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

2015 Solid-State Lighting R&D Workshop

A Broader Look at Government SSL Support

January 28, 2015

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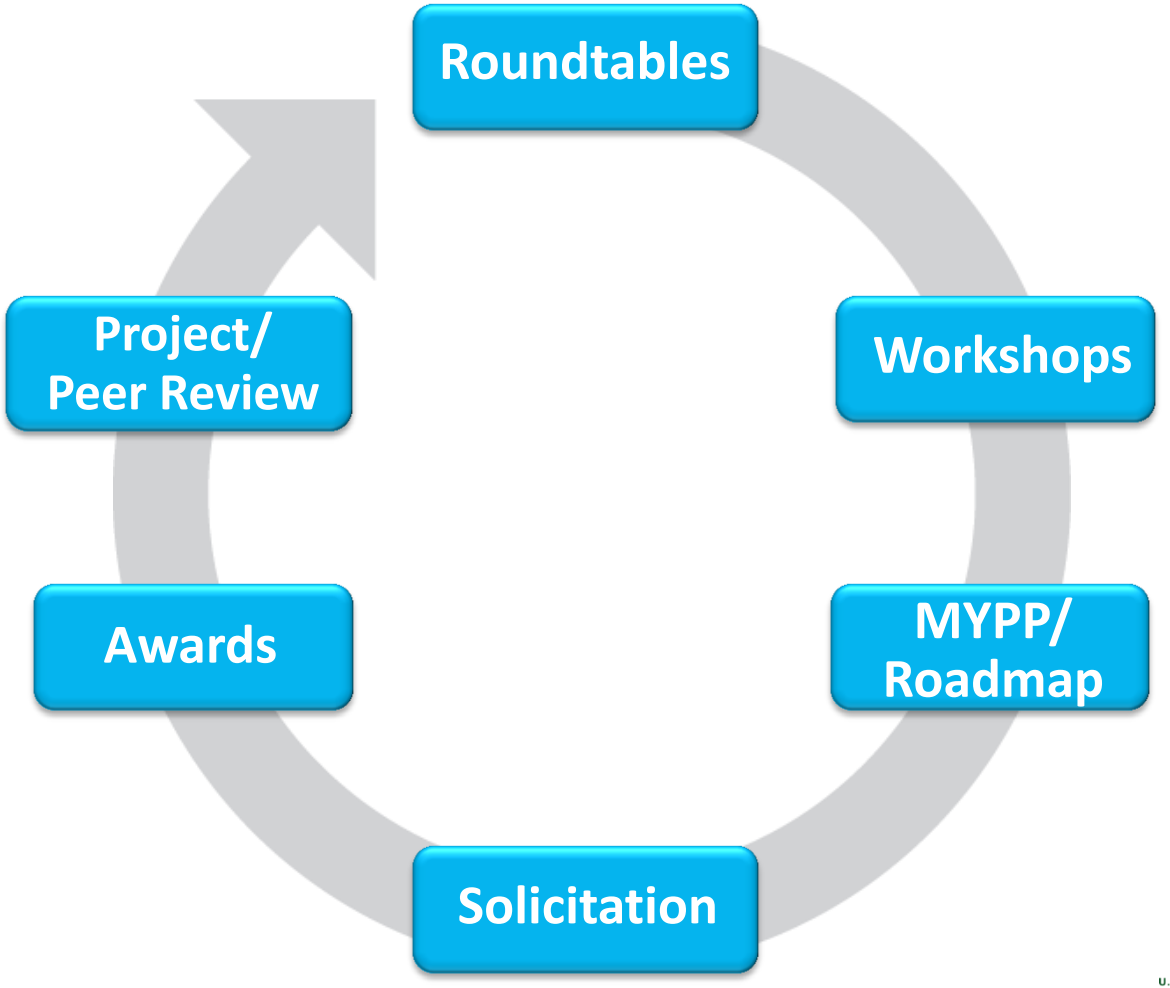
Solid-State Lighting Program Strategy

Industry input from Roundtables and Workshops shape DOE priorities and solicitations



One R&D Workshop, One Plan, One Solicitation

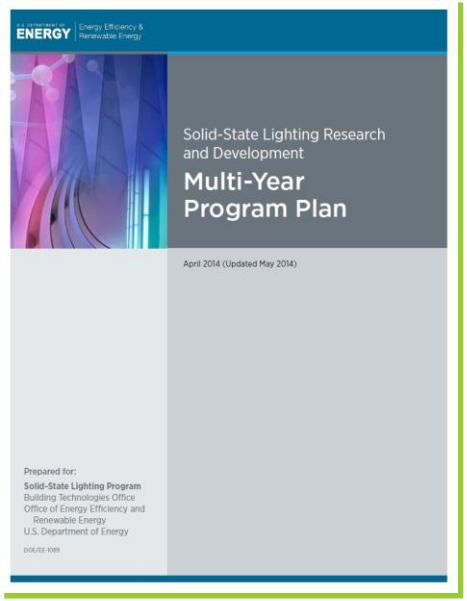
- Two R&D workshops combined to one
  - January → January
  - June
- One R&D Plan
  - Multiyear Program Plan
  - Manufacturing Roadmap → R&D Plan
- Three R&D focus areas addressed in a single funding opportunity
  - ✓Core Technology
  - ✓Product Development
  - ✓Manufacturing R&D

R&D Solicitation Goals

- Maximize the energy-efficiency of SSL products in the marketplace
- Remove market barriers through improvements to lifetime, color quality, and lighting system performance
- Reduce costs of SSL sources and luminaires
- Improve product consistency while maintaining high quality products
- Encourage the growth, leadership, and sustainability of domestic U.S. manufacturing within the SSL industry

Core Technology Research

- Applied research to fill SSL technology gaps, provide enabling knowledge or data
- Primarily improves efficiency and performance
  - Should address cost and manufacturability
- Guided by the priorities and targets of the R&D Plan
- Current solicitation
  - 2 years duration w/ annual decision point
  - Minimum 20% cost share
  - Up to $1.5 million Federal share



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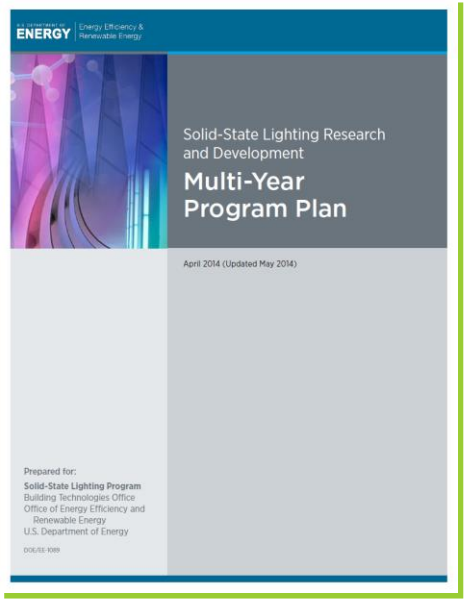
Product Development

- Use of applied research to develop or improve commercially viable SSL materials, devices, or systems
- Focus on a targeted market application with fully defined price, efficacy, and other performance parameters
- Guided by the priorities and targets of the R&D Plan
- Current solicitation
  - 18 months duration w/ decision point
  - Minimum 25% cost share
  - Up to $1.5 million Federal share OLED
  - Up to $500K Federal share LED



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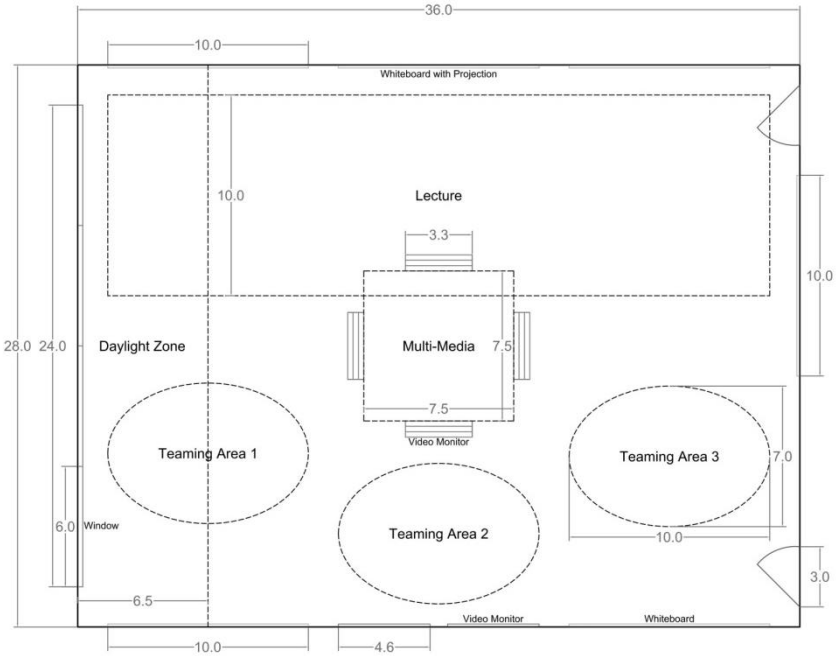
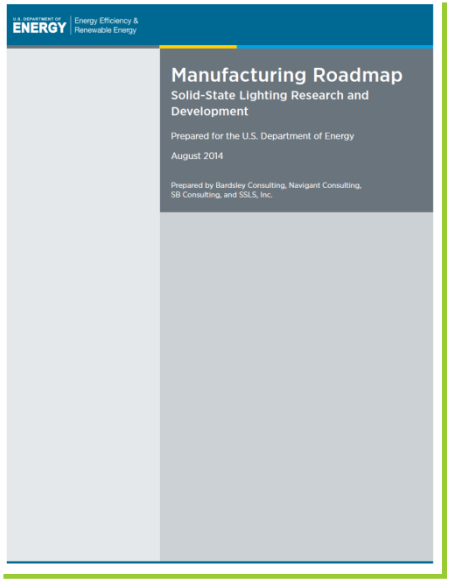
Product Development – “Light the Space”

- Currently Topic Area 3 – LED Product Development-Novel LED Luminaire System
- Design/layout a space that utilizes the unique characteristics of solid-state lighting
  - Hospital patient/exam room (2014 solicitation)
  - Office lighting
  - School classroom
- Not meant to design a specific luminaire but rather a complimentary system of luminaires to meet the needs of the space



Manufacturing R&D

- R&D to achieve cost reductions through improvements in manufacturing, while maintaining or enhancing performance
- Focus on significant leaps in SSL manufacturing equipment, processes, or monitoring techniques, and on fostering U.S.-based manufacturing
- Guided by the priorities and targets of the R&D Plan
- Current solicitation
  - 18 months duration w/ decision point
  - Minimum 50% cost share
  - Up to $1.5 million Federal share



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Changes to the Funding Opportunity Process

- Active Project Management Process
  - 2nd year under process ……. and still evolving
    - Concept Papers
    - Reply to Reviewer Comments
    - Data Management Plan, Intellectual Property Management Plan, US Manufacturing Plan
- Single Funding Opportunity
  - Topics cover Core, Product, and Manufacturing priority gap areas
  - Project value, cost-share, and project durations are specific to topic area
- End of the Exceptional Circumstances Determination
  - Expires 2015
    - Awards from current funding opportunity will not be subject to EC
  - Spirit of US Manufacturing continues in funding opportunity

FY15 SSL Program Funding Opportunity

- One solicitation covers all three areas: Core Technology, Product Development, and Manufacturing R&D

FY15 Funding Opportunity Schedule	
Funding opportunity released	October 14, 2014
Concept papers due	November 14, 2014
Full applications due	January 15, 2015
Reply to reviewer comments due	March 9, 2015
Selection announcement	May 2015
Awards	July 2015

Collaboration & Coordination Create a Bridge

SSL Program R&D

Small Business Innovation Research (SBIR) Program

Energy Frontier Research Centers (EFRCs)

Advanced Research Projects Agency-Energy (ARPA-E)

Advanced Manufacturing Office

National Science Foundation SBIR Program

Highlight - New Projects - LED

- **Core Technology R&D**
  - **Carnegie Mellon University** - Novel Transparent Phosphor Conversion Matrix with High Thermal Conductivity for Next Generation Phosphor-Converted LED-based Solid State Lighting
- **Product Development**
  - **Cree, Inc.** - Scalable, Economical Fabrication Processes for Ultra-compact Warm-White LEDs
  - **Momentive Performance Materials Quartz, Inc.** - Next-Generation LED Package Architectures Enabled by Thermally Conductive Transparent Encapsulants
  - **Philips Lumileds Lighting, LLC** - High-Voltage LED Light Engine with Integrated Driver
  - **Philips Research North America** - Innovative Patient Room Lighting System with Integrated Spectrally Adaptive Control

Highlight - New Projects - OLED

- **Core Technology R&D**
  - **Pixelligent Technologies, LLC** - Advanced Light Extraction Structure for OLED Lighting
  - **Princeton University** - ITO-free White OLEDs on Flexible Substrates with Enhanced Light Outcoupling
  - **University of California-Los Angeles** - The Approach to Low-Cost High-Efficiency OLED Lighting
- **Product Development**
  - **OLEDWorks, LLC** - High-Performance OLED Panel and Luminaire

Moving Forward with OLEDs

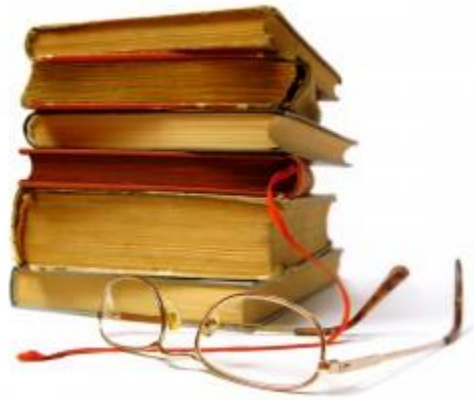
- OLED Stakeholder Meeting
  - Conducted mid-October in Rochester NY
    - Report available at ssl.energy.gov
- Formation of the OLED Coalition
- Next Generation Luminaire™ - OLED Luminaire category
- Workshop tours w/ OLEDs
  - Acuity Brands - Center for Light&Space
- OLED demonstrations
- OLED Testing Collaboration

Collaborative R&D - OLED Testing Opportunity

- Objective is to accelerate R&D developments in OLED lighting technology and manufacturing
  - Provides a pathway to prove-out and/or optimize components in a fully representative OLED
- Qualify as a testing laboratory
  - Open to any US-based organization w/ consistent OLED capabilities
  - Requires full OLED panels or subcomponent production/testing capability
- Have a component to be tested?
  - Provide technology description, maturation level, anticipated outcome, etc.
  - DOE funding to pay for testing – not material and shipping
- Progress to Date
  - One organization is “qualified” and under contract to test R&D products
  - Two OLED “components” are currently initiated for testing
- More at energy.gov/eere/ssl/oled-testing-opportunity

Increasing Academic Interest in SSL

- Plan to release new funding opportunity geared to increase academic participation in SSL
- Academic teams solve a problem utilizing novel aspects of SSL technology
- In sync with academic year
- Small-scale design efforts ($10-15K/project)
- Recognition of design at end of project cycle



This new concept is still in the development stage

Information, Resources, and Updates

www.ssl.energy.gov