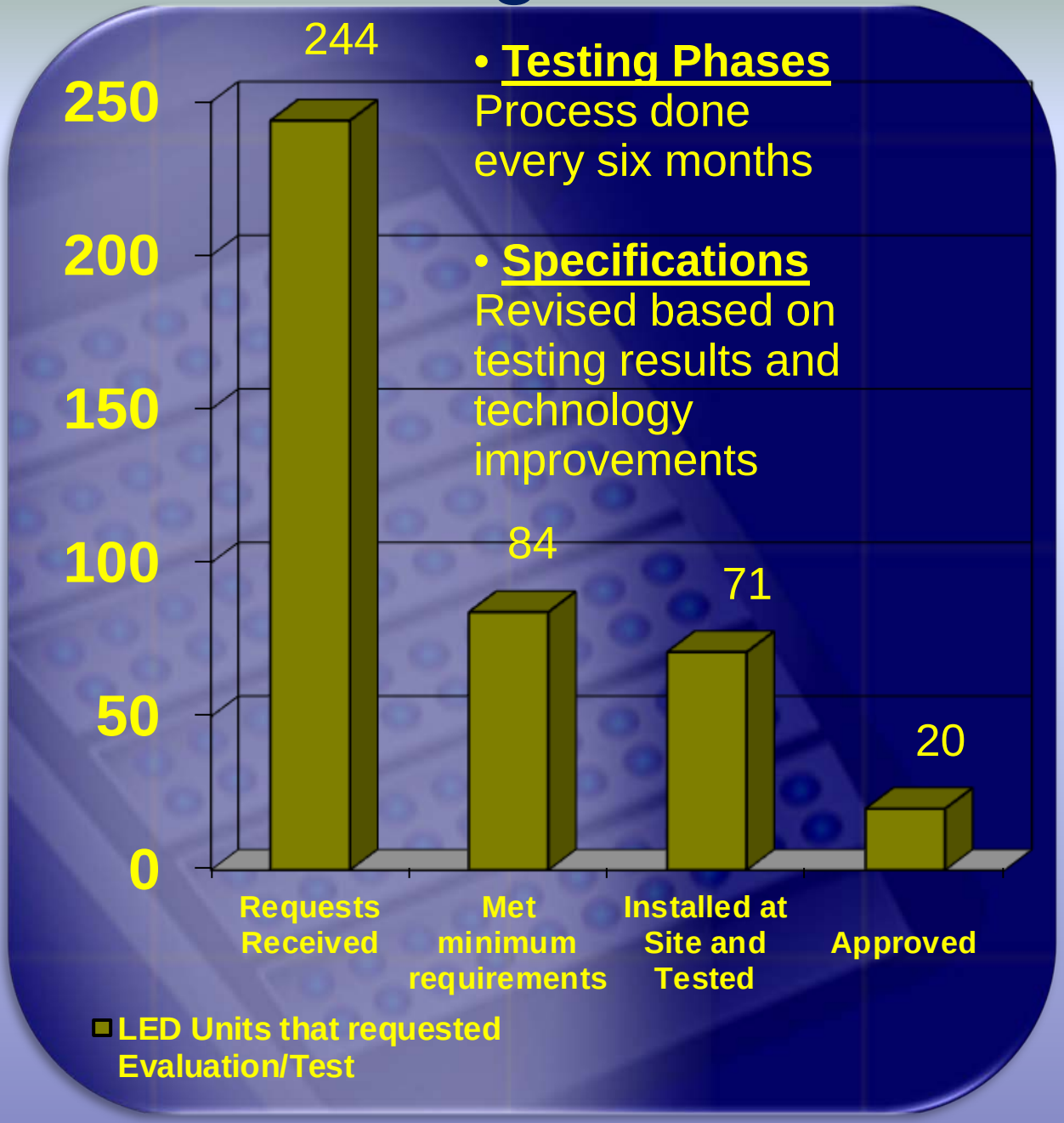
Testing and Evaluation



- **Testing Phases**
  Process done every six months
- **Specifications**
  Revised based on testing results and technology improvements

Lighting Evaluation
Illumination, Luminance, Uniformity Ratio, Color Temperature, Brightness.

Electrical Evaluation
Power consumption, Power Factor, Harmonic Distortion, Remote Monitoring Device compatibility, Remote Dimming/Controls.

Mechanical Evaluation
Disconnects, fixture assembly and ease of installation.

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Summary of City of LA Specifications

- 4000 K
- Warranty 6 years
- 70% delivery of initial lumens at 50,000 hours
- Minimum of 45% energy savings
- 3-prong twist-lock PE receptacle
- House-side light control
- Size, Weight, Packaging, Initial Lumens, and Efficacy
- Bureau's Webpage: http://bsl.lacity.org

Public Outreach

- Improved Lighting
- No Cost
- No Negative Impact
- Surveys
- Dedicated telephone line
- Website http://bsl.lacity.org

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LED Conversion Project

Implementation Process

Engineering

Testing & Evaluation

Specifications

Design & Plans

Installation

Procurement

Delivery

City Forces & Rental Trucks

GIS

As-Built & GIS

Bills

Dollar Savings & CO_2 Emission Reductions

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L.A. Lighting the Way

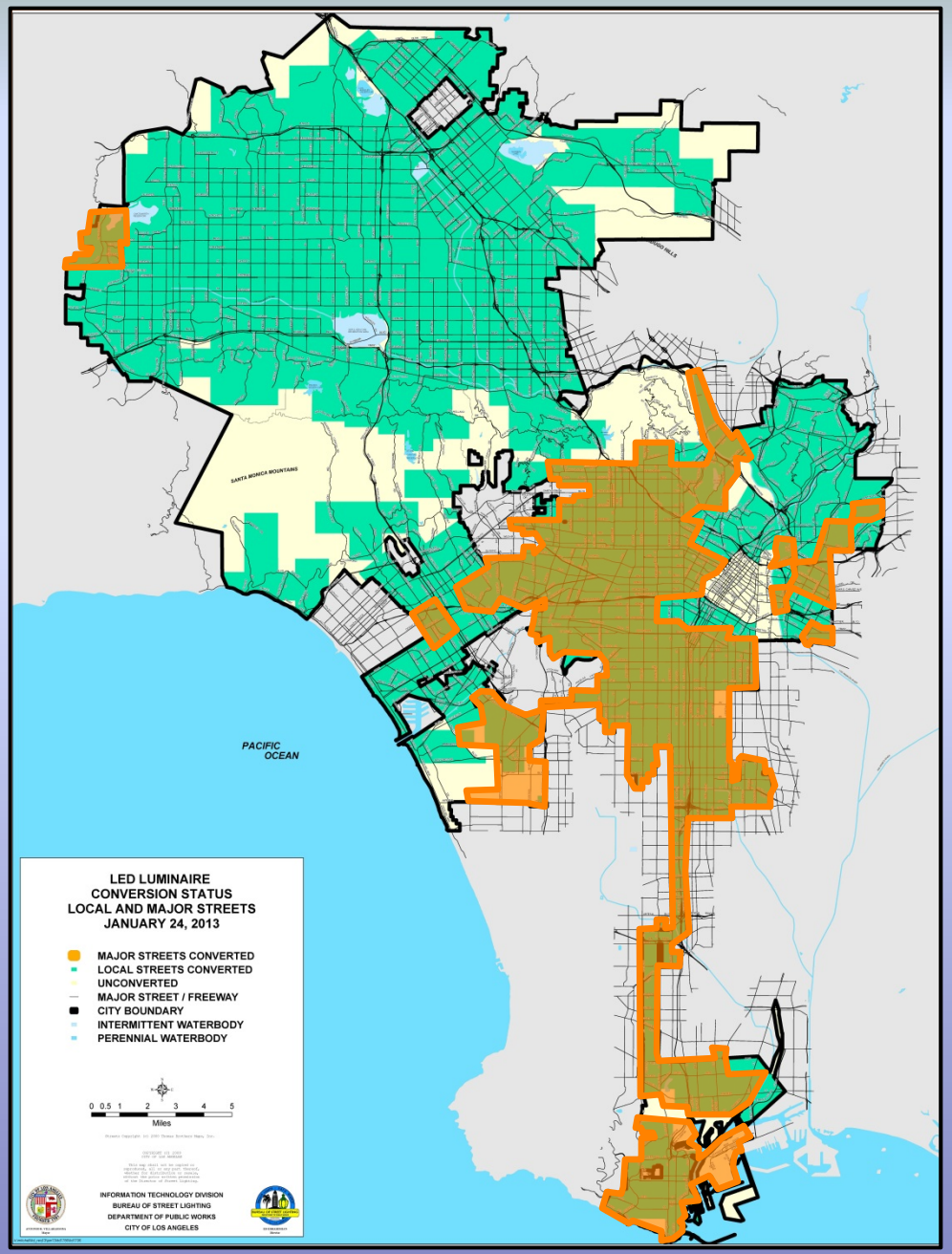
Statistics

- Jobs Created
  Manufacturer: 227
  City of LA: 15
- Truck rentals: 7
- No. of Crews: 7

Workload

- Weekly Installations: 1,000

City of Los Angeles - LED Conversion Project



Local Streets

Major Streets

CITY OF LOS ANGELES FOUNDED 1781

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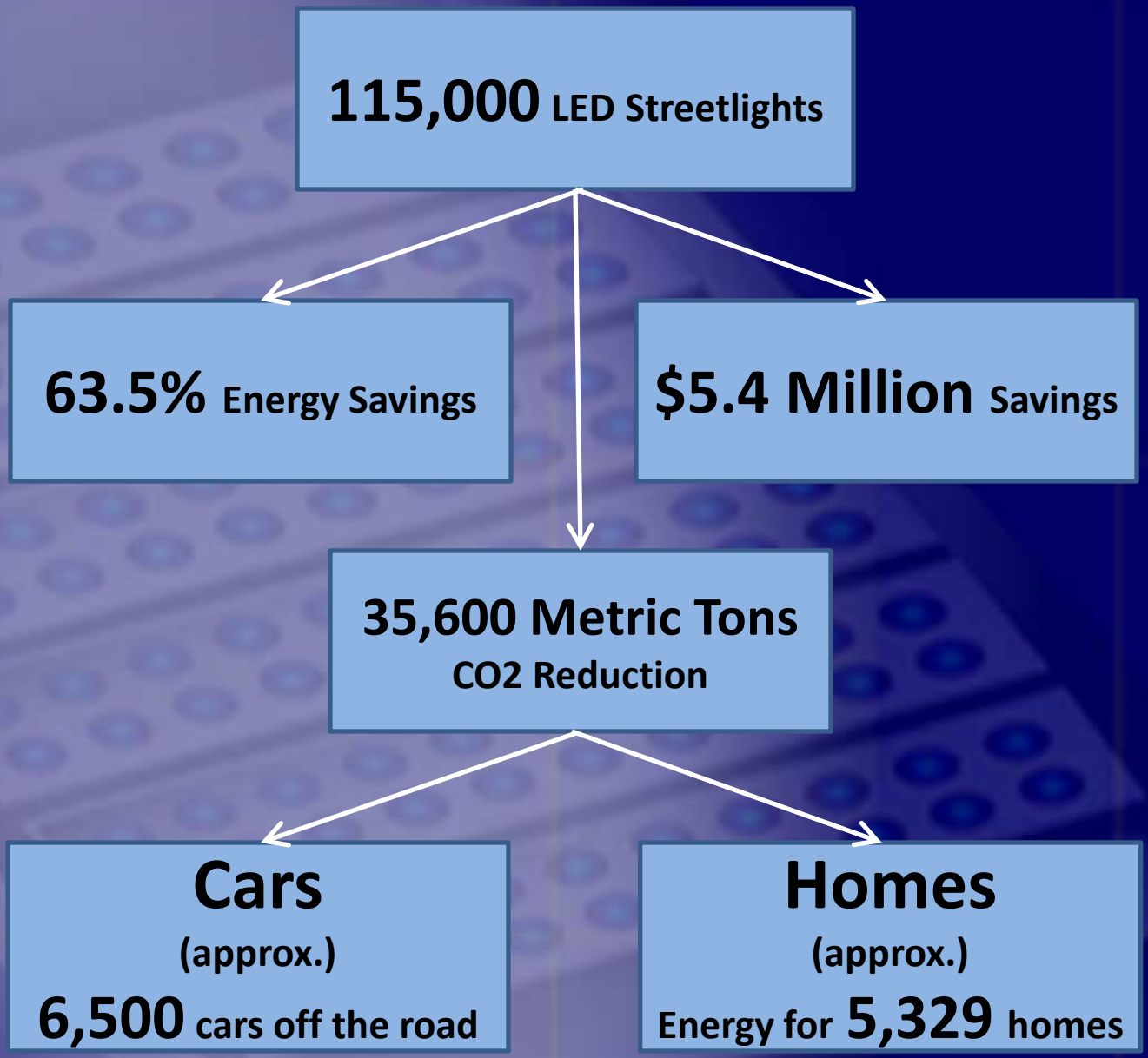
City of Los Angeles – Bureau of Street Lighting
LED Conversion Project



Yearly Comparisons

Local Street LED Fixture

2009

- Avg. Price = $ 432
- Efficacy = 42 Lm/W
- Life = 80,000 hrs
- Warranty = 5 yrs

2010

- Avg. Price = $ 298
- Efficacy = 61 Lm/W
- Life = 111,000 hrs
- Warranty = 6 yrs

2011

- Avg. Price = $ 285
- Efficacy = 72 Lm/W
- Life >150,000 hrs
- Warranty = 6 yrs

2012

- Avg. Price = $ 245
- Efficacy = 81 Lm/W
- Life >150,000 hrs
- Warranty = 7 yrs

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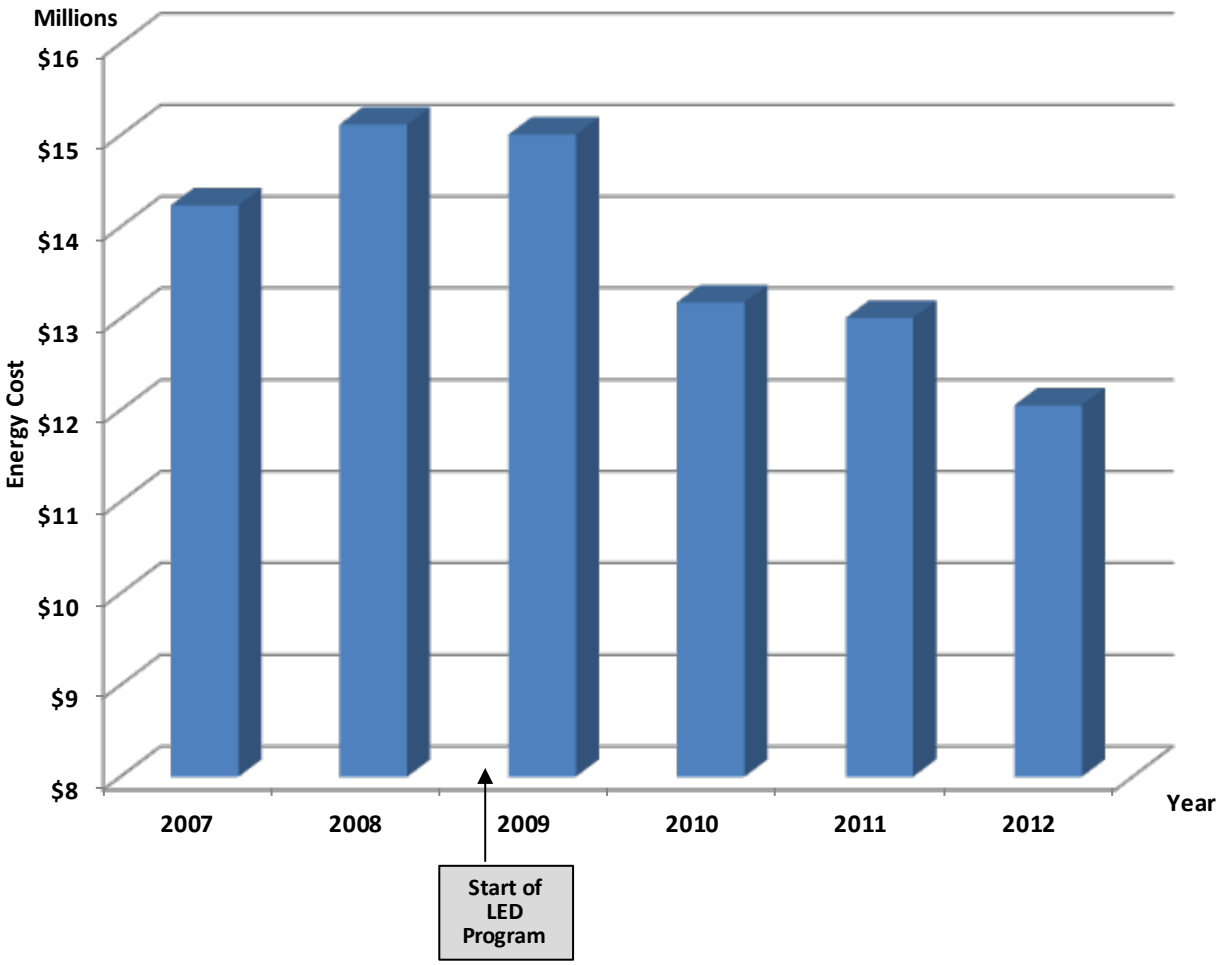
LED Program
Street Lighting Energy Cost



March 13, 2012

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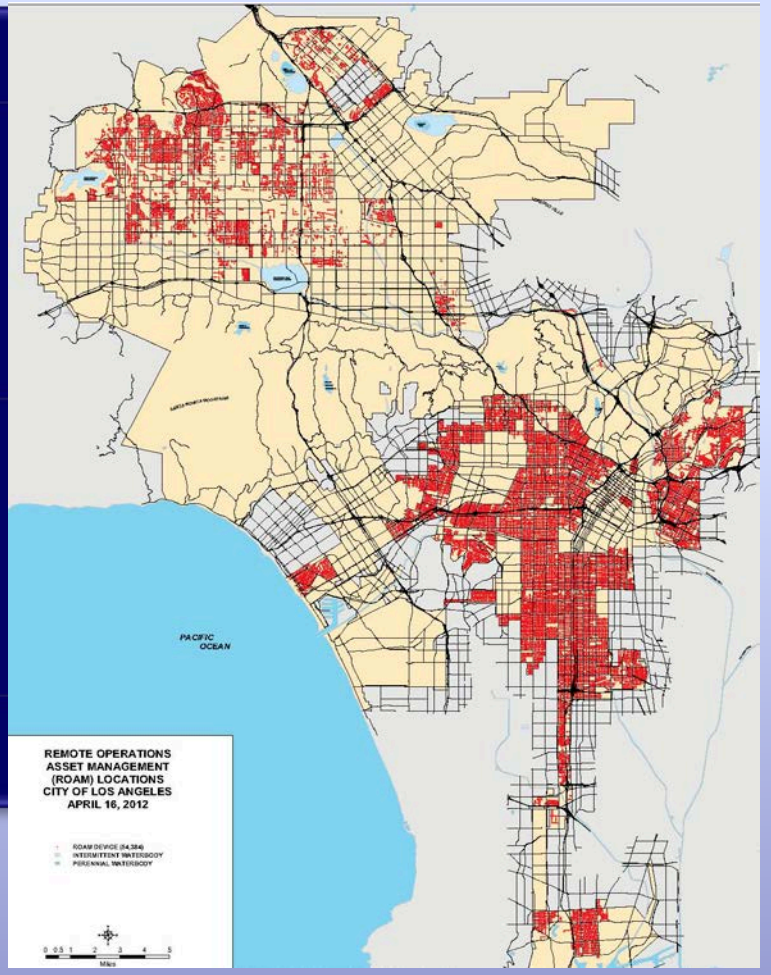
Remote Monitoring System

Street Lighting and Controls

- 210,000 streetlights in the City of Los Angeles
- 54,027 street lighting controls installed
- Majority installed over the last 3 years (with our LED program)



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Remote Monitoring System
Existing Street Lighting Controls

- System utilizes mesh network and gateway
- Server hosted by manufacturer
- Provide streetlight diagnostics (operations, power consumption etc.)
- On/Off ability
- Lighting Control integrated in PE cell
- No GPS self activation. Manually activated with a Bar Code scanner

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Remote Monitoring System
Street Lighting Control - Challenges

- Deployment Challenges
  - Stickers and bar coding
  - Cumbersome Process
  - Too much inputting
  - Too many devices
  - Too much time for activation
  - Field crew vs. contractor
- Interference – 3G, 4G to what's next.
- Ornamental Systems

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Remote Monitoring System

Street Lighting Control - Future Needs

- Better commissioning deployment
  - GPS built-in option
  - Remote activation
- Meter grade accuracy (2% or less)
- Flexibility for use with decorative systems
- Power back-up system on devices
- No monitoring fees
- Cost Reduction – more affordable
- Systems Compatibility – Standardization

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Before and After Pictures of Program

BEFORE – 200 W HPS (240 W)
6th Street Bridge over Los Angeles River

Before and After Pictures of Program

AFTER – 180 W LED (180 W)
6th Street Bridge over Los Angeles River

Before and After Pictures of Program

La Brea Avenue – HPS

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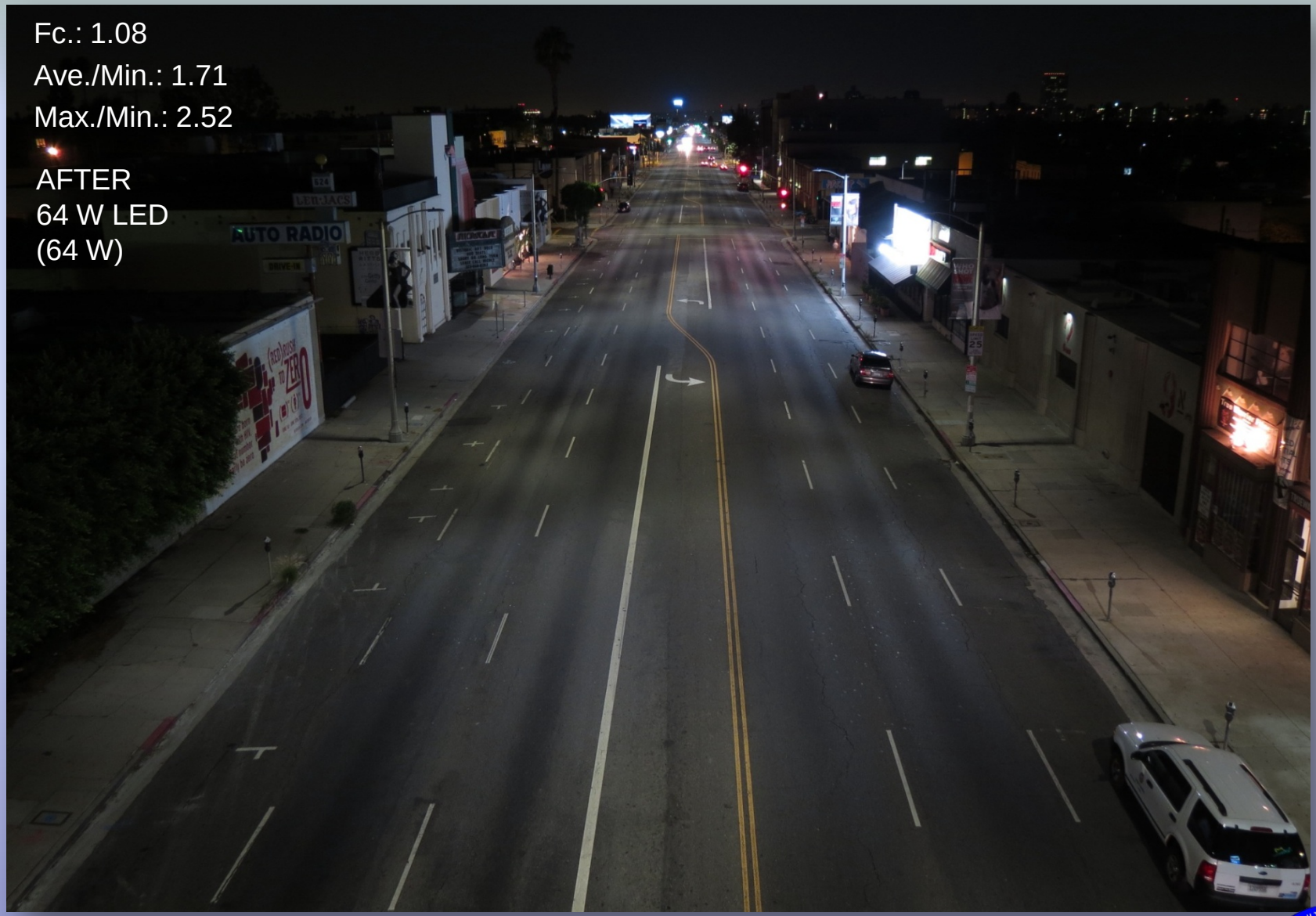
Before and After Pictures of Program



La Brea Avenue – LED

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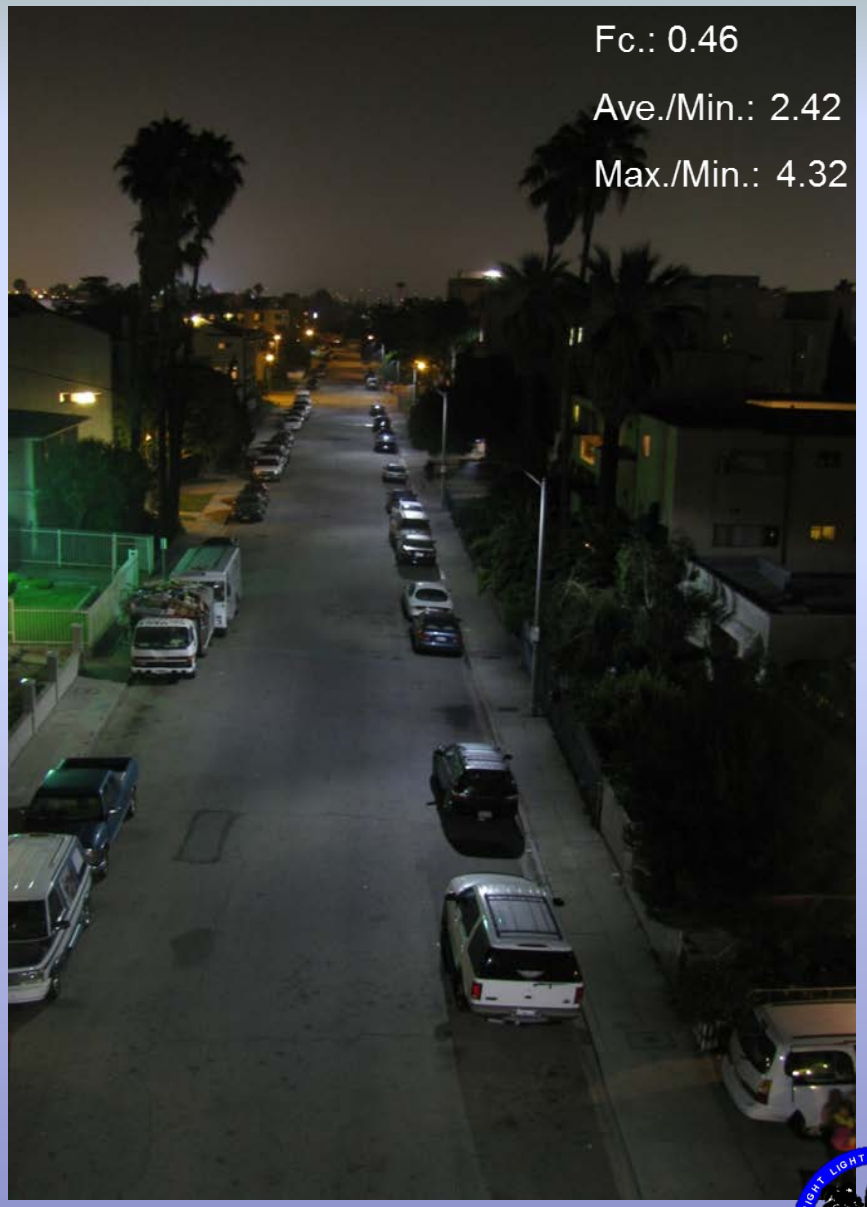
Before and After Pictures

BEFORE – 100 W HPS (138 W)



AFTER – 70 W LED (70 W)

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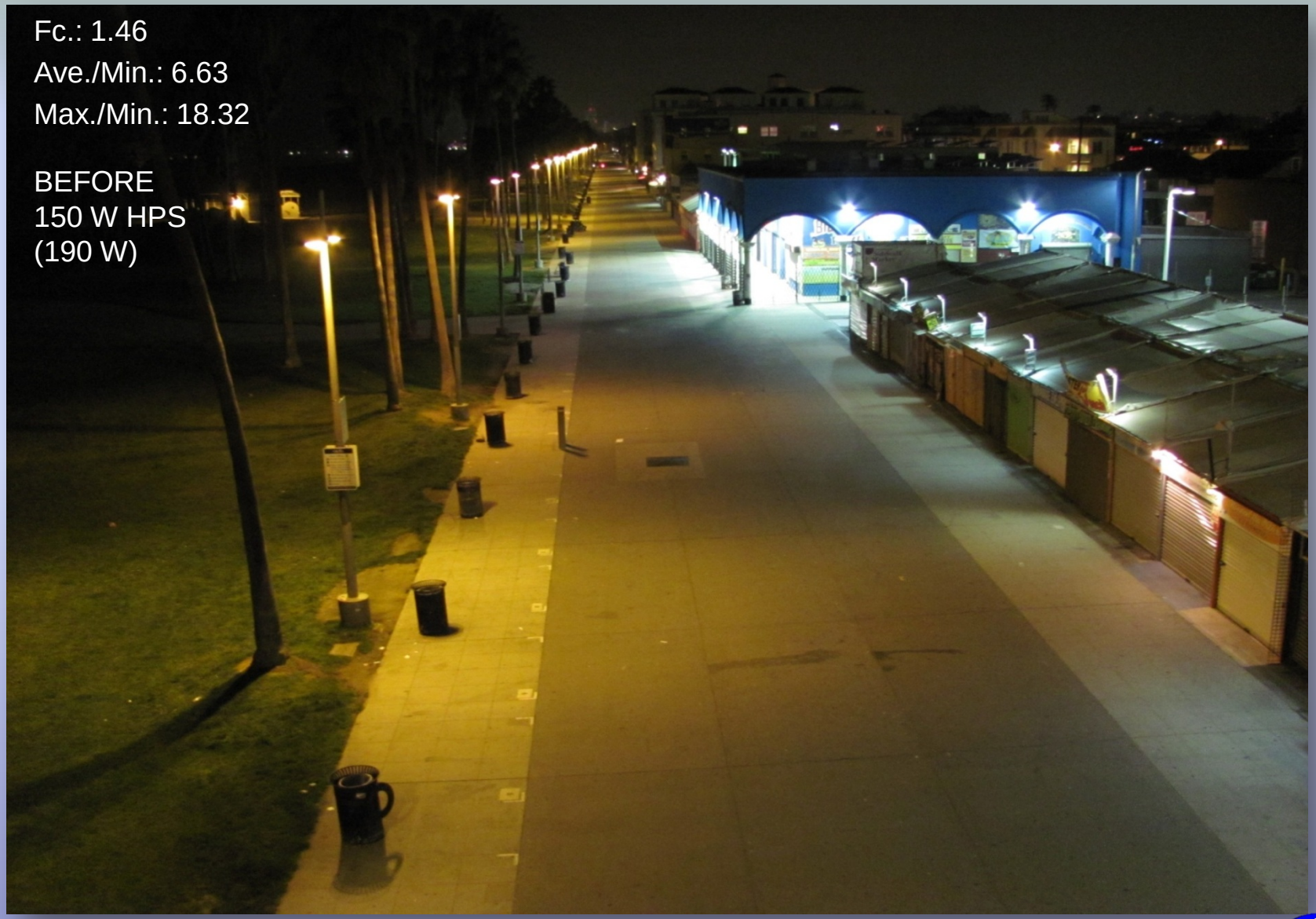
Before and After Pictures of Program



Ocean Front Walkway, Venice – HPS

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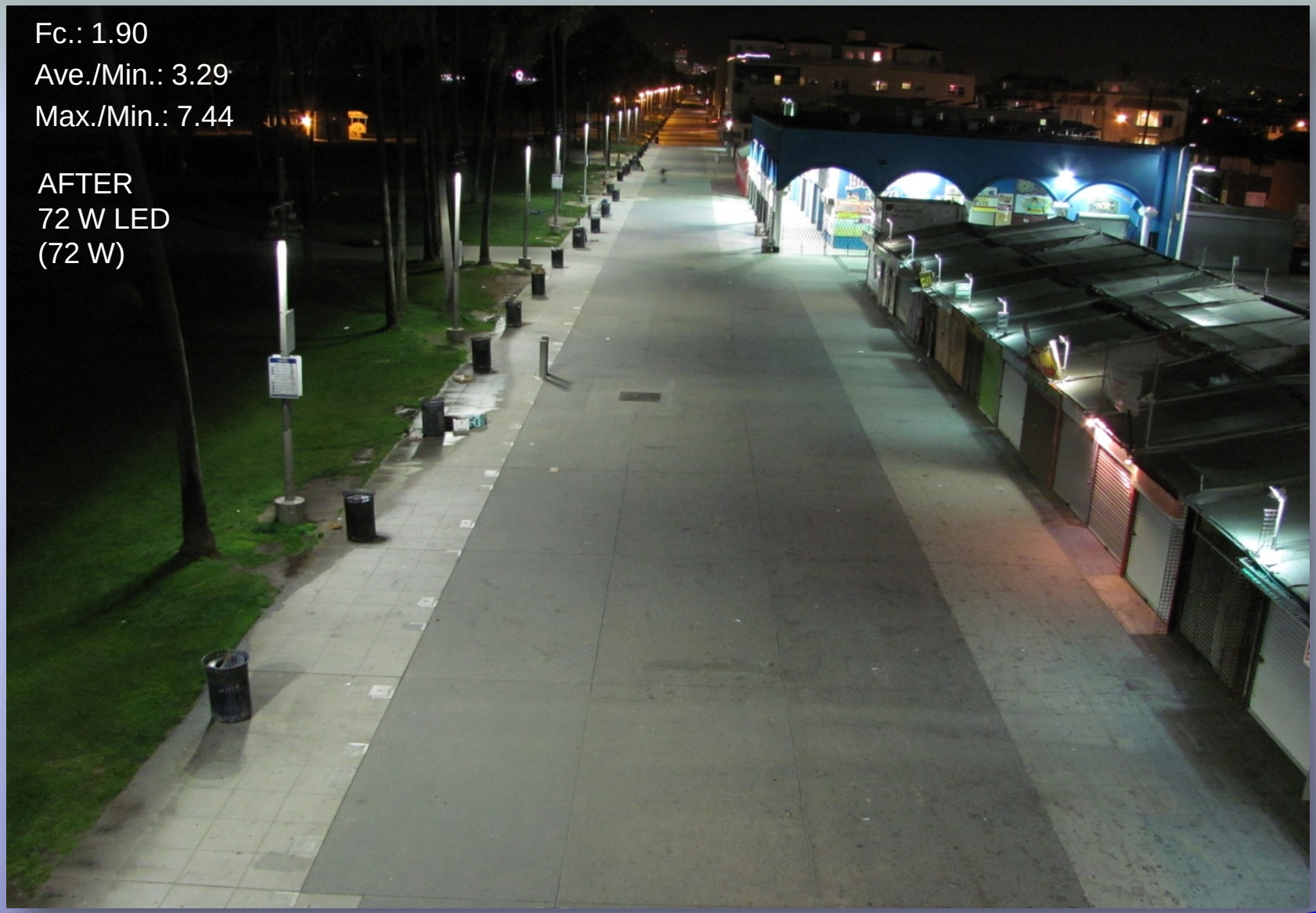
Before and After Pictures of Program



Ocean Front Walkway, Venice – LED

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“Lessons Learned”

- **“TRUST BUT VERIFY”** – Not all claims manufacturers make are true.
- **“REALITY VERSUS THEORY”** – The change from HPS to white light with the LEDs is being perceived as a significant increase in lighting levels.
- **“ENERGY SAVINGS ARE REAL”** – As the LEDs improve, and the manufacturers develop the technology, the energy savings are being realized and continue to increase.
- **“IMPROVED VISIBILITY”** – The change from HPS to white light have improved visibility as noticed by residents and encouraged by the Police Department.

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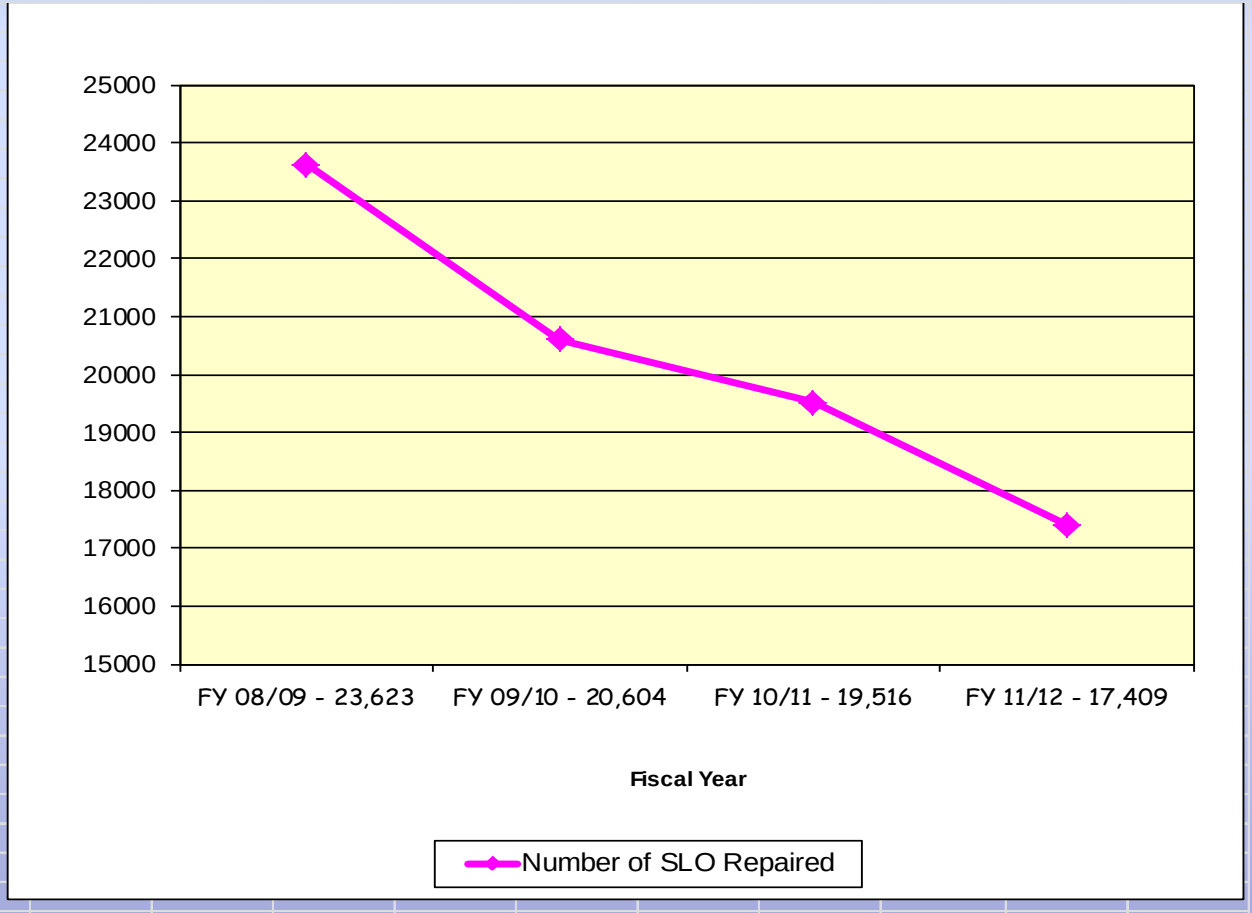
Maintenance Savings

- Single Streetlight Repairs
  FY 2009: 23,500
  FY 2012: 17,400

- Total Streetlight Repairs
  FY 2010: 70,000
  FY 2012: 46,300



Handling and Installation

- Smaller/lighter units, easy to install and transport
- No need to carry components in trucks for maintenance
- Reduction in warehousing space
- Packaging – 50% reduction compared to HID units

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LED Advantages

- Improved uniformity ratios – “Carpeted Effect”
- Allows for designs with smaller wire and conduit sizing
- Compatible with Remote Monitoring Systems
- Option of dimmable driver
- Instant ON and OFF operation

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LED Performance

- Availability of house-side shield
- Improved visibility and reduction of hot-spots
- Ratio of Maximum/Minimum has become more relevant than ratio of Average/Minimum
- The cooler the color temperature, the more glare complaints we received from people

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LED Performance

- **Lumen Depreciation**

	LUMEN
3 YEARS	13%
5 YEARS	15%

- **Annual Dirt Depreciation**
  4%

- **Failure Comparison (average)**

*HID – **10%** (based on past installation history)*

*LED – **0.2%** (based on 189 units from 98,000 installed)*

Results
Program vs. Actual

	PROGRAM GOALS	ACTUAL
TOTAL UNITS INSTALLED	97,500	115,000
ENERGY SAVINGS	40%	63%
PERFORMANCE	Uniformity a Concern	Good Uniformity, better than HPS
COMMUNITY FEEDBACK	Anticipated Negative	Mostly Positive
CITY CREWS AND UNION HALL	20 units/day/crew	30 units/day/crew
REMOVED HID UNITS	Recycle old units	Auction and Recycle $903,890 in revenue

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Citywide Crime Statistics

Incidents between hours of 7 PM to 7 AM

CRIME TYPES	YEAR		REDUCTION
	2009	*2011*	
Vehicle Theft	15,778	13,632	13.60 %
Burglary-Robbery-Theft	19,967	18,406	7.82 %
Vandalism	11,115	9,906	10.90 %
Total	**46,860**	**41,944**	**10.5 %**

- Most units installed in residential, local streets

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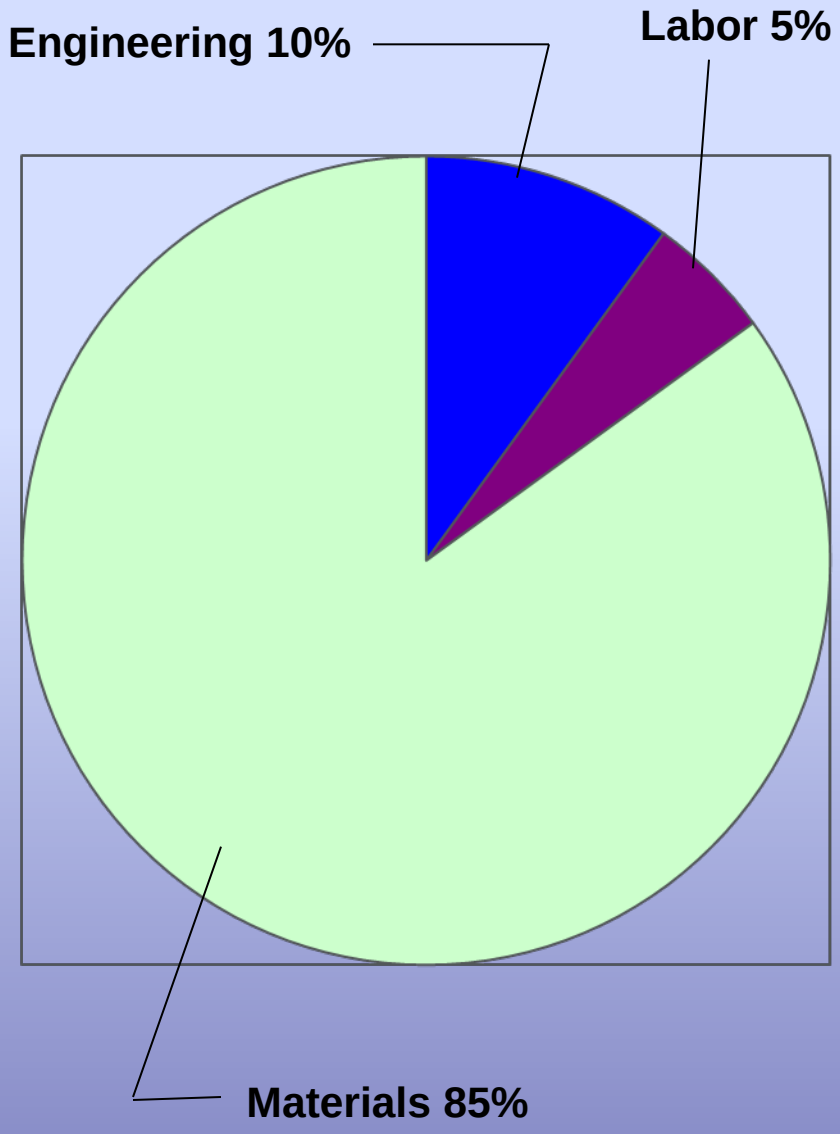
Cost Breakdown



Unit Cost Breakdown for 2011/12 Fiscal Year - LED Program

TOTAL COST PER UNIT = $309

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“Moving Forward”
LED Decorative Fixtures

48 LEDs; 54 W

4100 K

48 LEDs; 80 W

3000 K

32 LEDs; 48 W

2900 K

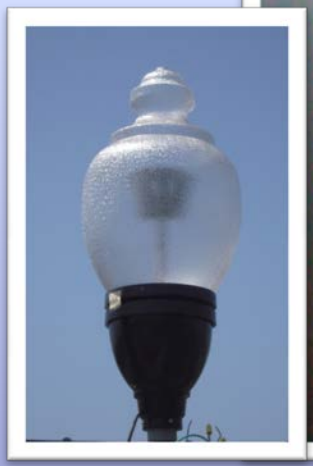
42 LEDs; 55 W

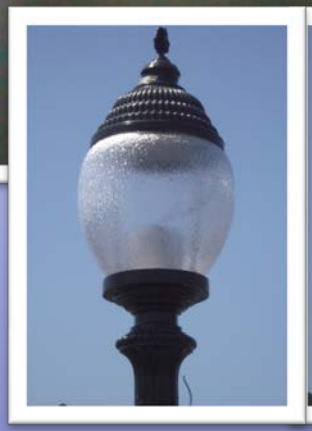
2800 K

- More than 70,000 existing decorative fixtures
- About 400 different styles
- Color Temperature range – 3000 Kelvin
- Presently testing and evaluating LED and Induction units

Typical post-top fixture

“Moving Forward”
LED Decorative Fixtures





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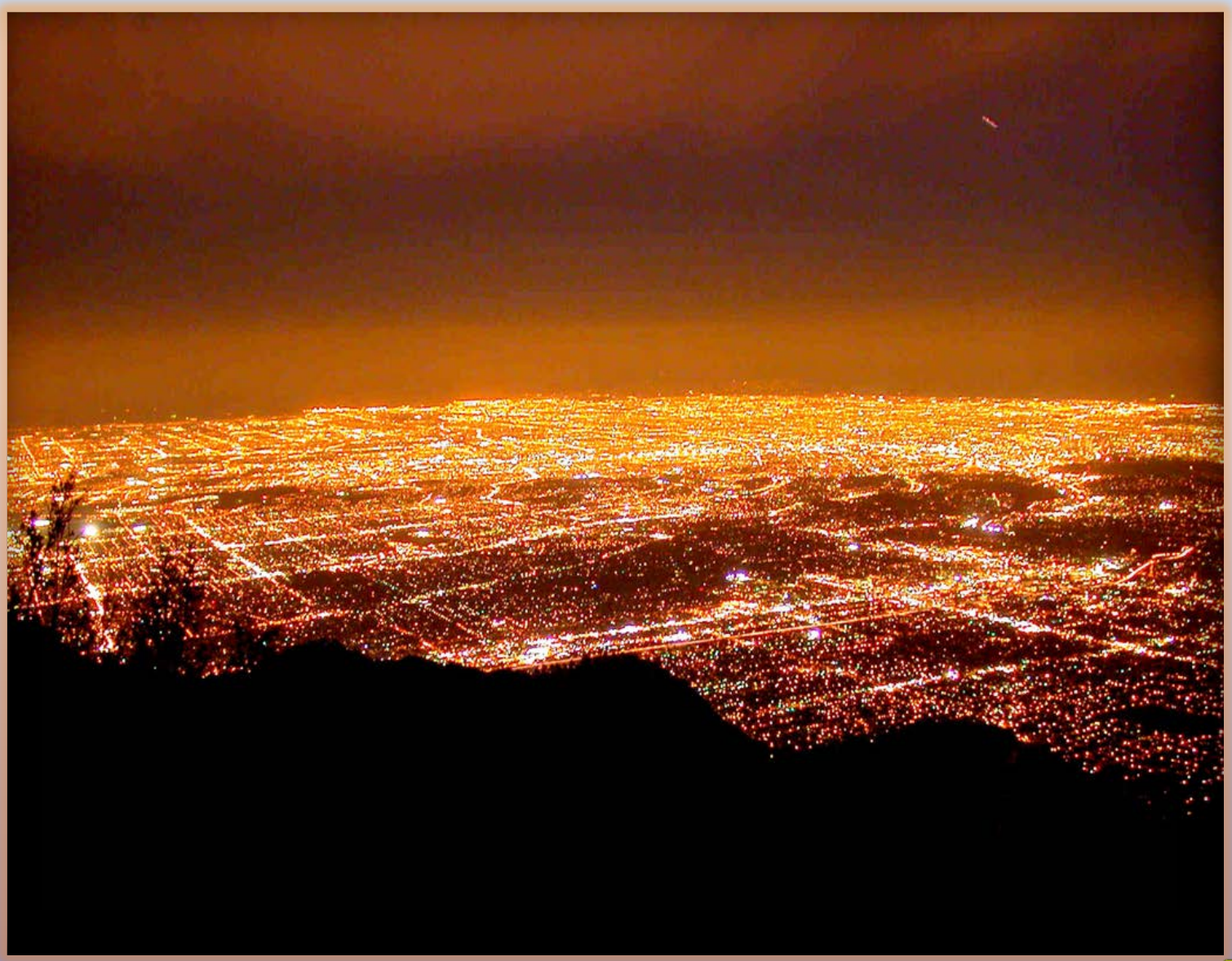
Los Angeles Basin – View from Mt. Wilson
Before LED Retrofit Project – 2008



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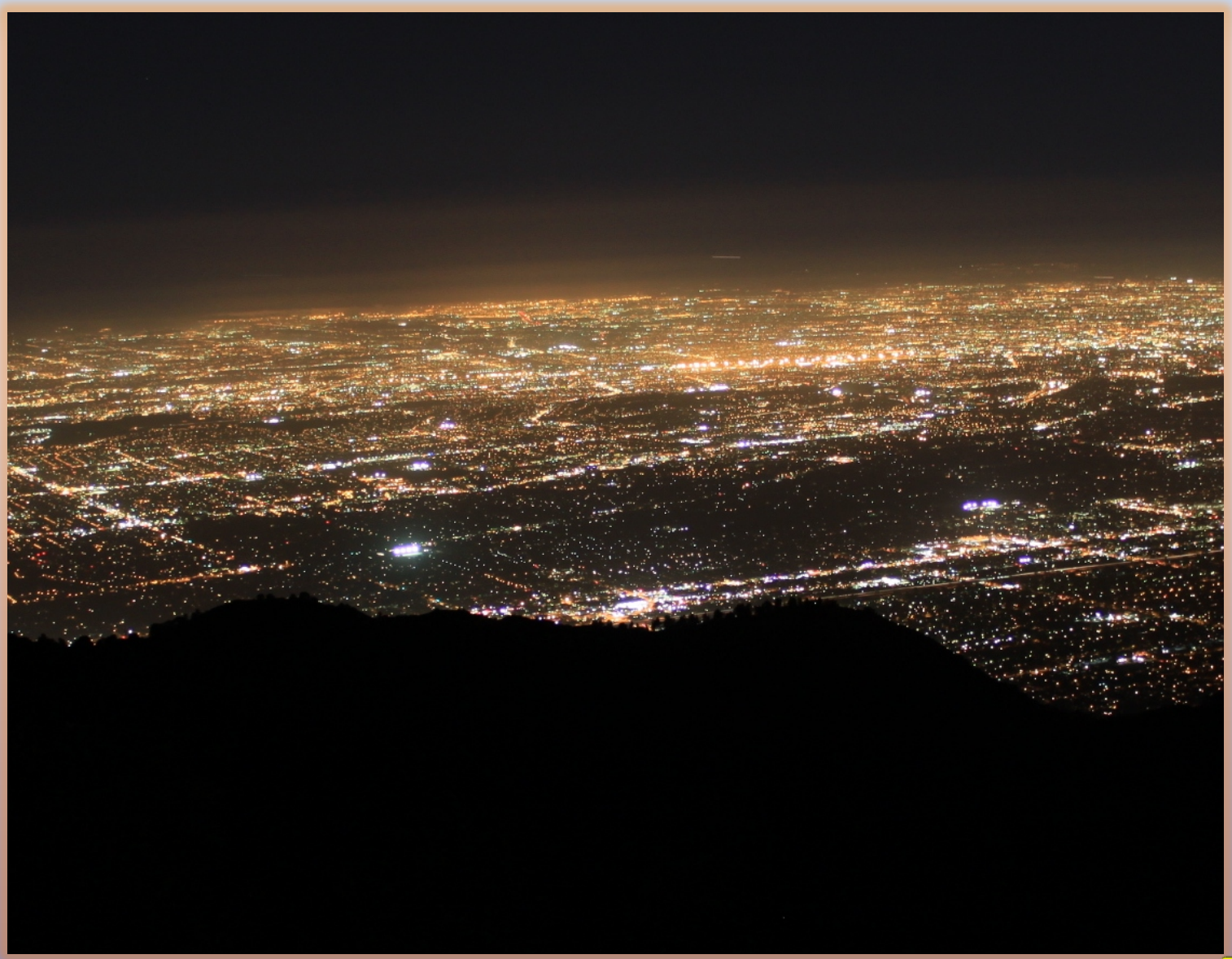
Los Angeles Basin – View from Mt. Wilson
After LED Retrofit Project – 2012



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THANK YOU

City of Los Angeles

Bureau of Street Lighting

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