

WELCOME

DOE Connected Lighting Systems Meeting

November 16, 2015

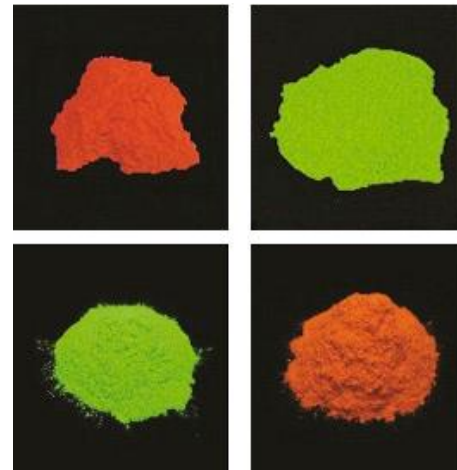
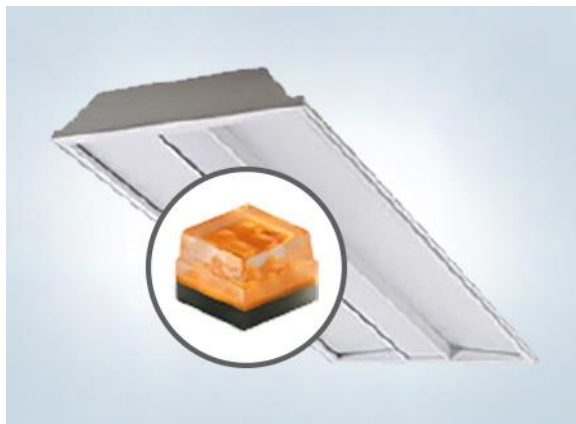
Portland, Oregon

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Results-Oriented R&D

- More than 245 patents
- Almost 200 on-market products
- 143 tBtu energy savings in 2014; equates to \$1.4B
- Funding total at ~\$350M over 14 years



The Early Years of LED Lighting (aka the Wild West)

- No real LED equivalents for incandescent or fluorescent
- No standards
- Exaggerated performance claims
- Steep learning curve

2006: Pilot round of DOE testing

None come close to matching performance of incumbent technologies

2008: Testing of LED replacement lamps

Most are equivalent to 25–40W incandescent, with a wide variety of color quality, shapes, and sizes



Lessons Learned from CFLs

- Early CFL products not ready for prime time: Quality issues, too expensive, exaggerated claims
- Poor-performing products damaged market, delayed acceptance for 15 years
- Lessons for LED lighting
 - Technical failures/limitations: Admit and correct
 - Life claims: Don't exaggerate, base on credible information
 - Performance matters, pricing is critical



These lessons shaped DOE strategies

Broad Focus Is Necessary

- Need objective, authoritative voice in this exploding market
- Work closely with lighting industry, researchers, lighting specifiers and users, standards and testing organizations

Testing and field studies
offer unbiased analysis



Data and analysis provide
broad view of market trends,
support standards organizations
and industry consortia



Technology competitions drive
innovation, draw attention to
well-designed products



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
- Open information and process
 - Workshops
 - Roundtables
 - Working groups



The New Lighting Landscape

- Huge improvements in SSL performance
- Huge reductions in SSL price
- Industry standards bring order to the Wild West; widely used, and more on the way
- SSL is a viable option for most lighting applications



Lessons Learned from Early SSL Market

- Actions taken by DOE and industry did result in smoother market entry, compared to CFLs
- BUT unique attributes of LED lighting present a host of new challenges impacting market adoption
- Technological challenges with today's products
- Existing infrastructure limits full potential of SSL
- Increased sophistication of future lighting systems presents further challenges
- New form factors, new questions, new players



Lighting as a Platform

- Future lighting systems could become a platform for greater energy savings in buildings and cities
- Tradeoffs are not necessary; we can have energy savings as well as other benefits if we work together now to address key issues
- Key barriers limiting potential energy savings:
 - Complexity of installation, start-up, commissioning
 - Lack of interoperability between system components
 - Limited ability to measure and report performance

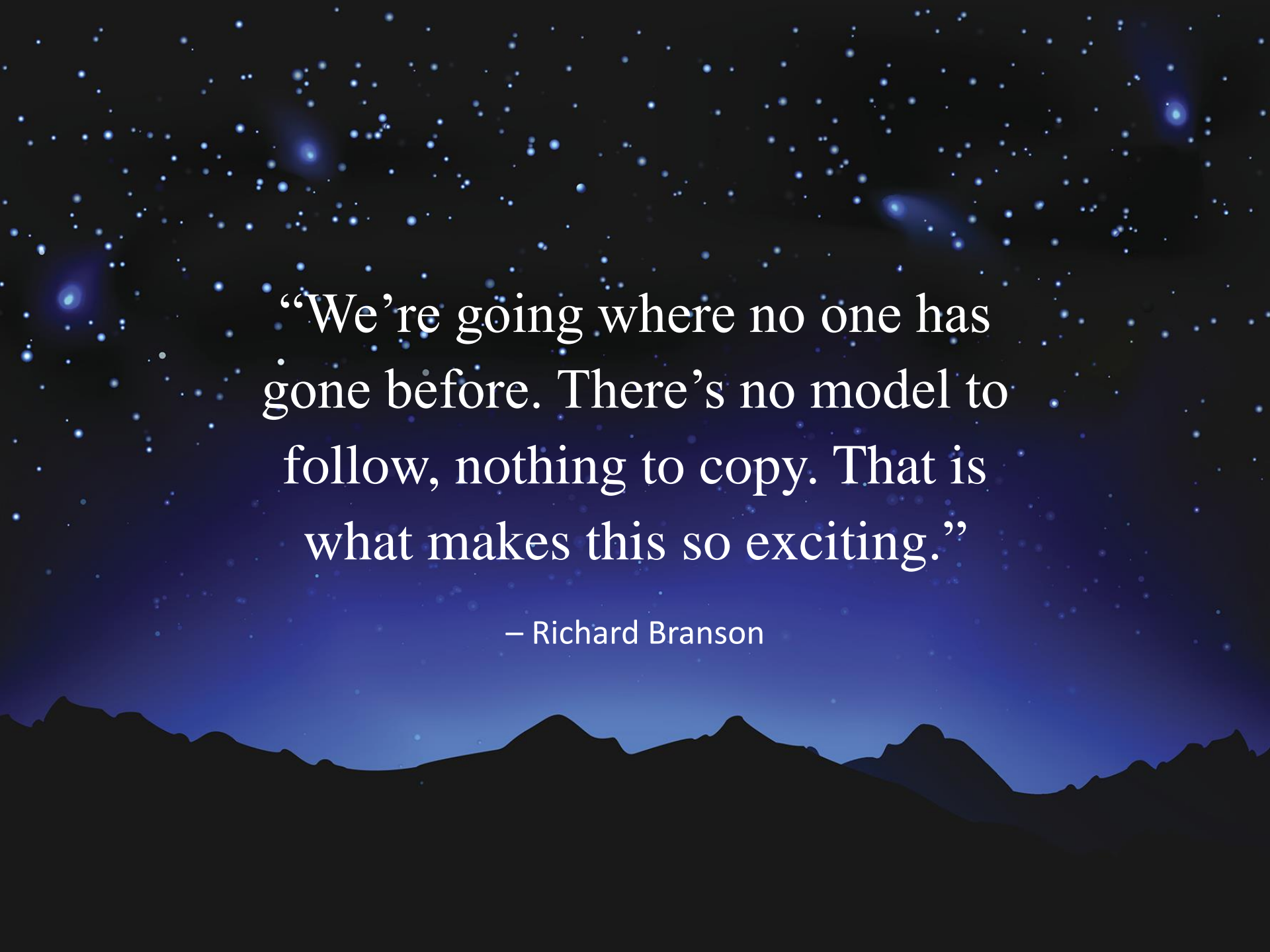


Let's Get Started

Top experts will kick off deep-dive discussions

- Why do lighting systems need to become more connected?
- Why should we (and how can we) enable lighting systems to report their own energy consumption?
- Where and when do we need interoperability?
- How can lighting system configuration complexity be reduced?
- What can we learn from game-changing installations?

Gabe Arnold, DesignLights Consortium • **Dagnachew Birru**, Philips • **Dan Cocosa**, Google • **Tom Griffiths**, AMS-TAOS • **Roy Harvey**, OSRAM SYLVANIA, representing the ZigBee Alliance • **Kaynam Hedayat**, Digital Lumens • **Tom Herbst**, Cisco Systems • **Ivan Judson**, Microsoft, representing the AllSeen Alliance • **Jefferay Lawton**, Microchip • **Kishore Manghnani**, Orama • **Remy Marcotorchino**, Sierra Wireless, representing oneM2M • **David McCall**, Intel, representing the Open Interconnect Consortium • **Michael Poplawski**, Pacific Northwest National Laboratory • **Brent Protzman**, Lutron



“We’re going where no one has gone before. There’s no model to follow, nothing to copy. That is what makes this so exciting.”

– Richard Branson