Assessing the Quality of Cash Flows of a Solar Power Project

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Why Solar? Why Now?

**Why solar:**
- The sun provides a stable resource in the form of direct normal irradiance and global insolation
- Solar generation coincides with peak demand for power
- Concentrated solar thermal is proven on a utility scale with a successful operating history
- The modular design of an array allows solar PV to be used for both distributed generation and utility-scale power

**Why now:**
- Increasing government support through Renewable Portfolio Standards and the extension of the Investment Tax Credit
- Capital costs are declining due to improvements in conversion efficiency, balance of system components and design, coupled with decreasing silicon prices
- US retail electricity rates are expected to increase due to cost of carbon and, we believe, additional capital expenditures will help make PV competitive with conventional forms of generation
Bottom line: It’s all about production

Solar power production is a function of something greater than the shining sun

• proper engineering
• performance and reliability of components
• availability of the plant

Operating and maintaining a plant has its price

• less of an issue with solar
  – less moving parts than conventional power
  – CSP more exposed to O&M costs than PV
Solar Resource Not As Risky As Wind

Inter-Year Standard Deviation, Daggett, CA 1991-2005*


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Measurement of solar resource assessment important

- Public data is not sufficient

- Solar resource assessment more important for CSP projects
  - greater variability in DNI
  - potential for Time-Of-Use Power Purchase Agreements

- We will look to an independent engineer and/or recognized solar resource consultant to opine on the strength of the solar resource.
  - How much measured data is on site?
  - Is there a strong correlation between measured and modeled satellite data?
  - Do the measurements take system orientation and configuration into account?
Variability In Sunlight Does Not Explain All Variability In Generation

Source: SunPower Corp
## What Leads To a Decline In Production?

### For PV
- Underperforming technology
- Poor engineering and design of system
  - Mismatched modules, problems with an inverter, shading
- Poor maintenance
- Heat degradation
  - The hotter the temperature, the faster the degradation
- Inverter performance
- Modeling

### For CST
- Underperforming technology
- Poor engineering and design of the system
  - Inefficient scale-up, placement of receivers, flawed HTF flow design
- Poor maintenance
- Tracking device problems
- Modeling
Operating and Maintenance Costs Are Important

- Costs expected to be higher for CSP than PV
Experience To Date

• Range of credit outcomes

• Other credit factors
  – Construction risk, especially for CSP
  – Offtaker risk
  – Financial structure