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

Wide Bandgap Semiconductors for Clean Energy Workshop
Wednesday, July 25, 2012
Hilton Rosemont O'Hare, Chicago, IL

Introduction

Wide bandgap (WBG) semiconductors operate at temperatures above 150°C without external cooling, have longer lifetimes at higher operating voltages, and switch at higher frequencies with fewer power losses than today's silicon based solid-state technologies. In the same way that the invention of the silicon chip 50 years ago led to the development of the modern computer and today's electronics industry, WBG semiconductors such as silicon carbide (SiC) and gallium nitride (GaN), as well as zinc oxide (ZnO) and diamond (C), offer a similar opportunity to revolutionize the next generation of microelectronics and clean energy innovations.

WBG materials are increasingly important in many industrial energy-saving technologies and have wide applications in the automotive, power electronics, and solid-state lighting manufacturing sectors. Significant effort in WBG semiconductor technology development has been made in the past two decades. As a result, WBG-based devices are already being utilized, for example, as switch-mode power supplies and solar inverters. Many challenges, however, remain before WBG technologies gain widespread market adoption in clean energy applications and achieve their anticipated potential for reducing overall U.S. energy intensity. In addition, it is anticipated that improving the quality, reliability, and reducing the cost of manufacturing WBG semiconductors offers significant potential to accelerate distributed energy deployment of electric vehicles and fuel cells, and grid integration of renewables..

Purpose

This Advanced Manufacturing Office (AMO) workshop will gather input from stakeholders in industry and academia on the current state of the art, and identify emerging applications, barriers and actions to advance WBG semiconductor technologies. Specifically, AMO wants to learn more about industry trends and emerging applications; identify the barriers to research, development and implementation of WBG semiconductors for clean energy at commercial scale; and identify actions needed to advance the use of WBG semiconductors for commercial and industrial clean energy applications.

Participants will learn about AMO -- our vision, goals, and initiatives and be encouraged to network with other leaders in this technical field. Participants are asked to provide their individual perspective during discussions.

Workshop participants should NOT discuss specific budget formulation activities, procurement-sensitive or proprietary activities including recent solicitations or awardees, promote WBG semiconductor technologies or products, or identify the specific technical solutions to problems that are identified. Participants will NOT be asked to reach consensus on, or prioritize any subjects under discussion.

This workshop will have three breakout groups to address opportunities and end-use applications in three focus areas of interest in clean energy: (1) power electronics for electric vehicles (EV) and motors drives; (2) power electronics for renewables grid integration, including high voltage (HV) applications; and (3) solid-state lighting.

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

Wide Bandgap Semiconductors for Clean Energy Workshop
Wednesday, July 25, 2012
Hilton Rosemont O'Hare, Chicago, IL

Background

Manufacturing converts a wide range of raw materials, components, and parts into finished goods that meet market expectations. AMO partners with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

AMO has a number of Advanced Manufacturing initiatives, such as the Innovative Manufacturing Initiative (IMI) and Manufacturing Demonstration Facilities. The IMI identifies and focuses investment in transformational manufacturing processes and materials. These innovations address core technical issues facing U.S. manufacturers – enabling significant gains in energy productivity, environmental performance, product yield, and economic growth.
See: http://www1.eere.energy.gov/manufacturing/rd/innovative_manufacturing.html

Breakout Discussion Ground Rules

- No speeches
- Listen to Each Other
- Suspend Judgement
- Challenges Ideas, not People

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

Wide Bandgap Semiconductors for Clean Energy Workshop
Wednesday, July 25, 2012
Hilton Rosemont O'Hare, Chicago, IL

Time (CDT)	Activity	Speaker
8:00am-9:00am	*Registration and Breakfast*	
9:00am-9:05am	***Welcome.*** *Advanced Manufacturing Office*	Robert Gemmer Advanced Manufacturing Office
9:05am-9:20am	***Setting the Stage.*** *EERE Thrust in Wide Bandgap Semiconductors for Clean Energy*	David Danielson Assistant Secretary, EERE
9:20am-9:50am	***Leveraging Past Government Investments.*** *Current State-of-Art Technology and Challenges for Wide Bandgap Semiconductors*	Charles Scozzie, Army Research Laboratory Mark Johnson, Advanced Research Projects Agency-Energy
9:50am-10:00am	*Instructions for Breakout Sessions*	Marina Sofos Advanced Manufacturing Office
10:00am-10:10am	*Break*	
10:10am-11:55am	***Breakout Session #1:*** *(3 groups)* • *Power Electronics (EV & Motor Drives)* Lead: Steve Boyd • *Power Electronics (HV & Grid Integration)* Lead: Mark Johnson • *Optical (Solid-State Lighting)* Lead: Colin McCormick	All Participants *Concurrent Groups*

Breakout Session #1:
- *Introductions and discussion of current state-of-art of the breakout group's focus area.*
- *What would impact in this focus area look like?*
- *What are the necessary performance and cost targets?*
- *What are the major barriers and current gaps?*

11:55am-12:30pm	*Lunch*	

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

Wide Bandgap Semiconductors for Clean Energy Workshop
Wednesday, July 25, 2012
Hilton Rosemont O'Hare, Chicago, IL

12:30pm-2:00pm	***Breakout Session #2:*** *(3 groups)* • *Power Electronics (EV & Motor Drives)* Lead: Steve Boyd • *Power Electronics (HV & Grid Integration)* Lead: Mark Johnson • *Optical (Solid-State Lighting)* Lead: Colin McCormick	All Participants *Concurrent Groups*

Breakout #2:
- *What are the major pathways to identified cost reduction and performance targets?*
- *What are the highest-impact critical technology breakthroughs (game changers) to address gaps?*
- *Are there "out of the box", risky, or other approaches that should be considered?*

2:00pm-2:15pm	*Break*	
2:15pm-3:30pm	***Breakout Session #3:*** *(3 groups)* • *Power Electronics (EV & Motor Drives)* Lead: Steve Boyd • *Power Electronics (HV & Grid Integration)* Lead: Mark Johnson • *Optical (Solid-State Lighting)* Lead: Colin McCormick	All Participants *Concurrent Groups*

Breakout #3:
- *Develop action plan of ideas*
- *Prepare slides of major findings*

3:30pm-3:40pm	*Reassemble*	All Participants
3:40pm-4:25pm	*Breakout Sessions Report Out/ Question & Answer*	Discussion Leads
4:25pm-4:30pm	*Closing Remarks*	