2012 PV Module Reliability Workshop
Feb 28 – March 1, 2012, Golden, CO

SunShot
U.S. Department of Energy

Overview

- The **SunShot** Initiative
- Systems Integration / Technology Validation Activities
- 2012 PV Module Reliability Workshop

SunShot Initiative

"The SunShot Initiative will spur American innovations to reduce life costs of solar energy and re-establish U.S. global leadership in this growing industry."

U.S. Energy Secretary Steven Chu

- DOE's **SunShot** Initiative aims to make solar electricity cost-competitive with conventional forms of energy before 2020.
- What is SunShot?
  - Subsidy-free solar electricity
  - 75% cost reduction by end of the decade
  - 5-6 cents/kWh at utility-scale
  - Global Competitiveness
- Coordination among DOE Solar Program, Office of Science, and ARPA-E.

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Taking a Team Approach

R. Ramesh
SunShot Director

Minh Le
PV Module
EERE

Module Task Force (EERE)
GOAL: 0.50$/Watt

Power Electronics (ARPA-E)
GOAL: 0.10$/Watt

Rajeev Ram
Power Electronics
ARPA-E

Ranga Pitchumani
EERE

Kevin Lynn
Systems Integration
EERE

Ravi Prasher
ARPA-E
CSP

Fundamental Research (SC) Foundational (EERE)

Balance of Systems (EERE)
GOAL: 0.40$/Watt

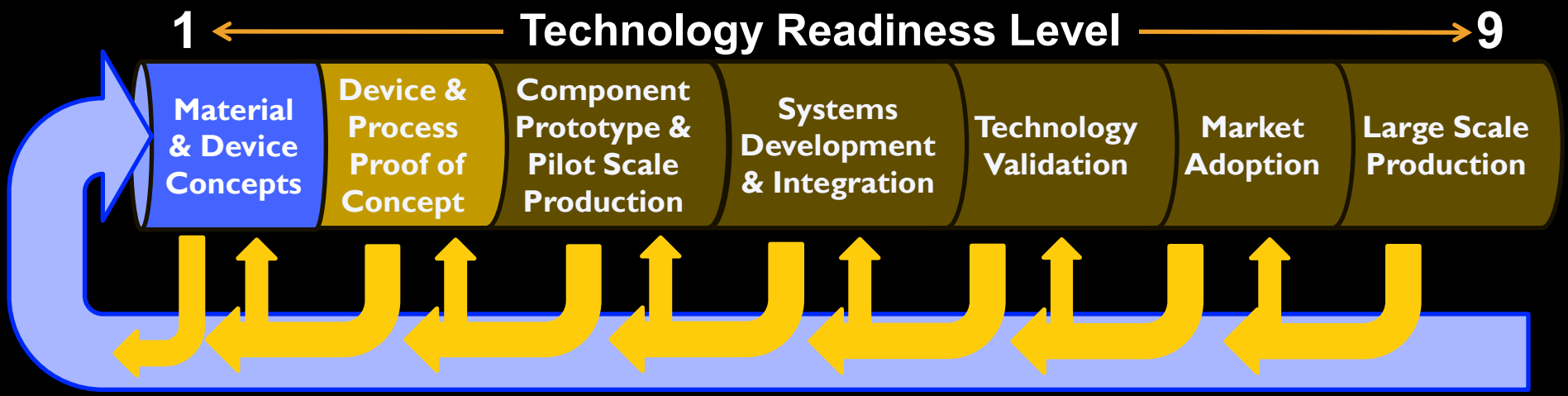
Jim Horwitz
Carol Bessel
Fundamental Science
SC

Rachel Tronstein
BOS-Soft
EERE

Craig Connelly
Financial Planning, EERE

Advisory Board: Bill Brinkman (SC); Arun Majumdar (ARPA-E); Henry Kelly(EERE)

SunShot Program Framework



- Basic Energy Sciences
- MURI
- Next Gen PV
- Program to Advance Cell Efficiency (PACE)
- SunShot Fellowships
- SunShot Incubator
- PV Supply Chain
- Balance of Systems-Hardware
- PV Manufacturing Initiative I
- Solar ADEPT
- SEGIS
- CSP SunShot FOA
- Thermal Storage: HEATS
- High Penetration
- Incubator – Soft Costs
- PVMI II: SUNPATH
- Rooftop Solar Challenge
- Non-Hardware BOS

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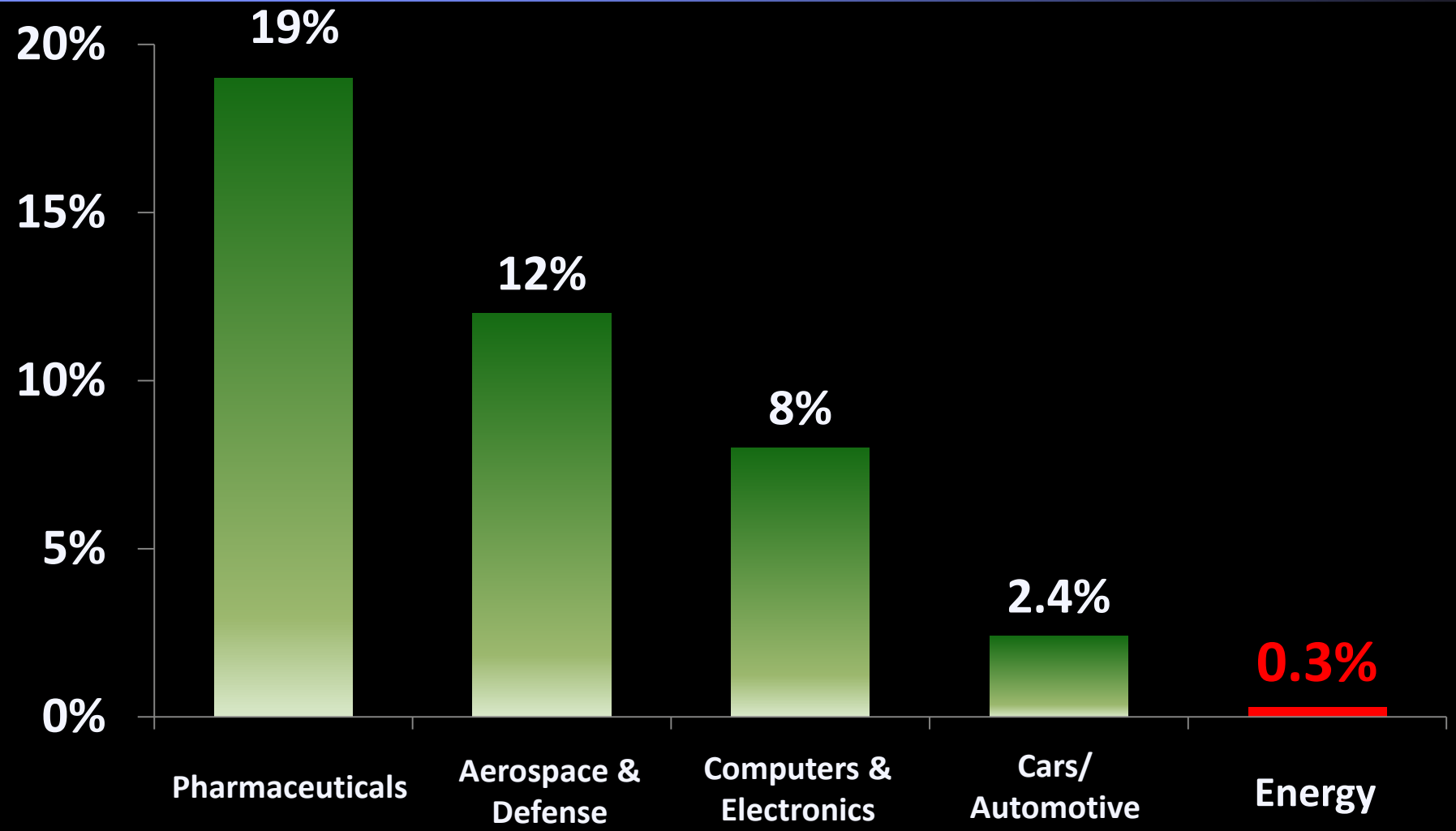
Percent Sales Invested in R&D



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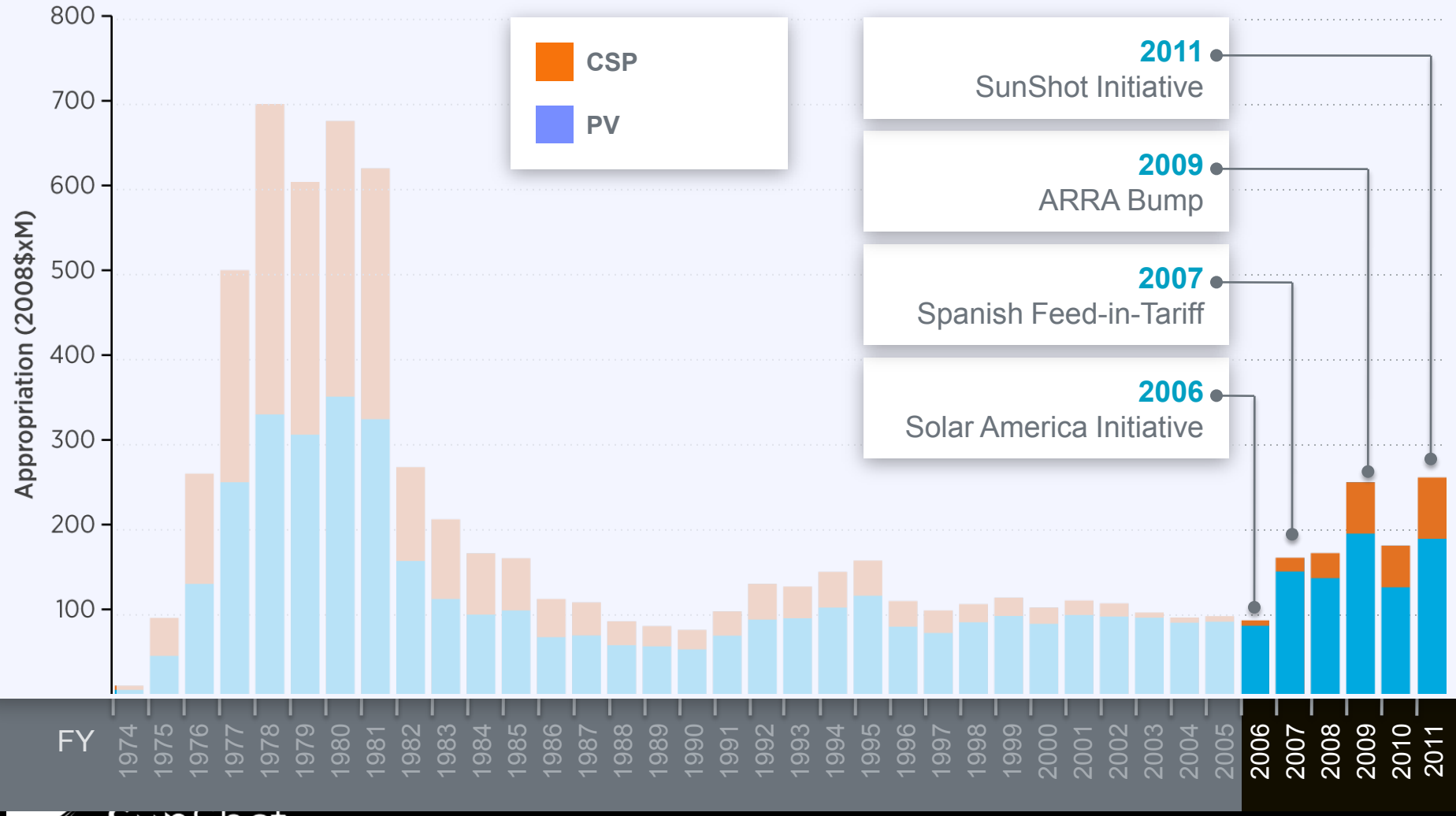
Source: American Energy Innovation Council, *Business Plan for America's Energy Future,* 2010

History of Solar at DOE



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SunShot - Systems Integration

Goals

- **BOS Costs:** Reducing the costs of power electronics and balance of system hardware
- **Bankability:** Reducing the risk associated with the use of new technologies
- **Grid Integration:** Establishing a timely process for integrating high penetrations of solar technologies into the grid in a safe, reliable, and cost-effective manner while providing value to the system owner and the utility grid.
- **Solar Resource:** Dramatically reduce the uncertainty in solar system performance due to solar radiation measurements, and provide grid operators and others the information necessary to cost-effectively and reliably integrate solar technologies into the grid.

SunShot – Technology Validation

Mission / Vision:

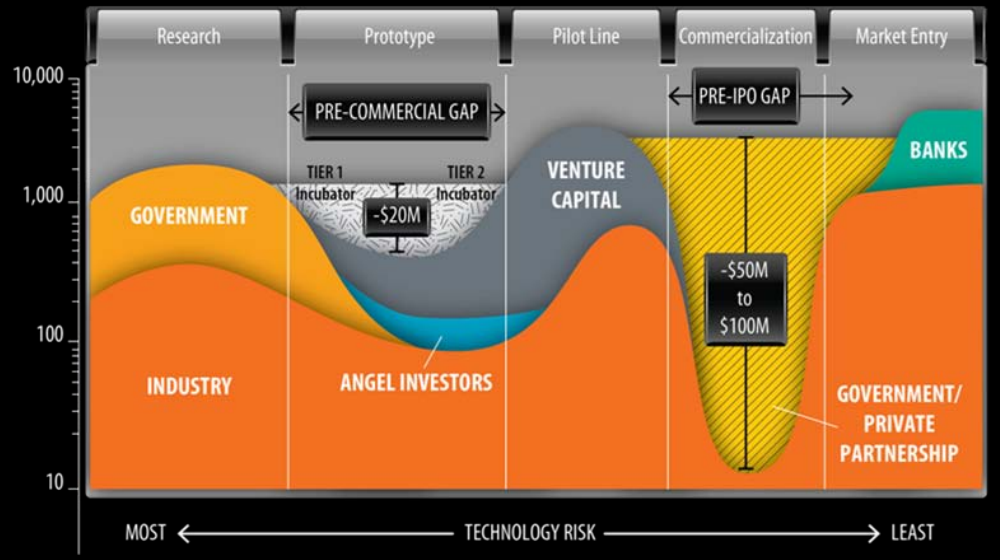
- To reduce the cost of PV by improving confidence in the expected performance, reliability, and safety of PV components and systems.
- Understanding of performance and reliability leads to reduction of risk and will lead to a greater investment in the technology.

Activities:

- Test & Evaluation
- Reliability & Safety
- Regional Test Centers (RTC's)
- Modeling & Analysis
- Codes & Standards

PV Regional Test Centers

- **Background / Vision:**
  - Accelerate adoption of renewable energy generation sources by helping U.S. PV manufacturers overcome the commercialization "Valley of Death"
  - Provide technical basis for bankability of PV systems
    - Test beds for large-scale systems in multiple climates, using a comprehensive validation approach to compare performance and initial reliability against predictions



- **Locations:**
  - Albuquerque (Sandia)
  - Denver (SolarTAC – NREL)
  - Orlando (UCF – FSEC)

2012 PV Module Reliability Workshop

- Objective: Share information among participants leading to the improvement of PV module reliability which:
  - Reduces the cost of solar electricity
  - Promotes investor confidence in the technology
  - Critical goals for moving PV technologies deeper into the electricity marketplace.
- Active participation provides benefit to all: everyone shares a little and takes home a lot.

2012 PVMRW Agenda

Sessions:

- **Silicon PV: Tues., Feb. 28, 2012**
- **PV Standards (Materials Testing / Quality Assurance Rating): Wed., Feb. 29, 2012**
- **Thin-Film Modules: Thurs., Mar. 1, 2012**
- **CPV: Thurs., Mar. 1, 2012**

Special Thanks to:

- Sarah Kurtz, *Chair*
- **Workshop Organizers:** Ian Aeby, Genmao Chen, David Degraaff, Neelkanth Dhere, Dan Doble, Ryan Gaston, Jennifer Granata, Peter Hacke, Pam Hajcak, Peter Hebert, Jason Hevelone, Dirk Jordan, Paul Lamarche, Kenneth Leffew, Michael Quintana, Mark Roehrig, Kurt Scott, Samir Sharma, Govindasamy Tamizhmani, Kaitlyn VanSant, Shuying Yang, John Wohlgemuth
- **Workshop Participants**