



# Street Lighting

# Street Lighting



- **Street Lighting Inventory**
- **Design Goals**
- **Technology**
- **Future**





# Street Lighting Inventory

- 60 Million “Cobra-head” fixtures in the US.<sup>1</sup>
- 31 Million Decorative Street fixtures in the US.
- 54% of all Municipalities own and maintain their street lights.<sup>2</sup>
- 32% are owned and maintained by Utilities.<sup>2</sup>
- 14% are a derivative of the above.<sup>2</sup>

1. Source - DOE
2. Source - LD&A



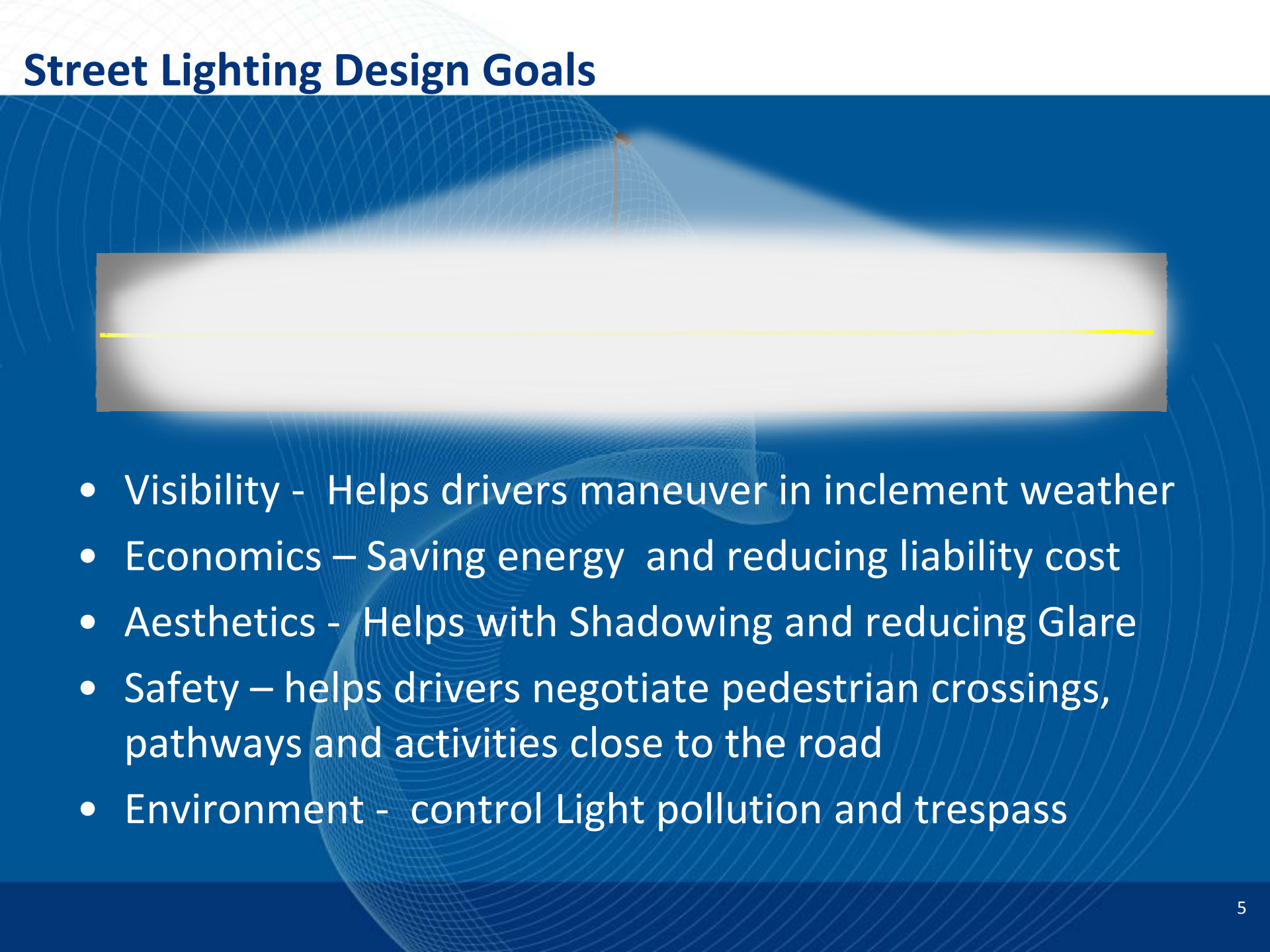
# Street Lighting Inventory



- Average burn is 12 hours per day.
- The average fixture wattage 187 watts.<sup>1</sup>
- Roughly total of >31 TWh/yr. (TWh -1 terawatt-hour per year = 114 megawatts)<sup>1</sup>
- Estimated 8% of the electricity used nationally annually.<sup>1</sup>

1. Source - DOE

# Street Lighting Design Goals

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- Visibility - Helps drivers maneuver in inclement weather
  - Economics – Saving energy and reducing liability cost
  - Aesthetics - Helps with Shadowing and reducing Glare
  - Safety – helps drivers negotiate pedestrian crossings, pathways and activities close to the road
  - Environment - control Light pollution and trespass



# Street Lighting Design Questions

- IES Roadway Classification - Freeway(A or B), Expressway, Major, Collector, Local, Interchange(A or B), Alley, Sidewalk, etc.
- Area Classification – Commercial, Intermediate and Residential
- Pavement Luminance – Material Reflectance
- Light Distribution Classification – Directional control
- Lighting System Geometrics – Luminaire mounting height
- Pole Spacing – existing or new layout



# Street Lighting Technology



STREET LIGHTING SOLUTIONS

# Technology - Induction Lighting



- Features –
  - Long life 100,000 hrs to L50
  - Energy Efficient 80Lm/W
  - Color Rendering index 80-90
  - Color Temperature
  - Cost?
- Drawbacks –
  - Temperature above 35° C/95° F
  - Effective Control of the Light they emit
  - Ballast life 65K hours & recommend relamp
  - 1 or 2 product Made in USA
  - Limited 5yr warranty

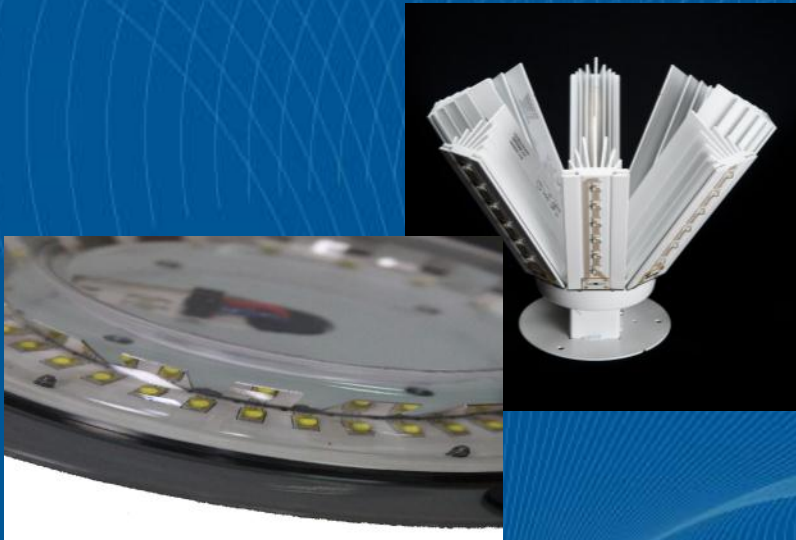


# Technology - LED Lighting



- Features –
  - Extremely long life 70,000+ hrs to L70
  - Energy Efficient 100Lm/W
  - Color Rendering index 80-90
  - Color Temperature
  - Effective control of the light emitted
  - 5 – 10 yr Limited Warranty
- Drawbacks –
  - Cost?
  - Temperature above 60° C/140° F
  - Too many manufactures
  - Interpretation of Standards
  - Limited ARRA product

# Street Lighting Technology LED Retrofit



- Features –
  - Cost is 1/3 of new fixture
  - Extremely long life 70,000+ hrs to L70
  - Energy Efficient 100Lm/W
  - Good Color Rendering index 80-90
  - Color Temperature
  - Effective control of the light emitted
  - 5 – 10 yr Limited Warranty
- Drawbacks –
  - Temperature above 60° C/140°
  - Flexibility of Kits(adaptability/lumen output)
  - Limited ARRA product





# Street Lighting Technology LED Retrofit



- Features –
  - Long life 100,000 hrs to L50
  - Energy Efficient
  - Color Rendering index 80-90
  - Color Temperature
  - Cost?
- Drawbacks –
  - Temperature above 35° C/95° F
  - Thermals design to fixture
  - Effective Control of the Light they emit
  - Ballast life 65K hours & recommend relamp
  - 1 or 2 product Made in USA
  - Limited 5yr warranty

# Street Lighting Technology Comparison

## Induction

- Limited Testing Standards
- 100K hrs life to L50
- 30% lumen reduction at 60K hrs of life
- Limited control
- Recommended lamp replacement with driver replacement
- Not optically directional
- Not easily Disposable

## LED

- LM-79, LM-80, TM-21
- 70K hrs life to L70
- 30% lumen reduction at end of life
- Highly Controlable
- Optically Directional
- Easily Disposable



# Street Lighting Technology Specifications



## Specification points:

- Architectural Appeal
- Total Internal Reflector (TIR) – Specially designed acrylic lens over each LED that directs the light to specific points on the roadway. Distributions meetings Classification Recommendations
- DLC, LM-79, LM-80, In Situ and TM-21
- Type 2-5 Distributions
- UL /ETL Listed – Entire fixture is listed, not just component parts.
- IP67 minimal
- Easy installation and access via removable door assembly
- Ease of maintenance
- Minimum 5 Year Warranty, Made in the USA

# Street Lighting Design Questions

- DLC – Design Lighting Consortium
  - Established to ensure that only high-quality, high-performance, tested and verified LED products will be eligible for rebate participating programs.
- LM-80 – test methodology by which LED chip manufacturers can measure light output degradation over time.<sup>3</sup>
- In Situ – the best indicator of the quality of the thermal design of a given fixture, and is also directly related to fixture lifetime.





# Street Lighting Design Questions

- LM-79 – IES Approved Method for accessing absolute photometry and performance data for the entire integrated fixture.<sup>3</sup>
- TM-21 – provides a method for determining a LED luminaire expected operating life using data collected per LM-80 and L70 testing.<sup>3</sup>



# Street Lighting Future

- Ca Title 24 Part II
  - Photocontrol or astronomical time switch on all exterior lighting for Daylight
  - Outdoor lighting must be controlled by an automatic schedule
  - All Outdoor lighting mounted below 24 ft shall have motion sensor dimming to 40% min/80% max.
  - Outdoor Sales frontage, lots and canopies below 24 ft can have centralized time-based zone control opposed to motion.
  - When >10% of fixture are retrofitted refer to previous requirements.





# Street Lighting Future

- Ca Title 24 Part II - continued
  - Exemption for safety lighting
  - All luminaires with  $> 150$  w shall meet required BUG ratings (IES TM-15-11)



How does this effect you?  
Controls and Tighter Regulations

# Street Lighting Future



Use Common Sense in Product  
Choice.



# Reference Page

1. DOE - Office of Energy Efficiency and Renewable Energy Building Technology Program *“National Lighting Inventory and Energy Consumption Estimate”*, September 2002
2. Osram LED - *“Lighting Options by Space or Area – Streets, Roadways and Urban Thoroughfares”* - credited to IES
3. DOE - Office of Energy Efficiency and Renewable Energy – [www.ssl.energy.gov](http://www.ssl.energy.gov) *“Understanding Photometric Reports for SSL Products”*, June 2009