

# **Solar Power – The Road to Commercial Competitiveness**

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# **Solar Power – The Road to Commercial Competitiveness**

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- 1. Introduction**
- 2. Where are the Economics Today**
- 3. Key business model considerations**
- 4. Credit Considerations for Solar Manufacturers and Projects**



## When can Solar be a material part of a solution to climate change?

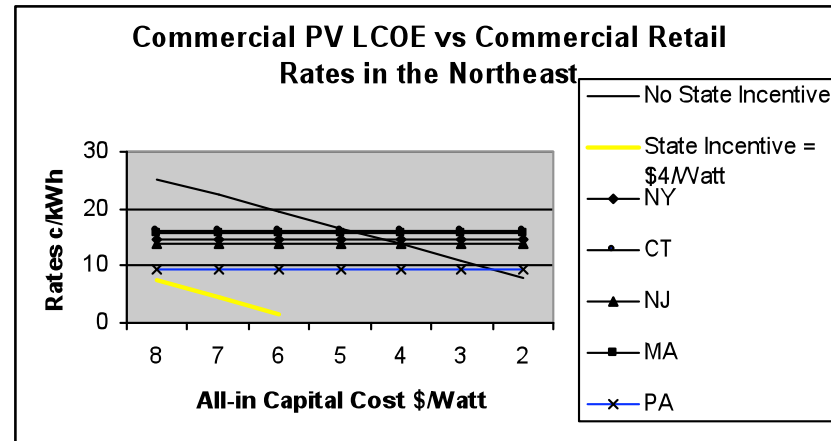
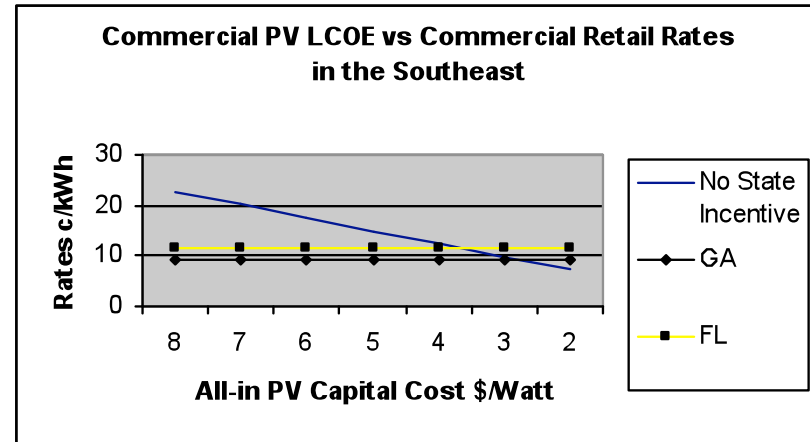
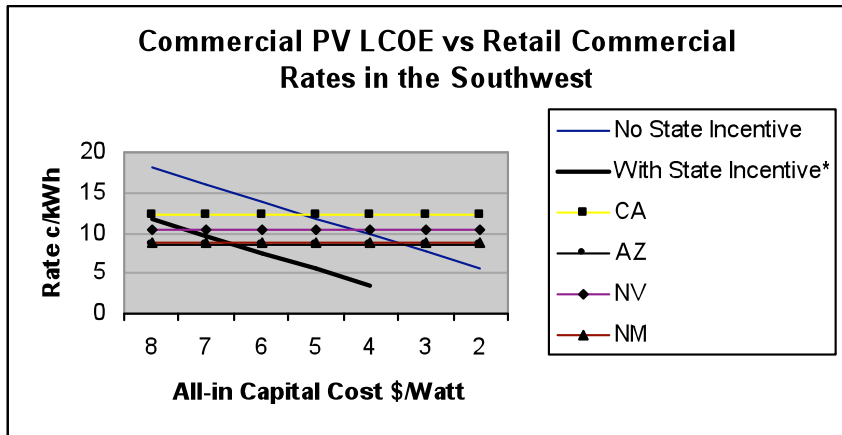
- “Grid-parity” – Or solar being competitive with other fuels without the aid of subsidies
- Solar panel manufacturing emerges as a profitable, standalone business
- Panel manufacturers and solar PV projects have access to capital markets on commercial terms

### Key Questions in this context are:

- What features of business models become important
- How does Standard & Poor’s analyze panel manufacturers ?
- What risks need to be managed to successfully implement large-scale solar PV projects?

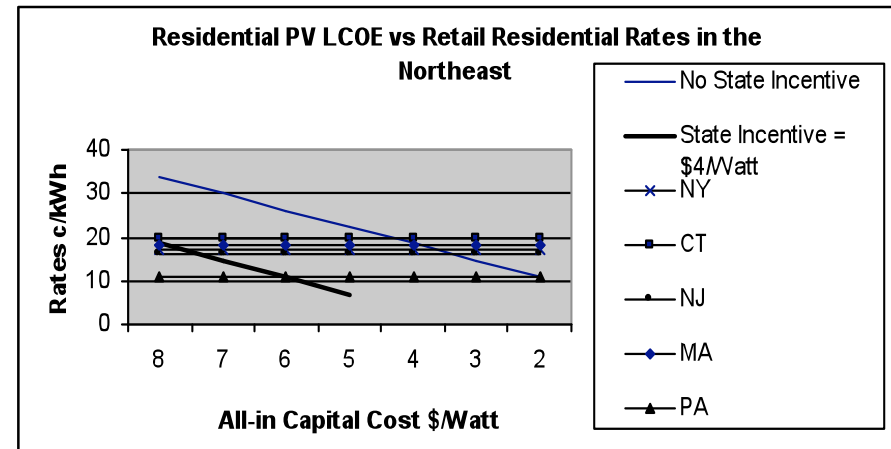
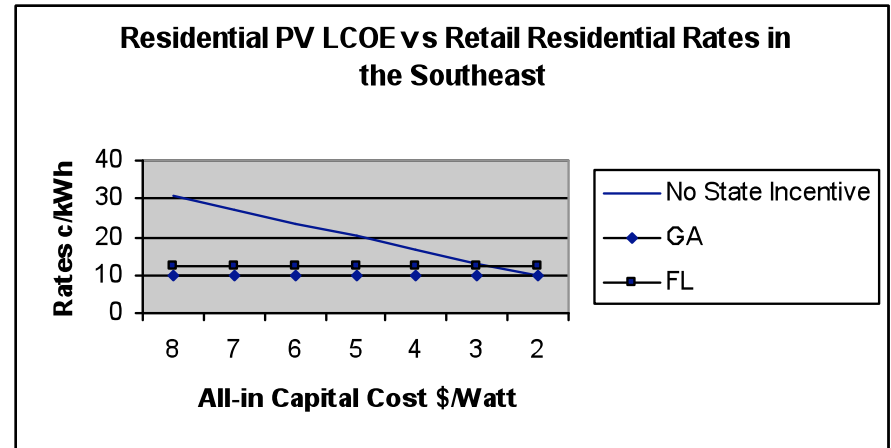
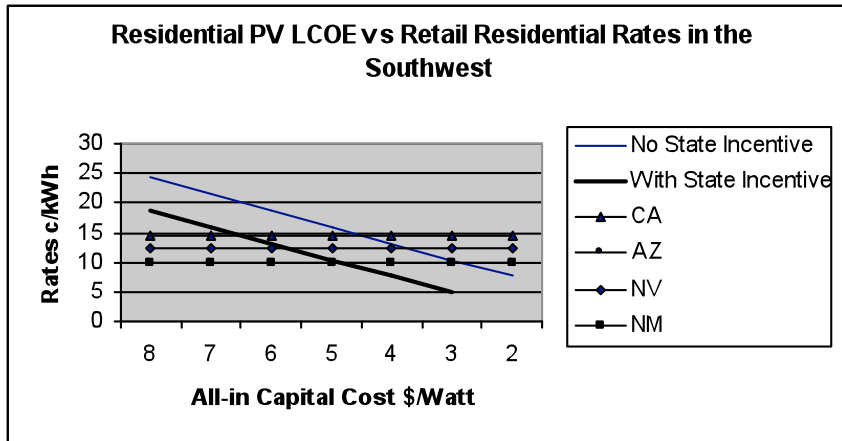
# Where are the Economics Today?

**Grid-parity requires about \$2-2.5/watt almost everywhere for commercial customers**



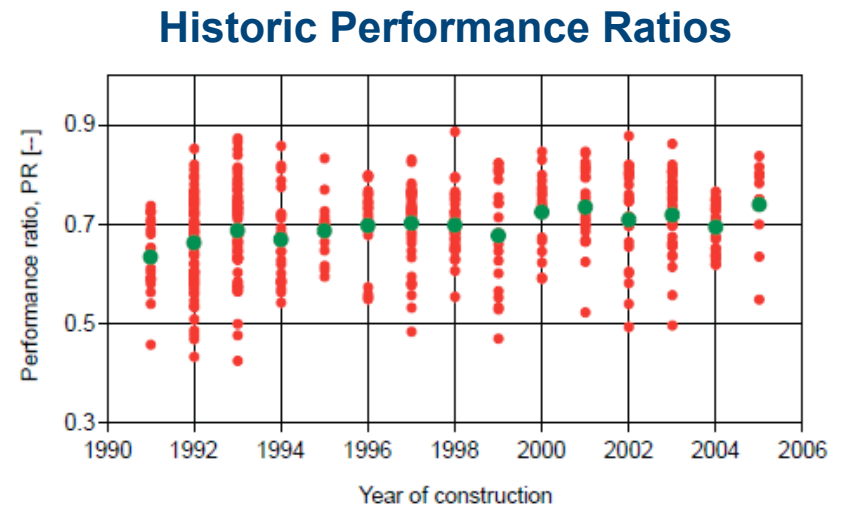
# Where are the Economics Today?

## Same story for residential customers



# Business Model Considerations

- Bottomline – You must be profitable at \$1/watt
- We view this ultimately as a globalized commodity business
- Warranties and quality considerations can be differentiators in the short-medium term
- Need to manage this to metrics of a commodity business with the added risk of technological obsolescence
- Utility-standard practices must enter business models through the value chain
  - ✓ Project design and construction
  - ✓ BOP Equipment manufacturing
  - ✓ O&M practices – particularly key



Source: IEA PVPS Performance Report, Dec 2007

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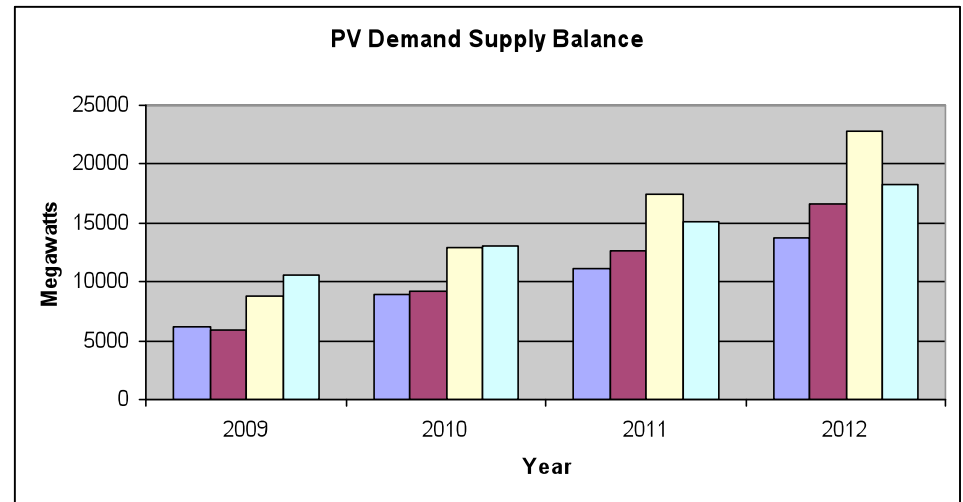
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## Solar PV Manufacturers

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## Business Risk Profile Vulnerable Due To Inherent Industry Risks

- Rapid expansion with a huge Demand-Supply Imbalance
- Declining ASPs.
- Potential for disconnect between Si-prices and ASPs
- The industry relies heavily on government subsidies, both domestically and abroad
- Products have a high risk of technological obsolescence.
- Many Manufacturers still subject to operational ramp-up risks



**Generally indicative of speculative grade credit characteristics**

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## Who Will Come Out On Top?

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- Manufacturers who can remain profitable in distressed environment will be the winners
  - ✓ Less silicon usage through thinner wafers and/or higher efficiency
  - ✓ Long-term, non-negotiable silicon supply contracts at low prices
  - ✓ Low breakeven ASPs that can support unsubsidized grid parity by 2016
- Pricing provisions in sales contracts not given much credit
- Thin-film BIPV may allow product differentiation
- Global presence to diversify regulatory risks
- Vertical Integration?
- Warranty Claims - Accelerated testing vs actuarial data

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## Utility-Scale Solar PV Projects

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# Our View of the Primary Drivers of Risk

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## General Project Level Risks

- **Contractual foundation**
- **Competitive market exposure**
- **Counterparty risk**
- **Financial performance**

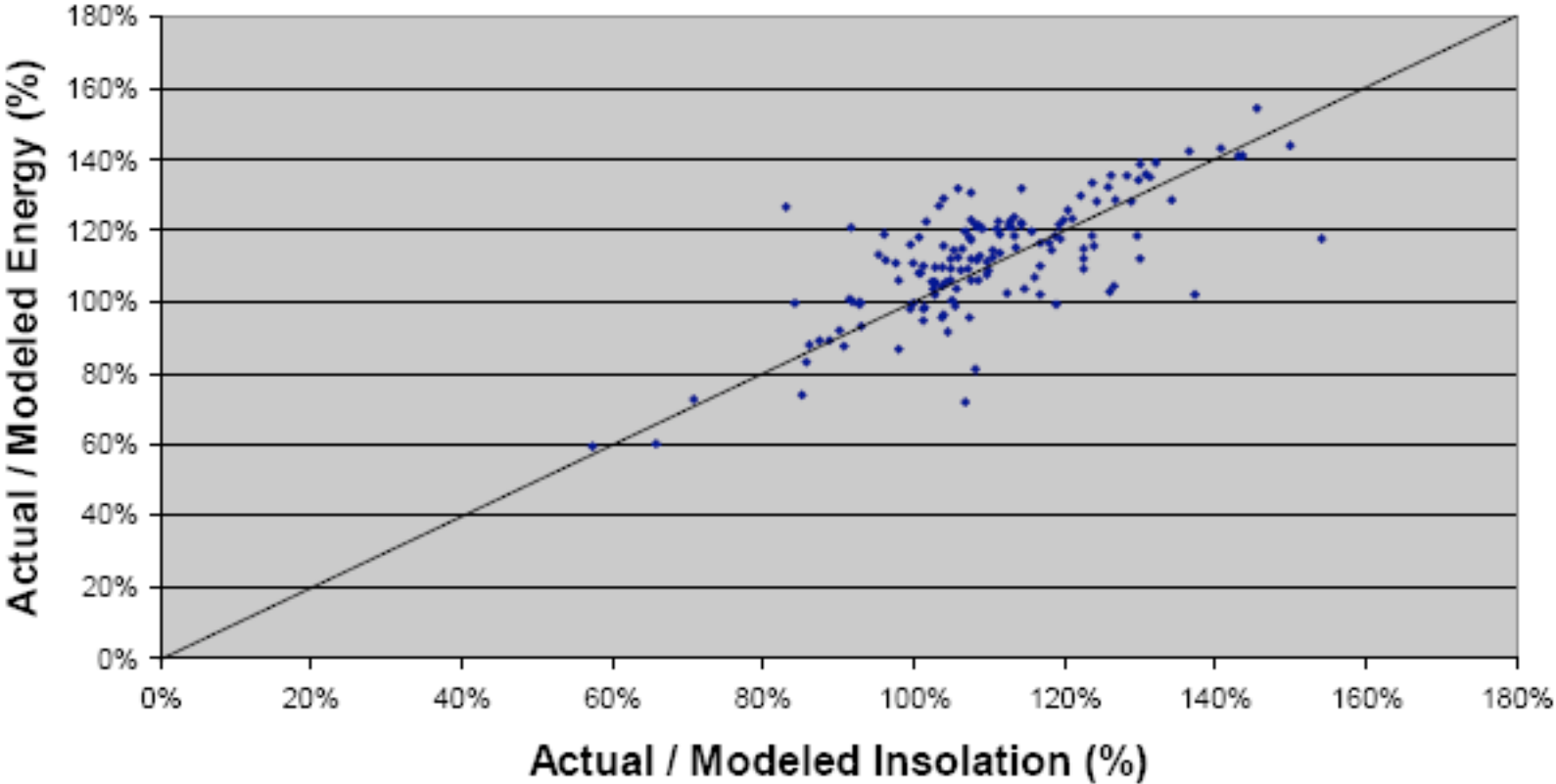


## PV Project-Specific Risks

- ***Resource availability***
- ***Engineering and Construction***
- ***Operations***
- ***Technology***



# Variability In Sunlight Does Not Explain All Variability In Generation

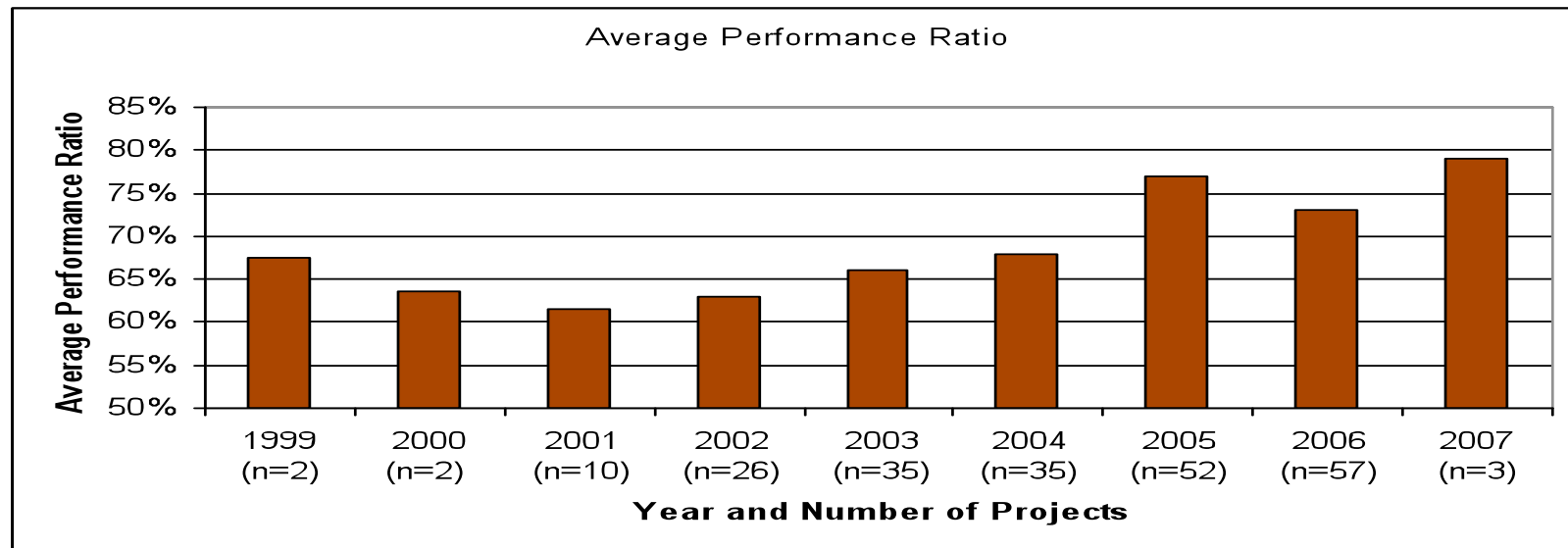


Source: SunEdison



## PRs Historically Lower Than Expected, But Improving

- The Performance Ratio (PR) is a measure of total system losses in the conversion of sunlight to electricity
- Adjusted for solar resource and panel efficiency. Can be used to compare systems, independent of size, mounting, weather and location.
- NREL estimates this to be in the 75-80% range for well-installed systems



Source: SunPower Corp

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## What Leads To a Decline In Performance Ratio?

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- Panel degradation – Over time and due to temperature
- Poor engineering and design of system
  - ✓ Mismatched modules, problems with an inverter, shading
- Poor maintenance
- Higher than anticipated derate factor when converting power from DC to AC
- Faulty panel ratings
- Modeling accuracy

We will run stress scenarios with PRs up to 10% lower than base case,  
or about 70%

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