WORKSHOP AGENDA

2013 DOE Solid-State Lighting Manufacturing R&D Workshop

June 5–6, 2013 • Boston, MA

DAY 1 — Wednesday, June 5

7:00 a.m.	*Registration Opens*
8:00 a.m.	**Welcome** *James Brodrick, Solid-State Lighting Program Manager, U.S. Department of Energy* **Introduction** To realize the full energy-saving potential of SSL, market adoption will need to accelerate rapidly in the next few years, which will require a corresponding ramp-up in SSL production. But do we have the right tools and manufacturing methods to make this happen? And what are the implications for a U.S. role? How can industry and government work together to foster a greater role for U.S.-based SSL manufacturing and export opportunities? *David Danielson, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy*
8:30 a.m.	**SSL Market Forecast** Insights from an investor's perspective: a look at the SSL market today, current trends, and where the market is headed. *Jed Dorsheimer, Canaccord Genuity*
9:15 a.m.	**LED Package Manufacturing Trends** Insights from an LED package manufacturer's perspective: How will LED chip and package manufacturing evolve in the next five years to ramp up production, handle a broad product mix, improve quality and consistency, and reduce costs? *Iain Black, Philips Lumileds*
10:00 a.m.	*Refreshment Break*
10:30 a.m.	**LED Luminaire Manufacturing Trends** Insights from a luminaire manufacturer's perspective: How will luminaire manufacturing evolve in the next five years to ramp up production, maintain flexibility in the face of an expanding product portfolio with short product cycle times, improve quality and consistency, optimize reliability, and reduce costs? *Ralph Tuttle, Cree*
11:15 a.m.	**Lessons from Other Industries** A look at manufacturing trends in other industries: What can we learn from their experiences and efforts to increase efficiency and strengthen a U.S. role? What new technologies and methods are they using to improve productivity? *Rick Jarman, National Center for Manufacturing Sciences*
12:00 p.m.	*Lunch*

1:00 p.m.	**Panel 1: Manufacturing Cost Impacts of Testing and Modeling** A key challenge facing the industry is to find ways to minimize the testing time and cost required to demonstrate performance and compliance with listing requirements. This panel will share ideas and experiences on how best to meet the challenge, clarifying the role of testing, exploring the use of in-line testing during the manufacturing process in conjunction with modeling to better predict product performance, and defining the testing requirements for LEDs and OLEDs. *Moderator: Marc Ledbetter, Pacific Northwest National Laboratory* *Mary Matteson Bryan, P.E.* *Eric Haugaard, Cree* *Jeremy Yon, Litecontrol* *Fred Proctor, National Institute of Standards and Technology*
2:30 p.m.	*Refreshment Break*
3:00 p.m.	**DOE SSL Manufacturing R&D Program Update** An overview of the DOE SSL manufacturing R&D portfolio, budget, and areas of focus sets the stage for the R&D presentations to follow. *James Brodrick, U.S. Department of Energy*
3:30 p.m.	**Introductory Presentations on Manufacturing R&D Projects** Progress updates from DOE-funded SSL manufacturing R&D projects provide an introduction to the project posters in the evening poster session/reception. ***Development of Production PVD-AlN Buffer Layer System and Processes to Reduce Epitaxy Costs and Increase LED Efficiency*** *Frank Cerio, Veeco Instruments* ***Creation of a U.S. Phosphorescent OLED Lighting Panel Pilot Facility*** *Mike Hack, Universal Display Corporation* ***Low-Cost LED Luminaire for General Illumination*** *Paul Fini, Cree* ***High Throughput, High Precision Hot Testing Tool for HBLED Testing*** *Mark McCord, KLA-Tencor* ***Low-Cost Illumination-Grade LEDs*** *Brendan Moran, Philips Lumileds* ***Improving Product Yield of OLEDs*** *Gopalan "Raj" Rajeswaran, Moser Baer Technologies*
4:30 p.m.	**Defining Targets and Priorities** This talk will explore potential updates to the DOE SSL Manufacturing R&D Roadmap, sharing feedback from roundtables held in March, and setting the stage for in-depth discussions on Day 2. Where does future R&D need to be directed to support DOE goals for efficacy and cost reductions? *Fred Welsh, Radcliffe Advisors*

5:00–7:00 p.m. **Reception: Poster Session and Exhibits**

A reception featuring posters on DOE-funded SSL manufacturing R&D projects provides an opportunity for one-on-one discussions and networking. The reception also features hands-on exhibits to illustrate innovative new manufacturing materials, methods, and technologies.

Presenters:

DOE-Funded Projects

Frank Cerio, Veeco Instruments
Lynn Davis, RTI International
Paul Fini, Cree
Mike Hack, Universal Display Corporation
Jerry Liu, GE
Mark McCord, KLA-Tencor
Brendan Moran, Philips Lumileds
Jeff Spindler, Moser Baer Technologies

DOE Analysis Reports

Marc Ledbetter, Pacific Northwest National Laboratory
Mary Yamada, Navigant

Manufacturing Exhibits

Cree
Lighting Science Group
LUXeXcel
OSRAM Sylvania
Rambus
Universal Display Corporation/Acuity Brands

DAY 2 — Thursday, June 6

7:30 a.m. *Continental Breakfast*

8:00 a.m. **LED Manufacturing Outlook**

An update on LED chip manufacturing trends, including manufacturing standards in development, global capacity and spending trends, Chinese manufacturing trends, and a global investment outlook.

Tom Morrow, SEMI

8:30 a.m. **LED/OLED Track Sessions: Barriers to Low-Cost Manufacturing**

The LED track session will focus on future LED manufacturing challenges and explore R&D opportunities that could lead to a step change in manufacturing efficiency and cost reduction.

Moderator: Steve Bland, SB Consulting
Paul Fini, Cree
Jay Montgomery, Veeco Instruments
Richard Solarz, KLA-Tencor
Jerry Zheng, iWatt
John Tremblay, OSRAM Sylvania

The OLED track session will focus on strategies to reduce the cost of OLED manufacturing and will explore the status of OLED manufacturing from a global perspective.

Moderator: Norman Bardsley, Bardsley Consulting
Mike Lu, Acuity Brands
AB Bhandari, PPG
Tom Trovato, Trovato Manufacturing
John Hamer, OLEDWorks

10:00 a.m.	*Refreshment Break*
10:30 a.m.	**LED/OLED Topic Table Discussions** Attendees will have an opportunity to talk in small groups about a variety of topics considered key to achieving SSL manufacturing goals. Each table will focus on a specific priority topic, allowing for more detailed exploration of the topic and related issues.
12:00 p.m.	*Lunch*
1:00 p.m.	**LED/OLED Topic Table Reports and Discussion** Each group will share a brief report of key points related to their topic, with an opportunity for further discussion with the full LED or OLED group. Input will guide the choice of priority manufacturing R&D topics and other changes and updates to the roadmap.
2:30 p.m.	*Refreshment Break*
3:00 p.m.	**Panel 2: New Manufacturing Materials and Methods** This panel will share various perspectives on new materials and methods for manufacturing that will enable a significant ramp-up in SSL production. Do we have the right infrastructure, the right level of automation? What state-of-the-art manufacturing tools and techniques can be applied to LED luminaire manufacturing? How can the manufacturing landscape be reshaped to improve manufacturing effectiveness? *Moderator: Morgan Pattison, SSLS Inc.* *Jose Sierra, Lighting Science Group* *Imro Wong, LUXeXcel* *Brad Koerner, Philips Lighting*
4:30 p.m.	*Wrap-Up and Adjourn*