

OLED Collaboration Session

January 30th, 2014

Solid-State Lighting R&D Workshop - Tampa, Florida

Report Prepared for U.S. Department of Energy

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INTRODUCTION

This OLED Collaboration Session was convened by the U.S. Department of Energy's (DOE's) Solid-State Lighting (SSL) Program, on January 30, 2014 in Tampa, Florida during the SSL R&D workshop. This session provided a forum to continue discussions that arose during the OLED planning meeting held in Rochester, New York on October 1, 2013. The intention of these meetings was to bring together the OLED community to discuss the need for a collaborative R&D framework to accelerate advancements in OLED lighting technology and manufacturing, and to explore the different roles DOE and industry should play for improved collaboration. The meeting was moderated by DOE SSL Program Manager Dr. James Brodrick. The discussion and results are presented in this report.

PARTICIPANT PRESENTATIONS

Summary of the Rochester Meeting on OLED Manufacturing October 1, 2013

Norman Bardsley of Bardsley Consulting gave a summary of the OLED planning meeting held in Rochester, New York. The meeting was held on October 1, 2013 at the facilities of Trovato Manufacturing, Inc., which were graciously offered for use by CEO Tom Trovato. The meeting agenda was organized by the DOE SSL program to discuss ways in which U.S. companies and organizations could work together to promote OLED technology. Ideas that emerged from this discussion included the formation of a formal U.S. OLED lighting industry advocacy group and the development of manufacturing and test standards that could help accelerate adoption through lower-cost manufacturing and improved customer acceptance of OLED lighting products. The meeting also explored the role DOE could play in facilitating discussion among OLED industry stakeholders.

There were many participants representing a variety of industry interests including panel, materials, equipment, and luminaire manufacturers as well as several universities and the representatives from the OLED Association. Many views were expressed and were captured in a summary report.¹ While no clear consensus emerged from the meeting, six action items were formulated to address key needs:

1. **Formation of an OLED Lighting Alliance.** Keith Cook and Barry Young were tasked with offered to develop a plan for forming an OLED Coalition.
2. **Alternative funding mechanisms.** DOE agreed to investigate an alternative funding mechanism that would allow for fast-turnaround projects.
3. **Specific suggestions for a collaboration program.** DOE offered to collect specific suggestions for a collaborative facilities program.
4. **Development of standards for OLED lighting.** DOE offered to compile a list of current activities related to the development of standards for OLED lighting.
5. **Support for market establishment.** DOE agreed to consider possible prize competitions to support market establishment by engaging panel and luminaire manufacturers.
6. **Future OLED forums.** DOE agreed to explore ideas for future OLED forums, through adapting DOE SSL meetings or creating new approaches.

¹ DOE, "DOE Roundtable on OLED Lighting Industry Planning," October 2013.
http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/oled-roundtable-report_oct2013.pdf

Progress has been made on all action items. DOE along with the following presenters at the OLED Collaboration Session in Tampa, Florida provided updates on each.

OLED Association – Update on Efforts

Barry Young of the OLED Association recapped the Ad-Hoc OLED Advocacy Group’s visit to Washington, DC in July 2013 to ask for continued DOE funding of the OLED industry. The group was made up of representatives from Acuity Brands, EMD Chemicals (Merck), Moser Baer Technologies, OLEDWorks, NGLIA, PPG Industries, Trovato Manufacturing, Universal Display Corporation, and the OLED Association, which is a consortium of about 20 OLED companies. The group visited the House Energy and Commerce Committee, the House Energy and Water Appropriations Committee, the Senate Energy and Water Appropriations Committee, the Office of Management and Budget (OMB), and DOE Assistant Secretary for Energy Efficiency and Renewable Energy, Dr. David Danielson.

Workshop attendees are invited to participate in future visits to Washington DC, provide their input on how they view the program, and indicate their interest in establishing a permanent DOE OLED support group. OLED products are not available in the marketplace, and it’s incumbent on the industry to change this. Barry asserted that the U.S. is capable of having a full-scale OLED industry.

Next Generation Lighting Industry Alliance (NGLIA) – Status of the OLED Coalition

Keith Cook of Philips talked about how the NGLIA and the OLED Association are both actively working with Congress. Both organizations recognize the need for the OLED lighting industry to coordinate a common communications effort. Thus, the OLED Coalition is forming with the intent to be the recognized voice of the OLED lighting industry. In terms of logistics, the OLED Coalition is to be a not-for-profit LLC with a Board comprised of 5-7 members. All members must have presence in U.S. and be a participant in the U.S. OLED supply chain or be otherwise linked to the U.S. OLED lighting industry. There would be no fees for those who already have membership with the NGLIA or the OLED Association; the fee for sole membership to the OLED Coalition has yet to be determined.

Intended Coalition activities include facilitating communication of industry priorities and requirements to groups within the OLED industry as well as to Congress, DOE, and OMB. The Coalition also plans to assist the priority setting for intercompany activities related to DOE SSL program efforts and to produce an annual report on the overall progress of the U.S. OLED industry. The next steps include finalizing the memorandum of understanding, and beginning execution of the Coalition’s activities.

Sources Sought for Testing Opportunity: Organic Light-Emitting Diodes

James Brodrick shared an update on DOE plans to implement DOE-funded testing capabilities to advance OLED technology more quickly. Greg Washington of Leonardo Technologies, Inc. (LTI) provided details for a proposed collaborative testing opportunity. Based on the inputs and action items created from the OLED planning meeting held in Rochester, the DOE SSL program is developing collaborative testing opportunities with the purpose of testing OLED panels and/or components to compare them to baseline panels and/or components in order to quickly measure performance improvements. OLED organizations who can build “standard”

OLED recipes which incorporate emerging technologies in their baseline structure and labs that can test these devices will be qualified by the DOE to assist with this program. It is hoped that this will allow innovative ideas to be rapidly tested and more quickly adopted by panel manufacturers.

While details of this opportunity are still being developed, DOE encourages any domestic laboratory with the capability to test OLED components or complete OLEDs to apply for this testing opportunity. A testing laboratory does not have to be able to perform testing on all OLED components to qualify. Standard baseline structures to be tested include, but are not limited to, substrates, conductive layers, extraction layers, metallic grids, panels/panel size, multilayer and single layer barrier structures, light extraction approaches, color emitters, OLED pixels, OLED drivers, cathodes, emissive layers, and anodes. DOE proposes that the qualified testing laboratories conduct short-term pilot line testing of components of OLED technologies, and then produce a technology validation status report that briefly summarizes the performance (i.e. 20 percent efficiency improvement from baseline). All qualified testing laboratories will be subcontractors to LTI, and employees participating in the testing process are required to sign confidentiality forms. Feedback on the proposed OLED testing opportunity is welcome and further details and contract requirements will be provided in the near future.

Discussion Details

There were questions from several participants regarding details of the collaborative testing opportunity proposed by DOE.

- In particular, there were questions on what scale of testing could be conducted at the qualified testing facilities. DOE emphasized that this opportunity is meant to be restricted to testing of production scale OLED devices or components and would not support laboratory scale OLED devices.
- Some participants were concerned if DOE limits the OLED device size to a minimum of 4" that there would be a very limited number of laboratories that would qualify for testing.
- DOE was also asked to provide specifics on how projects would be selected for funding. While many details are still pending, DOE proposed that they would pair projects with a qualified testing laboratory and would fund the facility testing costs, but not the materials or necessary products and devices to complete the test.

There was also discussion surrounding the current DOE SSL program structure and what improvements could be made to better service the OLED community.

- Some participants were concerned that the core and product development R&D OLED tasks need to be redefined to better enable market adoption of OLED lighting.
- Others emphasized the need for the OLED industry to hear the perspectives of lighting designers and luminaire makers. This could mimic earlier meetings that DOE hosted for the LED community in 2007-2008, to solicit feedback on what is needed for OLED technology to become a viable lighting option. It was suggested that rather being hosted in Washington DC, these meetings could take place at Acuity's OLED demonstration center in Berkeley, California or elsewhere on the west coast.
- Some participants indicated the need for an OLED lighting prize – similar to the L-Prize. It was suggested that lighting designers could help to identify the prize criteria.
- There was much agreement that, similar to the 2014 SSL R&D workshop, DOE should continue to have more OLED specific sessions at all workshops. However, participants also agreed that there was not enough time allotted at 2014 R&D SSL workshop to discuss DOE's R&D priorities and milestones for the OLED lighting. It was proposed that a roundtable meeting could be held the day before each workshop to capture these inputs, to minimize travel for attendees.
- Discussion also surrounded the idea of including OLED specific panels and topics at the DOE SSL Market Introduction workshop. However, it was debated whether this would be the correct forum.
- The participants indicated that the OLED lighting community needs to partake in the DOE market support programs such as CALiPER and the GATEWAY Demonstrations. It was suggested that the OLED community review the DOE study, "*Compact Fluorescent Lighting in America: Lessons Learned on the Way to Market,*" and that it could be useful to have PNNL discuss the assessment at a future meeting.

Action Items

- Keith Cook will organize a conference call to discuss next-steps. It was proposed that the conference call take place after February 24th and prior to April 1st.
- The OLED lighting community will provide feedback on DOE's proposed collaborative testing opportunity.
- DOE will continue to formulate additional events specific to the OLED lighting community.