DOE Solid State Lighting GATEWAY Demonstration Program

Presented to GovEnergy 2008

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Outline of Presentation

- Introduction
- LED Efficiency 101
- Product Testing: CALiPER Results
- GATEWAY Demonstrations

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Introduction

LEDs have progressed into the mainstream of general illumination applications, though there is still a fair amount of confusion and hype surrounding their *appropriate* use:

- "Save up to 90% of your energy costs"
- "Never change another light bulb!"
- "Highest efficacy on the planet"
- "Designed for linear fluorescent tube/fixture replacement"

There is an important role for lucid, unbiased, third-party technical information to help navigate the maze.

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Introduction

DOE SSL Market-Based Programs

- ENERGY STAR®
- CALiPER Product Testing Program
- Standards Development
- Technical Information Network
- Technology Demonstration GATEWAY Program
- Lighting for Tomorrow Design Competitions

- DOE SSL Website: www.netl.doe.gov/ssl

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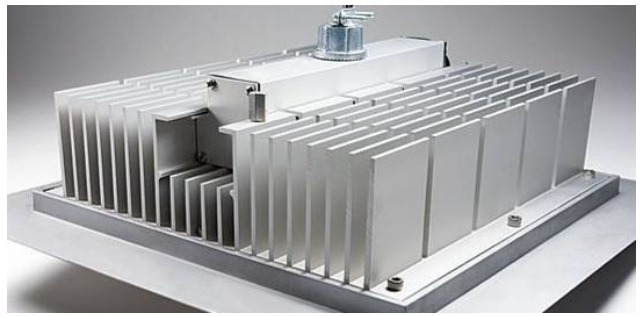
LED Efficiency 101

LED energy efficiency is a function of:

LED device efficacy

+



Thermal management

+

Driver/power supply efficiency

+

Luminaire design

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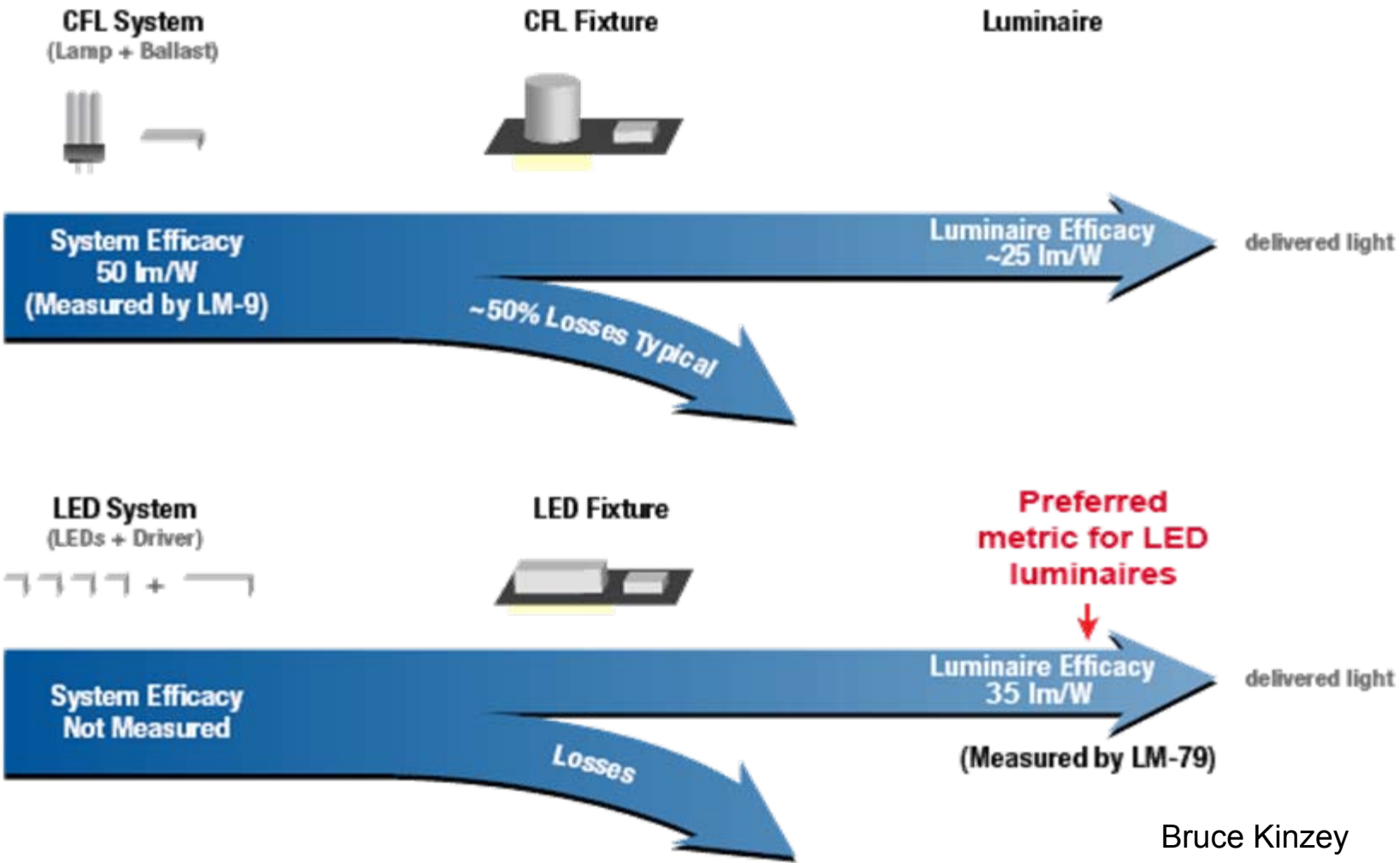
System Efficacy Vs. Luminaire Efficacy

(Recessed Downlights Example)



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http://www.netl.doe.gov/ssl/comm_testing.htm

CALiPER: Commercially Available LED Product Evaluation and Reporting

- Anonymous testing of commercially-available products
- Product selection based on expected performance, visibility, market impacts, and specific design characteristics
- Tests include efficacy, color temperature, illumination pattern, lumen depreciation (for some products), etc.
- Official DOE reports issued on each product and downloadable from the SSL website
- Testing program initiated in Aug 06; >100 products tested to date (7/15/2008)

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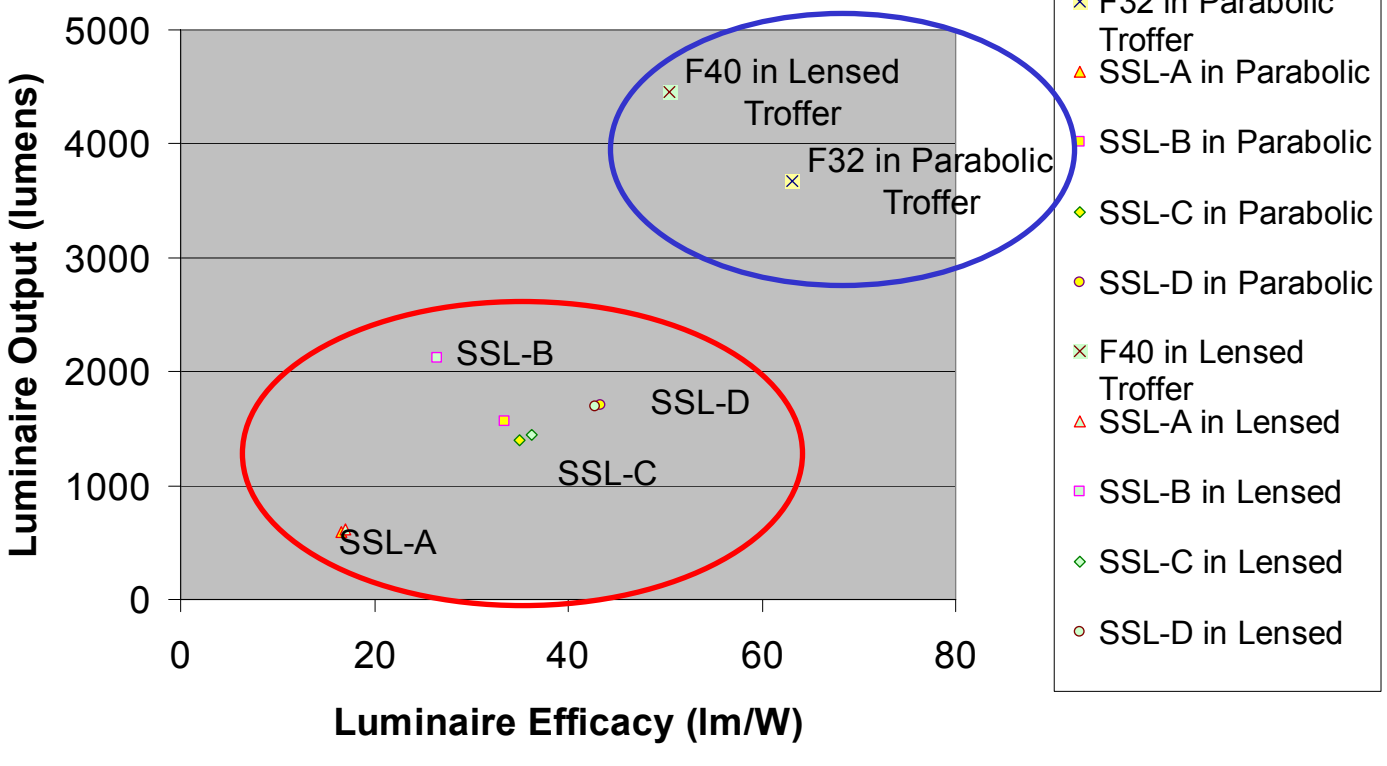
Sample CALiPER Results

T12, Lensed Troffer with Clear Prismatic Plastic Lens

T8 Parabolic Troffer with 12 Cell, Semi-specular, Aluminum Louver



-- 4 different SSL replacement tube products were used (2 samples each)

-- SSL-B uses troffer ballast. SSL-A, C, & D bypass ballast

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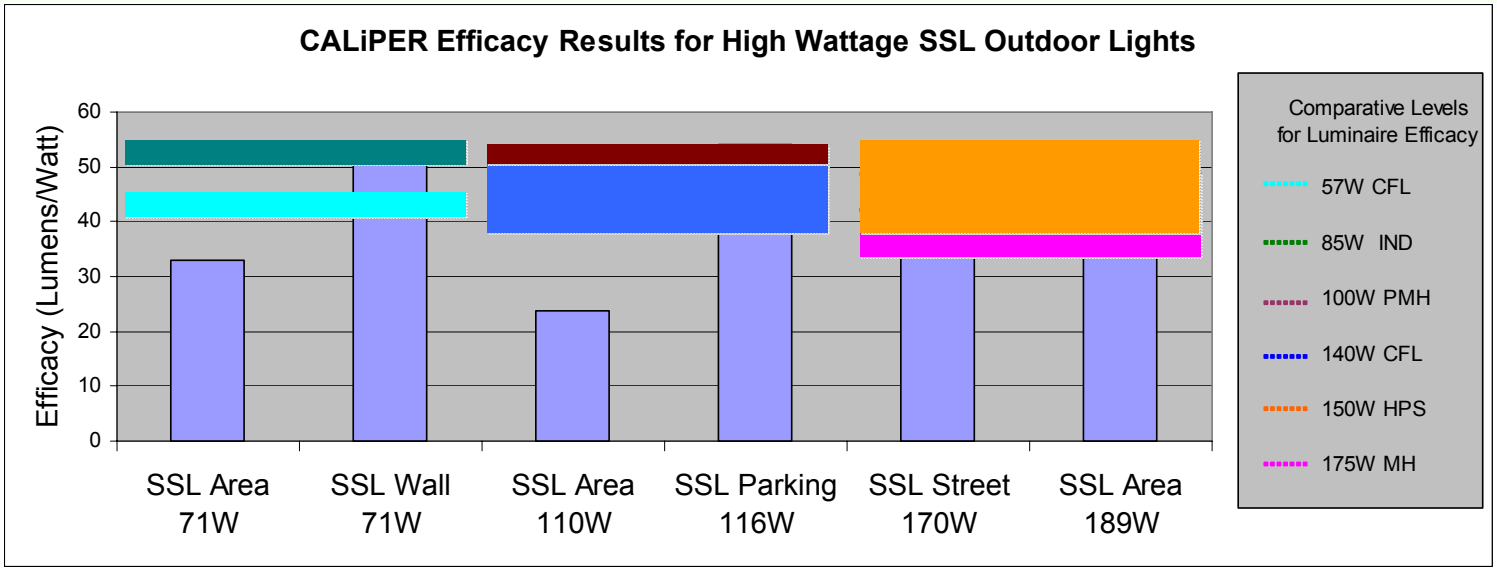
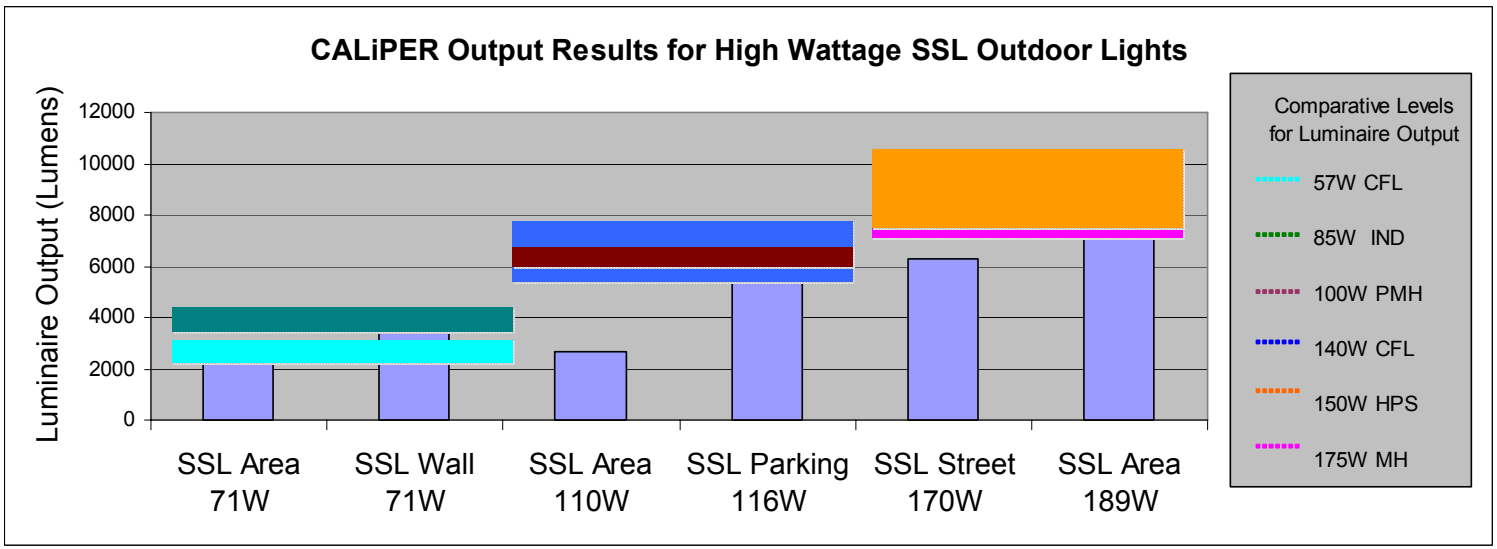
Sample CALiPER Results

- T8-T12 : SSL photometry and direct comparisons with fluorescents in troffers
  - ↓ Performance: not yet competitive with fluorescent in output or efficacy
  - ↓ Misleading manufacturer literature: SSL replacement lamps emit less than ½ the output expected based on spec. sheets
  - May be suitable for specific applications (e.g., cold or rugged environments, low output needs…)
  - Relative cost of SSL still very high

Sample CALiPER Results





Comparative levels for initial luminaire efficacy and output, established using IES files and ballast factors.

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For SSL, 'Can' ≠ 'Does'

- Some products do
  - Perform very well
  - Meet manufacturer specifications
  - Beat other, existing technologies
- Most LED products on the market today don't
  - Perform to their technical potential
  - Meet manufacturer claims
  - Beat existing alternatives

When designed correctly, SSL products are now capable of rivaling traditional sources

BUT

Be careful not to generalize about products
Request luminaire testing results
Be informed buyers

http://www.netl.doe.gov/ssl/techdemos.htm

DOE GATEWAY Demonstration Program

- Current situation and lack of field experience complicates investment decisions in SSL technology.
- GATEWAY provides case studies of tested, high-performance SSL products in real world applications.
- Purpose is to demonstrate new SSL products that:
  - save energy
  - match or improve lighting quality
  - are cost effective for the user

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The GATEWAY Demonstration Process

- Several steps:
  - Identification
  - Testing
  - Matching
  - Installation
  - Measurement
  - Feedback
  - Evaluation
  - Documentation and Reporting
- Every project is different in some respect
- Many potential projects don't make it

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GATEWAY Projects

- Several demonstrations currently underway to varying degrees
- Two completed; final reports available on DOE website
- Much interest from host sites and manufacturers
- Always looking for new products, hosts, and other participants

→ Visit the DOE SSL Website

Current General Illumination Applications for LEDs

- Residential
  - R Lamp Replacements
  - Kitchen undercabinet
  - Downlights
- Commercial
  - Undercabinet/Shelf Lighting
  - Task Lighting
  - Refrigerated Case
  - Downlights(?)
- Outdoor
  - Roadway/Walkway
  - Building Perimeter
  - Parking Garage/Low Bay

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GATEWAY Results

FAA William J. Hughes Technical Center, Atlantic City, NJ.

- 25-50% energy savings, lighting quality visibly improved.
- Estimated 7-year payback for new construction (or replacing existing fixtures at their end of life).

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Current Findings

- Performance-wise, the technology has arrived
- *But*:
  - Matching *suitable* products with applications must be pursued carefully; lumen output, color temp, distribution pattern all contribute to suitability
  - Not all products are yet "winners"
    - Many constrained by the attempt to retrofit existing luminaire with "drop-in" replacement
  - Product cost remains biggest hurdle
  - Buyer beware

The Right Product for the Right Application!

Ill-suited product application (note: non-DOE demo) showing lack of illumination in foreground

"I just don't like them."

-- Resident quoted in the Minneapolis/St. Paul Star Tribune

Thank You!

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