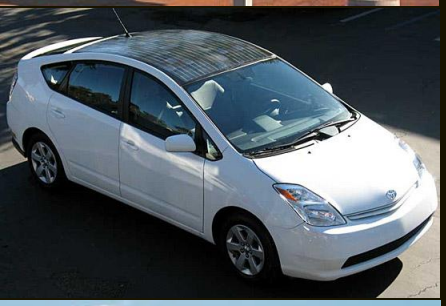
PV Validation and Bankability Workshop

SunShot
U.S. Department of Energy

Imagine a World…



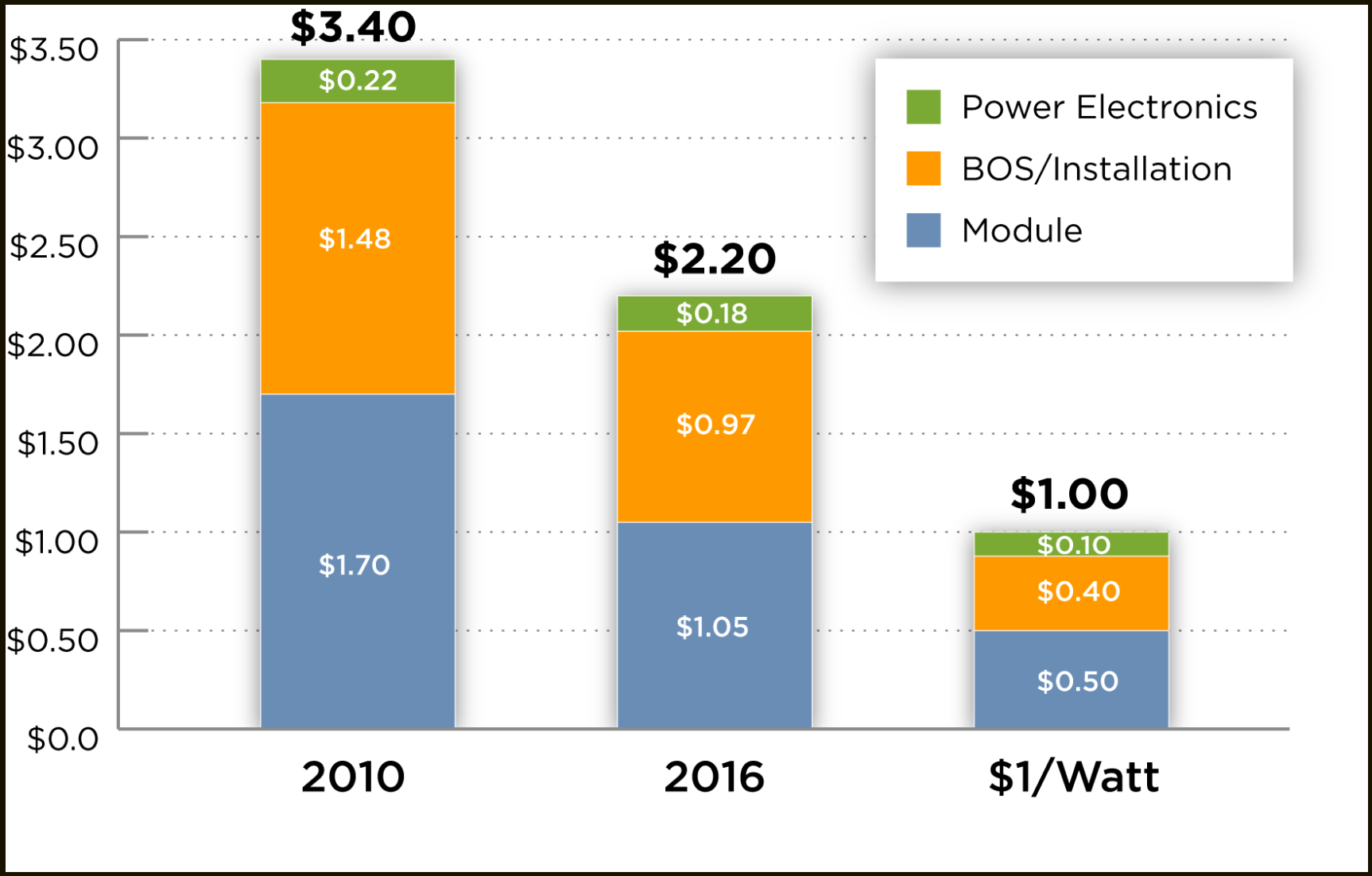
What if??

- **This is a reality**: A subsidy-free solar electricity infrastructure with an LCOE of 5-6 c/kWh without **subsidies**
- **Jobs and Competitiveness**: Innovation that ensures the U.S. leads the way on clean energy, supporting new jobs and opportunities for Americans
- **National Energy Security:** Independence from fossil fuel and increased national security
- **Healthy Environment**: Huge carbon reduction and cleaner air …

What are we doing now: Implementing "Imagine the world"?

- **Introducing SunShot:** *we will enable this world*
- We are working with US industry, national labs and academia to innovate and lay the foundation for a subsidy-free solar electricity infrastructure that is broadly competitive with fossil fuel based electricity

SunShot Goals for Utility-Scale Systems



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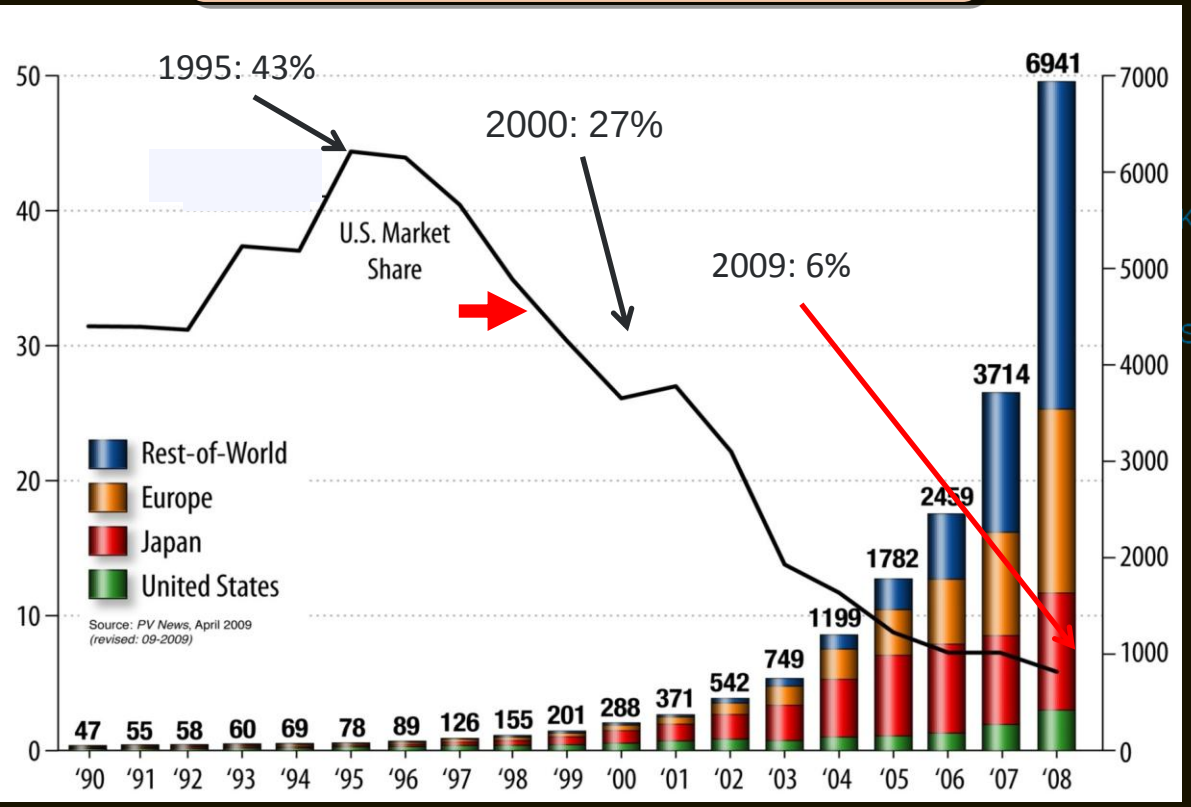
Addressing the Problems

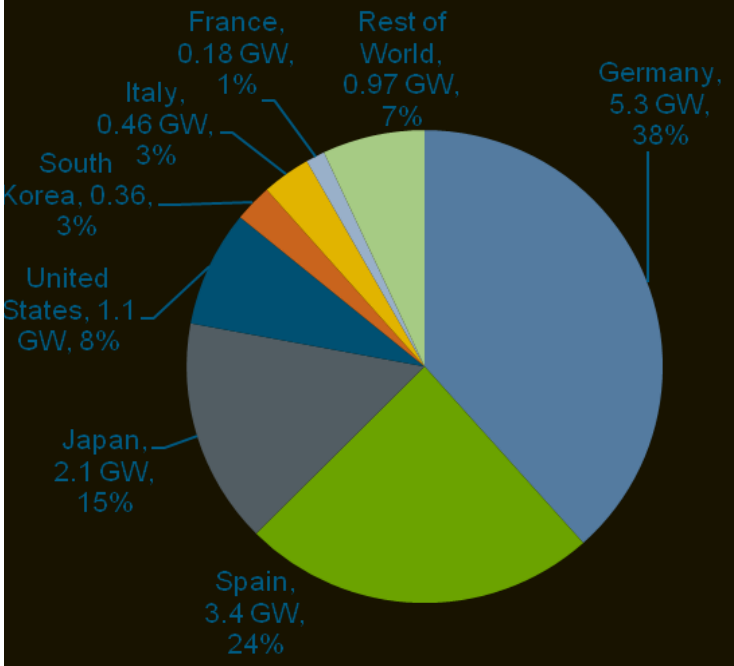
Solicitation	Open	Close
Foundational Program to Advance Cell Efficiency	04/08/2011	06/30/2011
Transformational PV Science and Technology: Next Generation PV II	04/08/2011	06/27/2011
Solar Energy Grid Integration System – Advanced Concepts	04/08/2011	06/23/2011
Extreme Balance of System Hardware Cost Reductions	04/08/2011	06/09/2011
Reducing Market Barriers and Non-Hardware Balance of System Costs	05/06/2011	06/23/2011
New Solicitations	**Open**	**Close**
New Rooftop Solar Challenge	06/01/2011	08/31/2011
PV Manufacturing Initiative Part 2: SUNPATH	08/02/2011	10/28/2011

A Shrinking US Market Share

Global & U.S. annual PV production by region



Cumulative Installed PV (thru 2008)



- U.S. market share in decline
- Dramatic growth in PV manufacturing in China, Taiwan, Malaysia, and the Philippines
- PV companies that started in the U.S. have moved most of their manufacturing overseas

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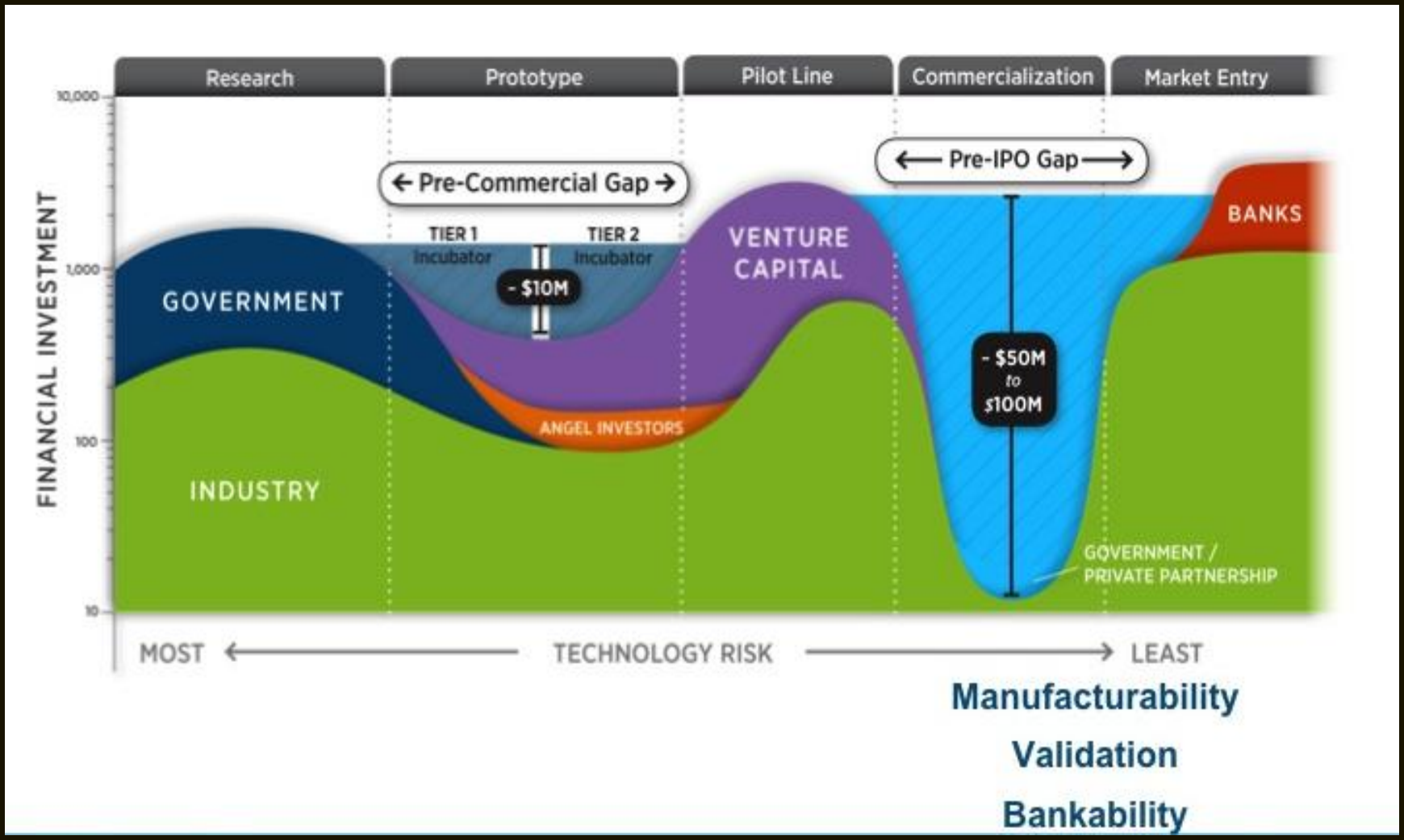
SUNPATH: Manufacturing



Problem Statement

- There is ***uncertainty*** in the performance, reliability, and safety in any components/systems.
- In more mature industries, these uncertainties are better understood leading to the appropriate assessment of risk and cost.

Problem Statement

- In less mature industries (such as within solar), these uncertainties are (or can be perceived) not as well understood. This greater uncertainty can lead to an unnecessarily high assessment of risk and cost.

Problem Statement

- Who: Investors, Banks, Insurance Companies, Venture Capitalists, Manufacturers, System Integrators, Consumers
- What: PV Cells, PV/CPV modules, inverters, balance of system hardware, PV system, installation
- What: Performance, Reliability, Safety
- Where: Hot-Dry climates, Hot-humid climates, Temperate, Variable
- **We need your help identifying and prioritizing the problem!**

Solution: Validation

- ***What is meant by Validation:*** Validation is a ***process*** to better quantify the uncertainties within a PV system to appropriately calculate the value of risk.
- ***The Problem:*** PV and CPV module manufacturers developing new technologies (or manufacturing methods) are having difficulty achieving **bankability**, even for companies that had already established commercial level manufacturing facilities.
- ***A Solution:*** Validate technologies through Regional Test Centers (RTC's) by deploying and quantifying performance
  - at scale (MW) over time (years)
  - in different regions across the country (see next slide)

Development of Regional Test Centers

- ***Size***: Provide space for 2 MW of PV/CPV installations
- ***Climates***:
  1. Hot-Humid (PV only): ***Florida Solar Energy Center***
  2. High Thermal Cycle and UV (PV and CPV): ***NREL***
  3. Hot-Dry (PV and CPV): ***Sandia National Labs***
- ***Requirements***:
  - Balance of system equipment to support the installation of a complete PV/CPV system
  - Test engineers who can maintain a calibrated test facility
  - Equipment to monitor parameters such as irradiance, module temperature, voltage, current, power, etc. and archive them
  - Equipment such as IV curve tracers, IR cameras, etc. to intermittently evaluate performance
- ***Locations:***
  - National Renewable Energy Laboratory
  - Sandia National Laboratory
  - Florida Solar Energy Center

Manufacturer Participation

- ***PV Participation***
  - 5 MW/yr Production: 125 kW in each region (500 kW)
  - 50 MW/yr Production: 250 kW in each region (1 MW)
- ***CPV Participation***
  - 5 MW/yr Production – 125 kW in each region (250 kW)
  - 50 MW/yr Production – 250 kW in each region (500 kW)
- ***Support***: RTC's support the awardees through a design review of the installation and a validation plan.
- ***Carrot***: Develop MOU with DoD, GSA, etc. to encourage the installation of validated products/systems.

Developing a Solution

- What are the gaps?
- What are the essential components of a validation program?
- What data should be collected and how should it be shared?
- What metrics will constitute a solution to this problem of uncertainty?

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