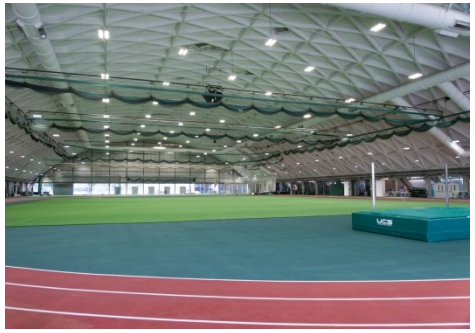
DOE SOLID-STATE LIGHTING PROGRAM










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

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DOE Solid-State Lighting Program Mission and Goal

MISSION

Guided by a government-industry partnership, DOE's mission is to create a new, U.S.-led market for high-efficiency, general illumination products through the advancement of semiconductor technologies, to save energy, reduce costs, and enhance the quality of the lighted environment.

GOAL

By 2025, develop advanced SSL technologies that — compared to conventional lighting technologies — are much more energy efficient, longer lasting, and cost competitive, by targeting a product system efficiency of 50 percent with lighting that accurately reproduces sunlight spectrum.

Legislative Authority

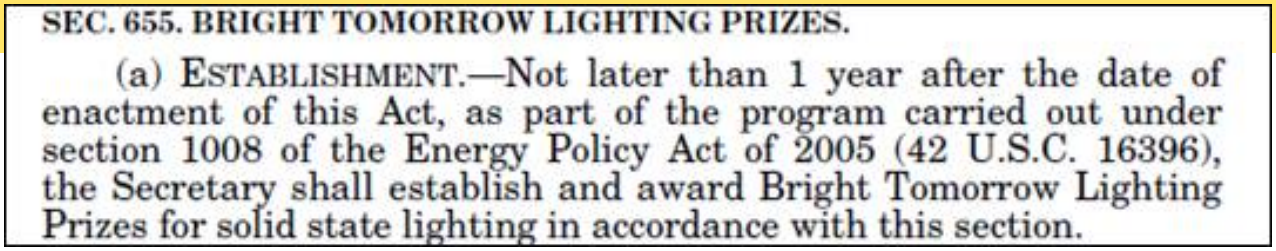
DOMENICI-BARTON ENERGY POLICY ACT OF 2005, SECTION 912

"**The Secretary shall carry out a Next Generation Lighting Initiative** in accordance with this section to support research, development, demonstration, and commercial application activities related to advanced solid-state lighting technologies based on white light emitting diodes."

Legislative Authority

ENERGY INDEPENDENCE AND SECURITY ACT OF 2007, SECTION 321

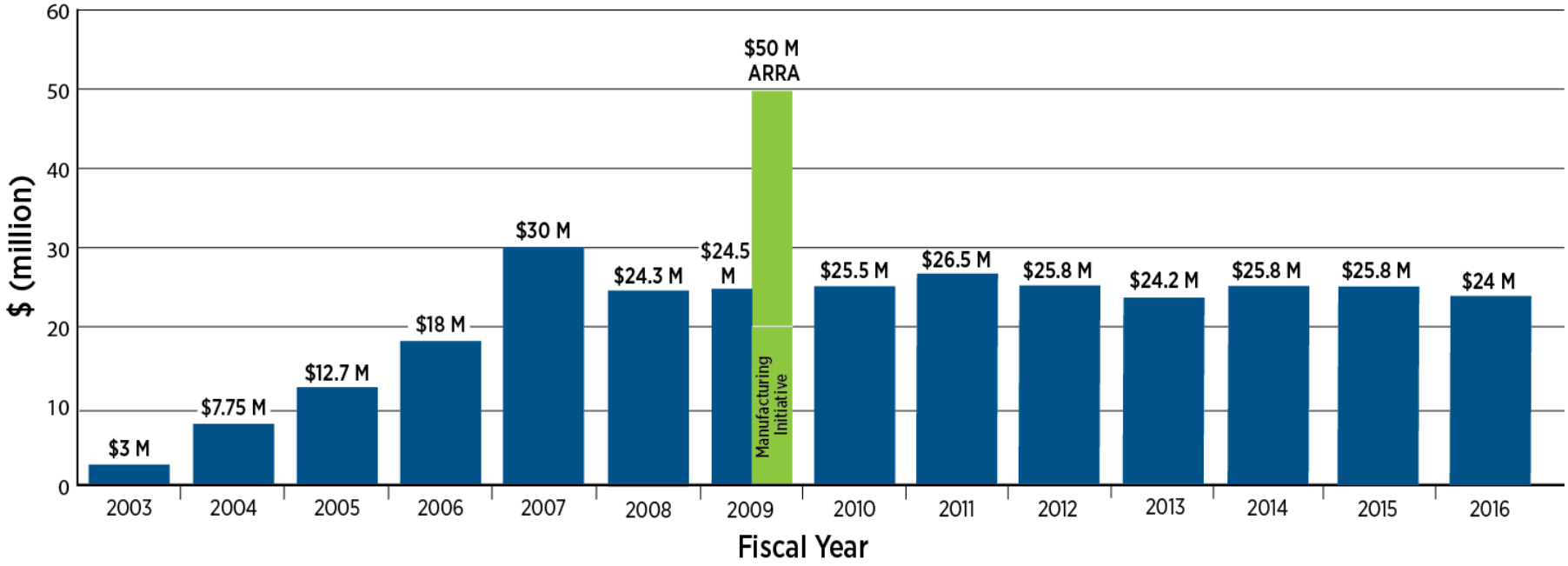
(g) Research and Development Program.— (1) In General.— The Secretary may carry out a lighting technology research and development program—(A) to support the research, development, demonstration, and commercial application of lamps and related technologies sold, offered for sale, or otherwise made available in the United States…



SEC. 655. BRIGHT TOMORROW LIGHTING PRIZES.

(a) ESTABLISHMENT.—Not later than 1 year after the date of enactment of this Act, as part of the program carried out under section 1008 of the Energy Policy Act of 2005 (42 U.S.C. 16396), the Secretary shall establish and award Bright Tomorrow Lighting Prizes for solid state lighting in accordance with this section.

Congressional Appropriations



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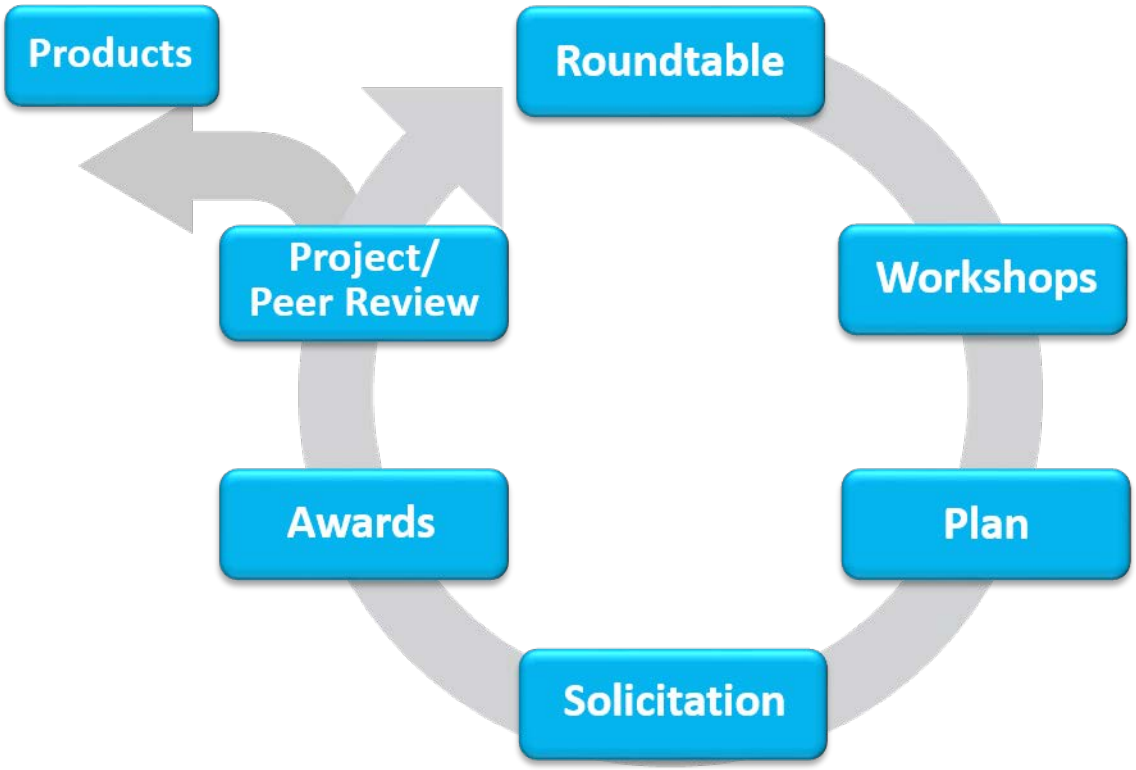
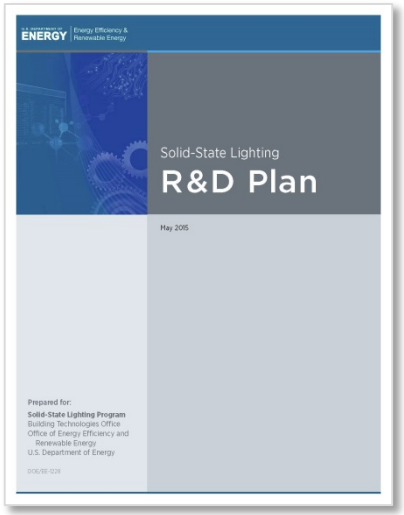
Guiding Principles

- Dynamic program constantly evolving in pace with technology advances
- DOE is convener and facilitator; tackles broad national goals
- Program conducts targeted R&D for focused needs
- Partners heavily involved in planning
- Annual milestones
- Open information and process
  - Workshops
  - Roundtables
  - Working groups

DOE R&D Plan Process

SSL community input from roundtables and workshops shape R&D priorities and DOE solicitations





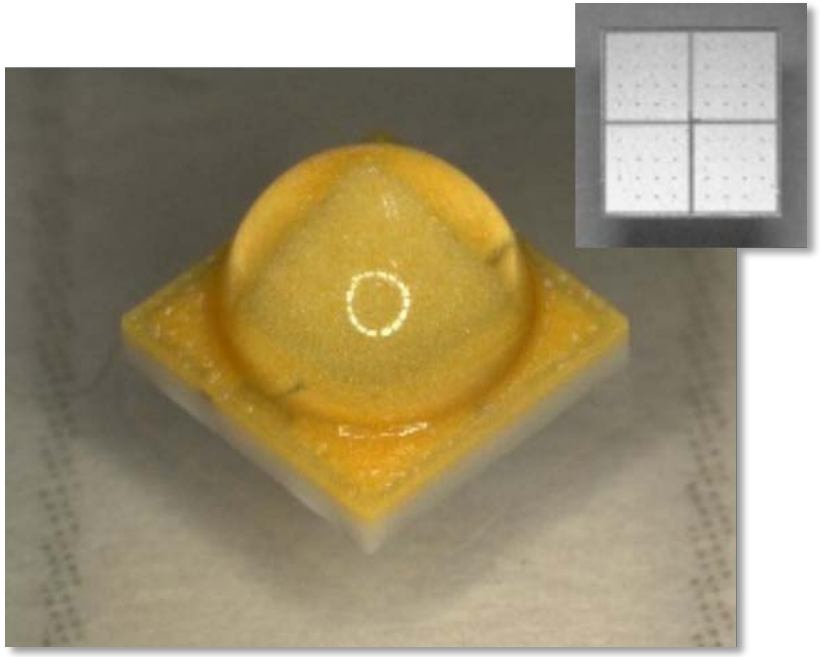
DOE targets push industry to levels of efficacy and performance that might not otherwise be achieved

Analysis of emerging products prompts improvements, informs R&D priorities

Expert Information Exchange

R&D Challenges for LEDs

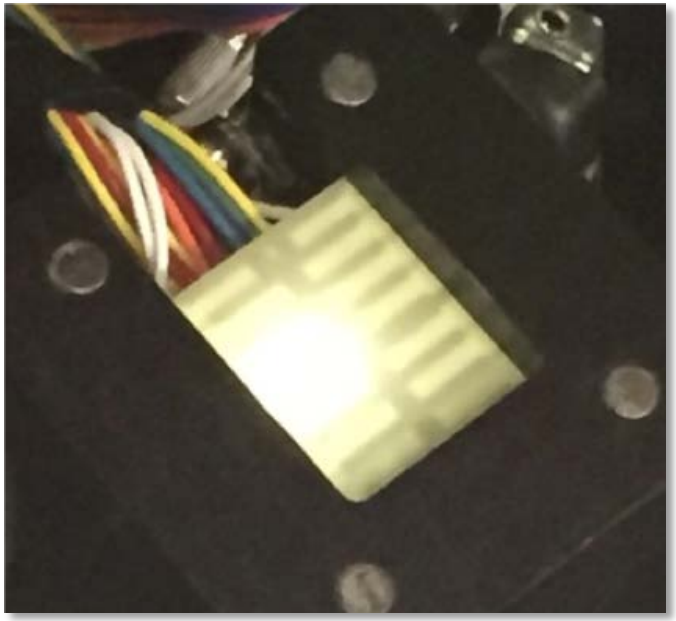
- Emitter materials
- Down converters
- Emitter architectures for system efficiency
- Encapsulation
- Package/module integration into luminaires
- Novel luminaire systems
- Manufacturing test and inspection equipment
- Package manufacturing



Lumileds is working to develop a high-voltage LED light engine with integrated driver. Pictured here is a packaged LED based on a multi-junction PSS-FC die (inset).

R&D Challenges for OLEDs

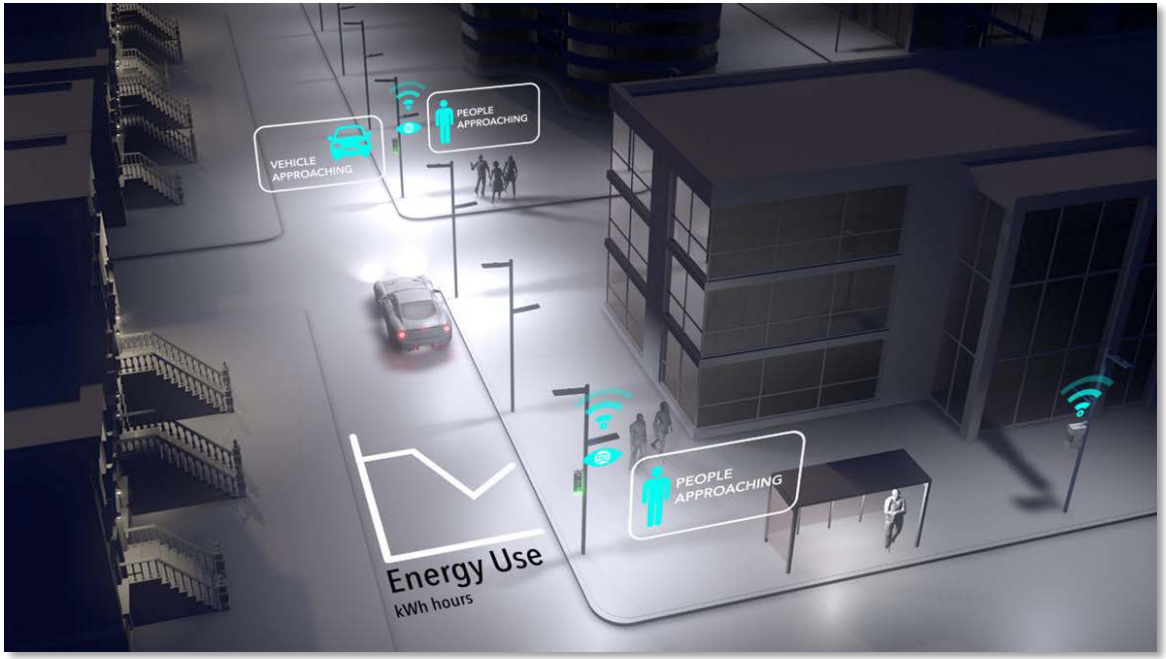
- Stable white devices
- Light extraction concepts
- Luminaire development
- Panel light extraction
- Panel manufacturing
- Roll-to-roll manufacturing
- Deposition equipment



Researchers at Princeton University are looking to improve outcoupling efficiency of thin film OLEDs. Pictured here is a white OLED with the scattering layer attached to the back of the substrate.

R&D Challenges for SSL in Total

- Controls and connected lighting
- Light quality
- Reliability
- Human factors



Connected lighting systems hold the potential to deliver improved energy performance and lighting quality, along with a host of other benefits.

Broad Mix of R&D Partners

Invited Projects

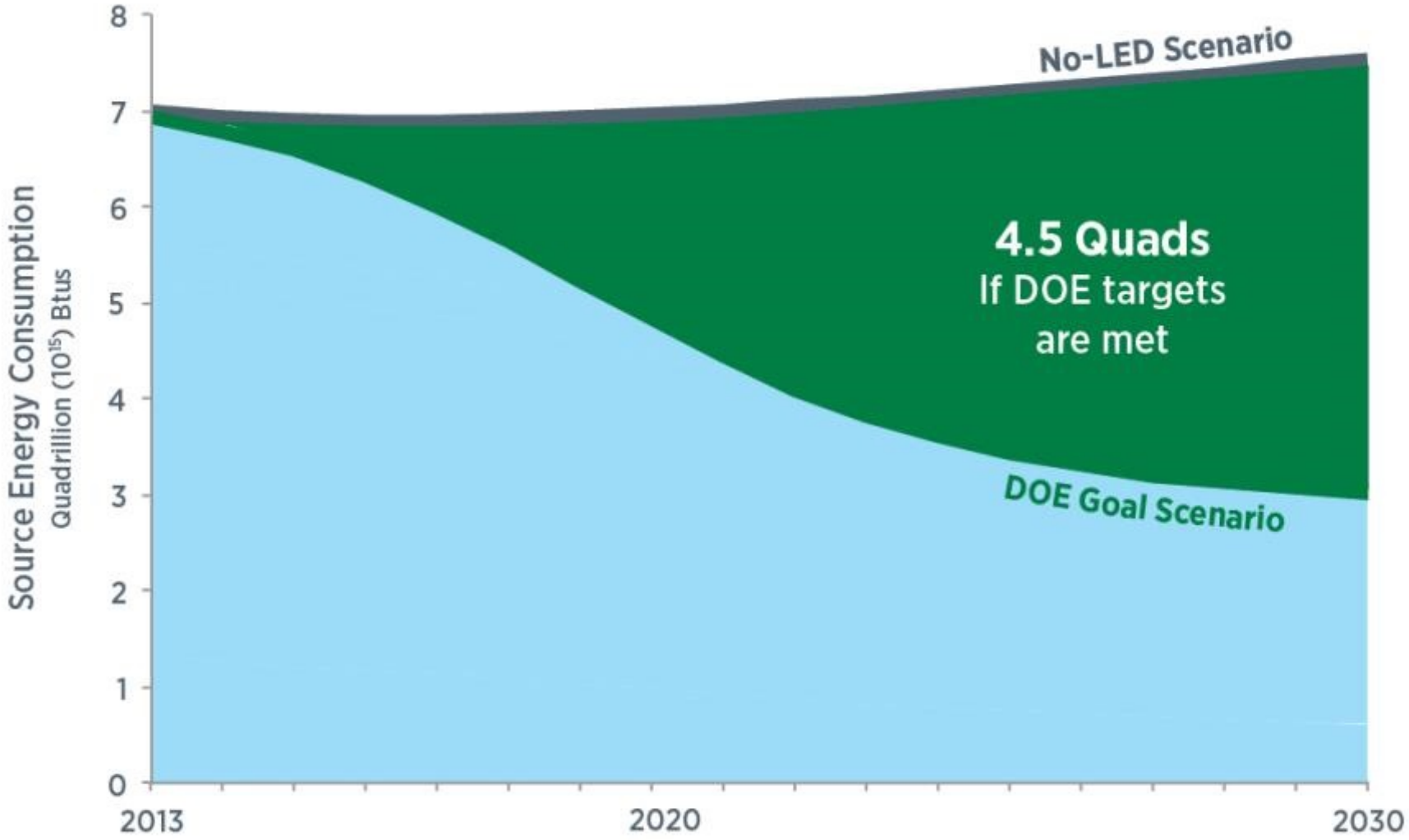
- **Novel Transparent Phosphor Conversion Matrix with High Thermal Conductivity for Next Generation Phosphor-Converted LED-Based Solid-State Lighting,** Michael Bockstaller, Carnegie Mellon University

- **The Approach to Low-Cost High-Efficiency OLED Lighting,** Qibing Pei, University of California, Los Angeles

- **ITO-Free White OLEDs on Flexible Substrates with Enhanced Light Outcoupling,** Barry Rand, Princeton University

- **Advanced Light Extraction Structure for OLED Lighting,** Gene Chen, Pixelligent

The Best Is Yet to Come



energy.gov/sites/prod/files/2015/05/f22/energysavingsforecast14.pdf