U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

DOE Lighting Program Update

LED Validation Activities



Federal Utility Partnership Working Group

April 15, 2010 Providence, RI

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Legislative Mandate

The DOE is directed by U.S. government policy (EPACT 2005, Section 912) to:

"…*support research, development, demonstration, and commercial application activities related to advanced solid-state lighting technologies based on white light emitting diodes.*"

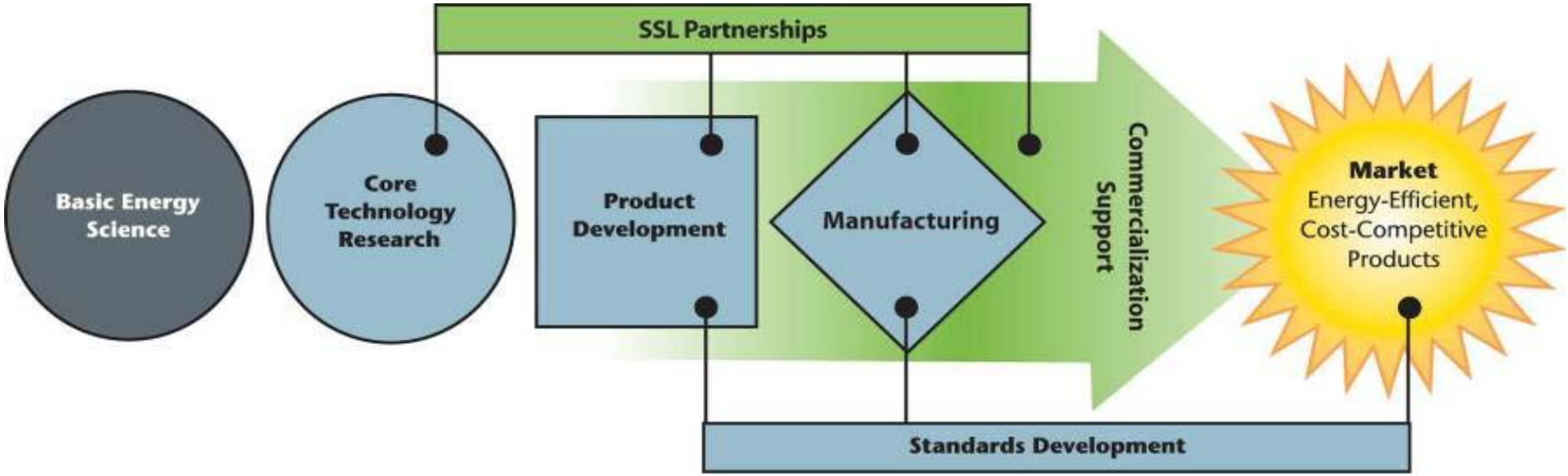
SSL Energy Saving Potential

By 2030:

- Potential to cut U.S. lighting electricity use by 25%
- Cumulative energy savings: $120 billion
- Annual energy savings equivalent to:
  - 190 terawatt (billion kilowatt) hours
  - Output of 24 1,000 MW power plants
  - 31.4 million metric tons of greenhouse gas emissions
- Additional benefits
  - Global leadership in SSL technology
  - High-tech, value-added jobs

Source: *Energy Savings Potential of Solid-State Lighting in General Illumination Applications* (February 2010)
www.ssl.energy.gov/tech_reports.html

DOE SSL Program Strategy



Guiding technology advances from laboratory to marketplace

Key Messages

- LED technology continues to improve rapidly
  - New/revised/improved LED products introduced regularly
- LEDs can save energy and provide high quality lighting in a growing number of applications

- Beware of generalizations
  - Few are good; many are not
  - Most LED products are new-to-market
  - Field experience is limited
- Ask questions and validate information

Topics

How does DOE validate LED performance?

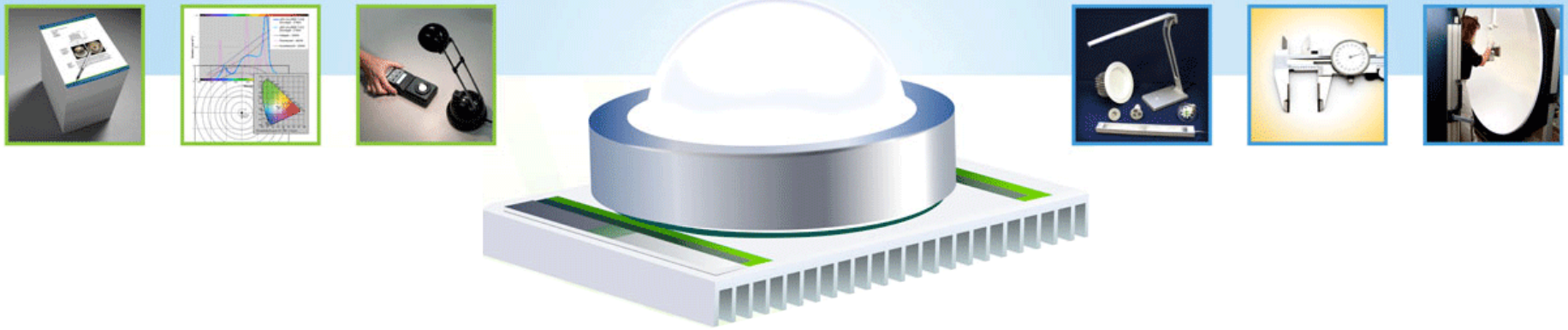
- Laboratory testing
- Field demonstrations
- Product labeling
- Competitions

CALiPER

GATEWAY Demonstrations

lighting facts
A Program of the U.S. DOE

L PRIZE℠



Commercially Available LED Product Evaluation and Reporting

Lots of marketing hype, but where do we get the truth?

- Which products are good? Which products aren't?
- How do they compare to what we know?
- How do we avoid the early negative CFL experience?

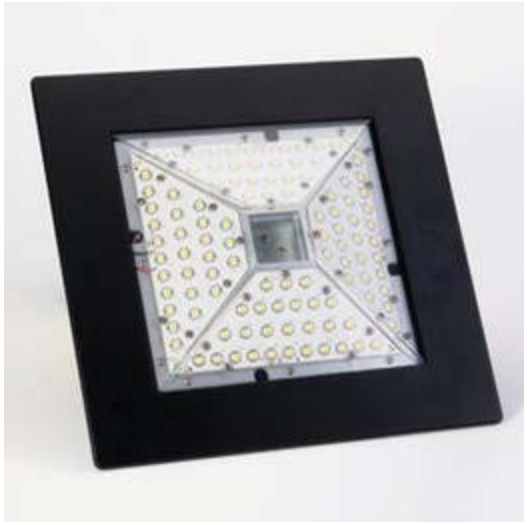
CALiPER

CALiPER Scope

- SSL
- General illumination
- White light
- Market-available

CALiPER Round 10

- Parking Garage Fixtures
- Cove Lighting
- Exterior Wall Packs



Parking Garage Fixtures

LED versus Fluorescent, Induction, Metal Halide

Parking Garage Fixtures

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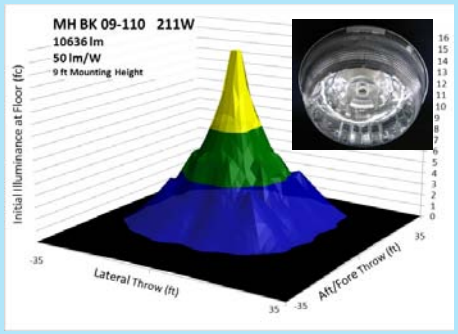
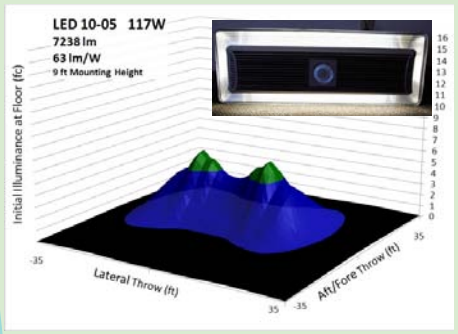
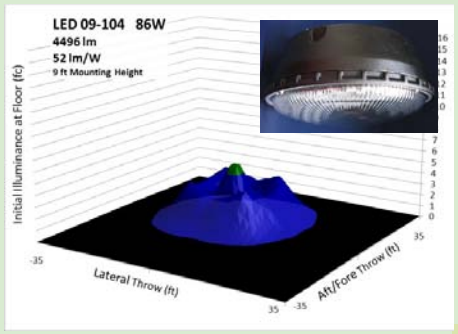
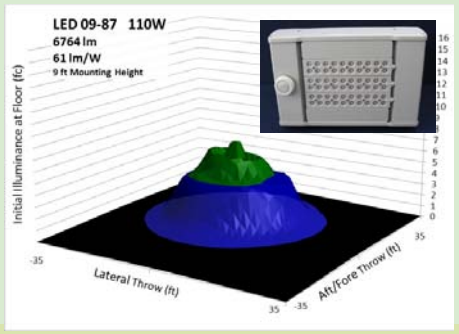
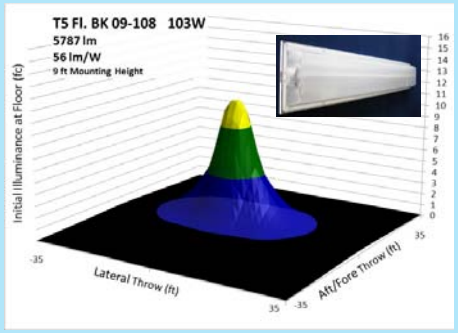
Initial Illuminance at Floor (foot-candles) and Throw

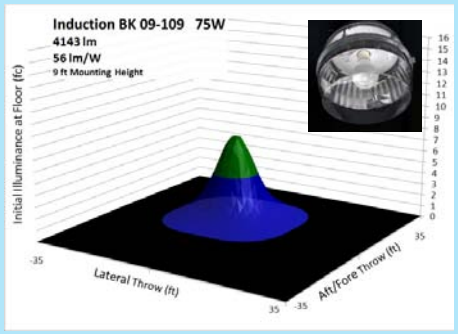












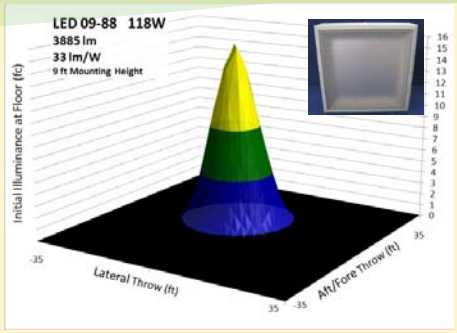
Benchmarks

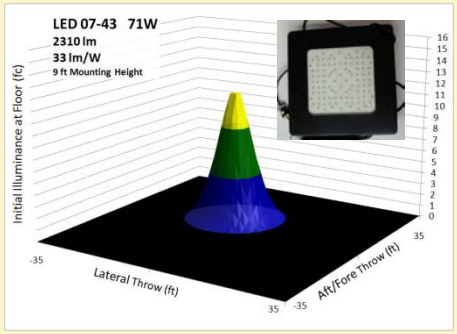
Uniform Distribution SSL

- Hot spots (> 9 fc)
- Fair-high (5-9 fc)
- Optimal (1-5 fc)
- Low (< 1 fc)

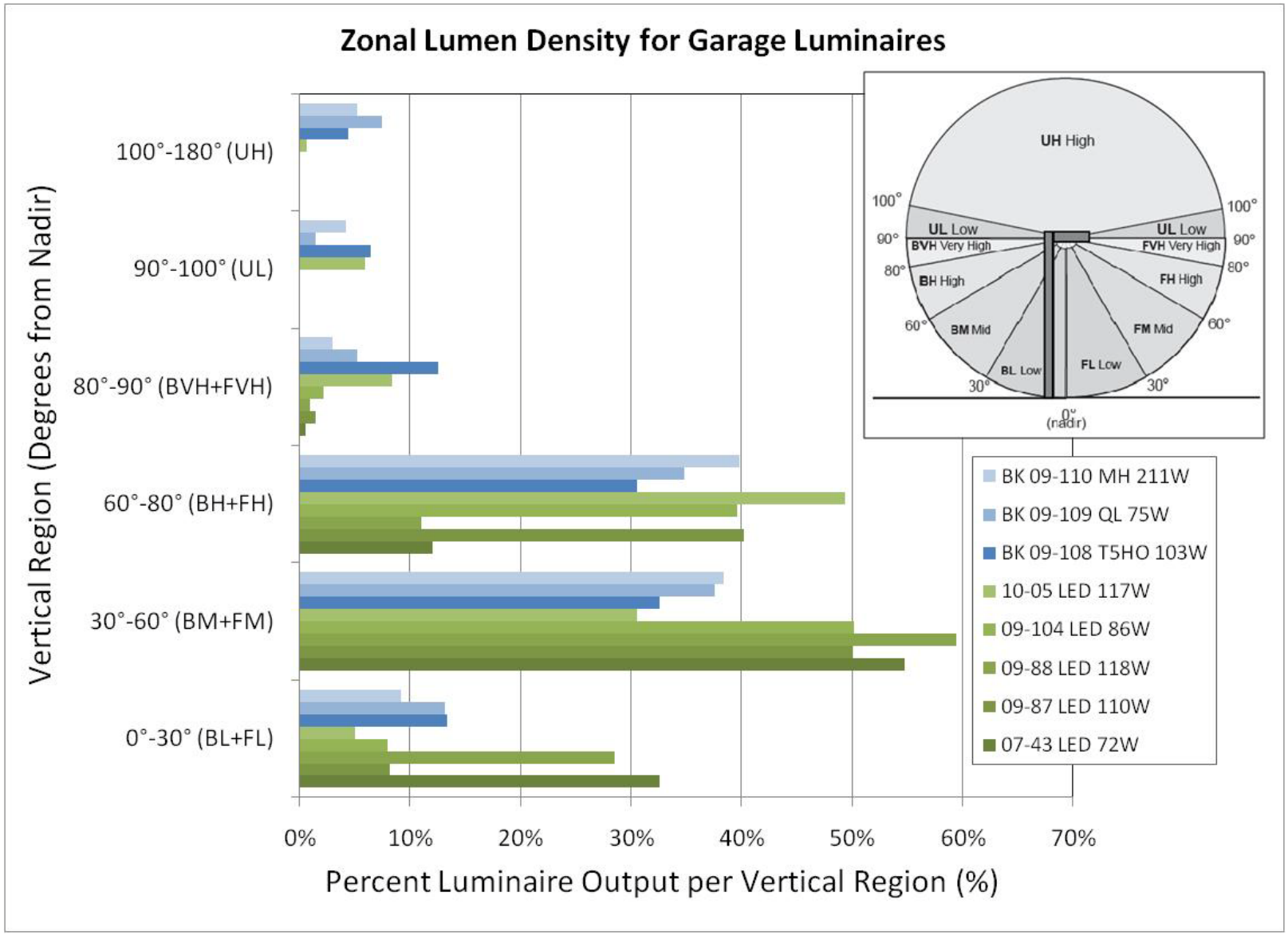
(Based on 9 ft mounting height)

Narrow Distribution SSL

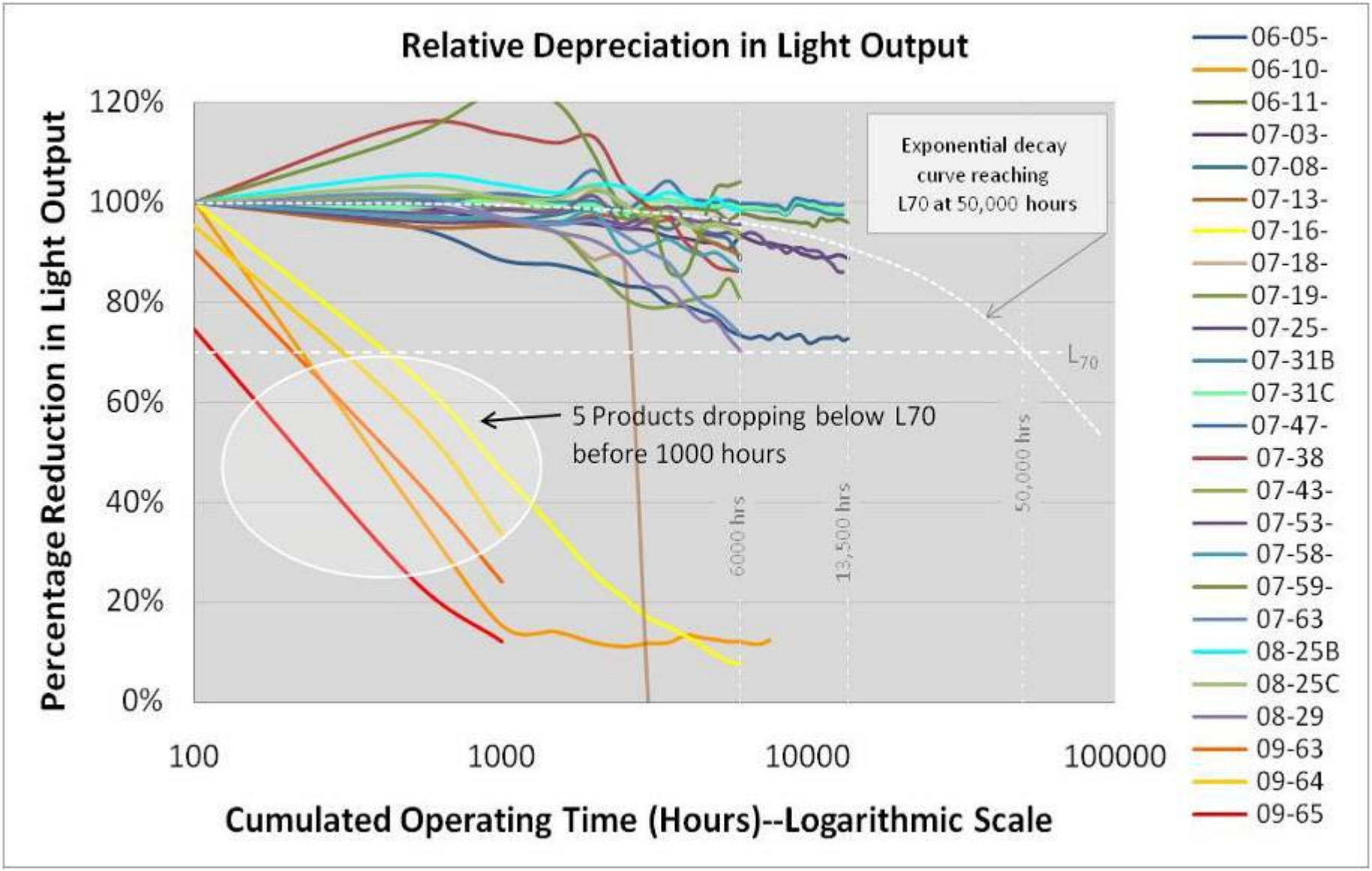




Parking Garage Fixtures



CALiPER Long Term Testing



GATEWAY
Demonstrations








GATEWAY Demonstrations

- Showcase products in real applications
- Provide valuable data on performance, energy savings, payback
- Lessons learned
- Reports and technology briefs available

Minneapolis, MN

New York, NY

West Sacramento, CA

Leavenworth, KS

Oakland, CA

www.ssl.energy.gov/gatewaydemos.html

New GATEWAY Demonstrations

Outdoor area and roadway lighting

- FDR Expressway and Central Park, NYC
- Parking lots and parking structures with members of Retailer Energy Alliance

Photo credit: Ryan Pyle

Photo credit: Ryan Pyle

New GATEWAY Demonstrations

Increasing focus on indoor sites:

- Hotel Intercontinental, San Francisco
- The Field Museum, Chicago

Field Museum

Hotel Intercontinental

Municipal Street Lighting Consortium

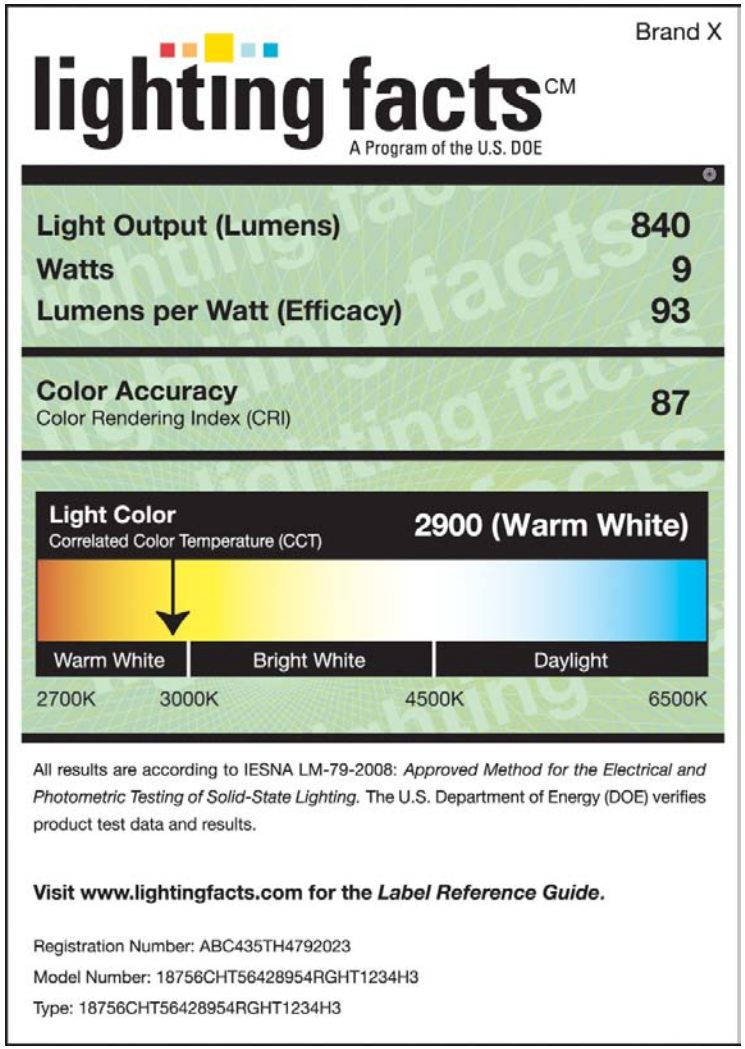
- –High interest in LED street lighting demonstrations
- –Leverage efforts of multiple cities evaluating LED street lighting products
  - Minimize duplication of effort, spread risk
  - Collect, analyze, and share information and experiences
  - Contribute to and tap into large pool of knowledge to maximize individual investment
- –Open to municipalities, utilities, energy efficiency sponsors

SSL Quality Advocates and the Lighting Facts Label

lighting facts
A Program of the U.S. DOE

What is Lighting Facts?

- Nutrition Label for SSL
- Web-based product performance reporting initiative
  - *LightingFacts.com*
- Product list backed by verification and (soon) 3rd party testing
- Buyer's guidance tool
  - Target retailers, distributors, lighting designers, utilities
  - Resource to evaluate reported product performance data



Example

Progress to Date

- Dec. 2008—Website launch
- Spring 2009—Program announced via DOE SSL Update and various industry/utility conferences
- Partners and Products (as of April 1, 2010)
  - 300 Manufacturers
  - 85 Retailers/Distributors
  - 100 Utilities and Lighting Designers
  - 506 Registered Products

… and counting!

lighting facts
A Program of the U.S. DOE

Product and partner lists at

www.lightingfacts.com

L PRIZE™

- Created by EISA 2007
- Two key lamp replacements:
  - 60W Incandescent
  - PAR 38 Halogen
- Cash prizes, federal purchasing, utility programs
- Technology competition to spur innovation and exceptional performance
- 30 utility/energy efficiency partners across North America

L Prize Requirements

- Exceptional efficacy
- Long life
- Form factor identical to lamps they replace
- Additional details specified for
  - Quality
  - Performance
  - Mass manufacturing

Competition Requirements

60W Incandescent Replacement Lamp

- More than 90 lm/W
- Less than 10 Watts
- More than 900 lumens
- More than 25,000 hour life
- More than 90 CRI

PAR 38 Halogen Replacement Lamp

- More than 123 lm/W
- Less than 11 Watts
- More than 1,350 lumens
- More than 25,000 hour life
- More than 90 CRI

21st Century Lamp

- To be defined in a future L Prize Program Announcement

First entry: Philips 60W replacement

Philips

New York Times

TIME

The 50 Best Inventions of 2009

L Prize Short-Term Testing

- IES LM-79-08 test procedure
  - Luminous flux
  - Intensity distribution
  - CCT, chromaticity coordinates
  - CRI
  - Power factor
- 200 samples
- Integrating sphere
- Goniophotometer

L Prize Long-Term Testing

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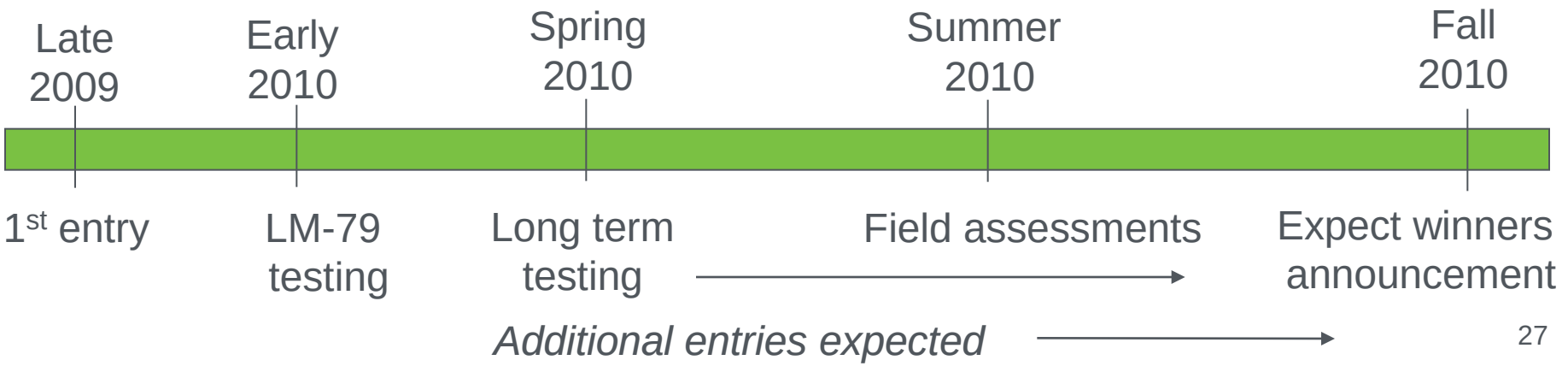
- At least 6,000 hours of testing
- 200 samples
- Elevated temperature (45C) environment
- Field assessments with L Prize Partners
  - 15 Partners participating
  - 45 sites
  - 1,400 samples

Field Assessment

- ☑ Energy use
- ☑ Lighting system performance
- ☑ Reliability
- ☑ Customer acceptance
- ☑ Cost-effective deployment

www.lightingprize.org

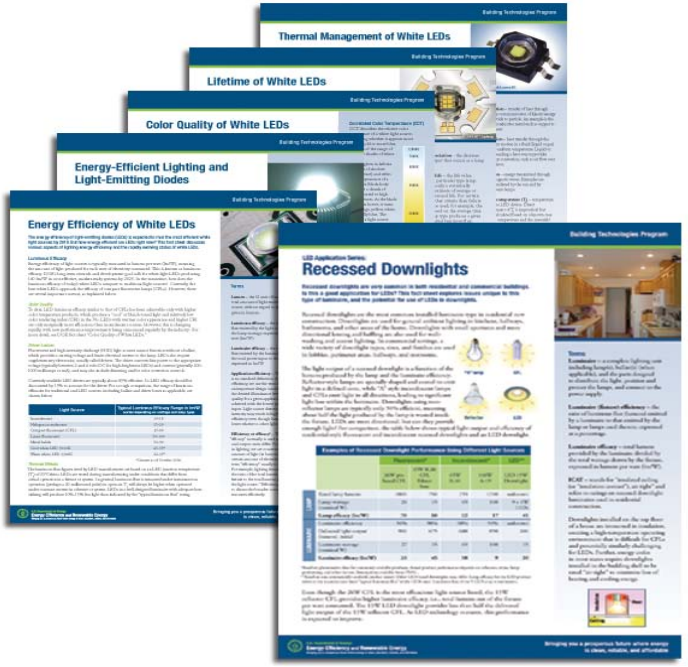
The race is on!



SSL Technology Fact Sheet Series

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- 34,000 downloads in ’09
- LED Basics
  - Energy Efficiency
  - Thermal Management
  - Lifetime
  - Color Quality
  - Basics
- Application Series
  - Recessed Downlights
  - Undercabinet
  - Portable Desk/Task
  - Outdoor Lighting
- Measurement Series
  - SSL Standards
  - CRI and LEDs
  - Luminaire Efficacy
  - Luminaire Reliability



www.ssl.energy.gov/factsheets.html

Annual Workshops and National Conferences

DOE SSL workshops

- Manufacturing R&D, April 21-22, San Jose, CA
- Market Introduction, July 20-22, Philadelphia, PA

Visit the DOE booth at Light Fair:

- May 12-14
- Las Vegas
- Booth #2121

www.ssl.energy.gov

Thank You!

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For more information, go to www.ssl.energy.gov

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