

Investment Opportunities in Solar

November 2012



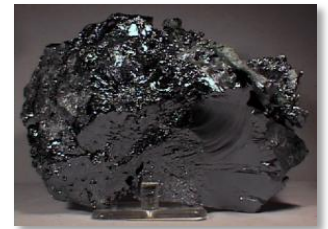
BofA Merrill Energy Conference



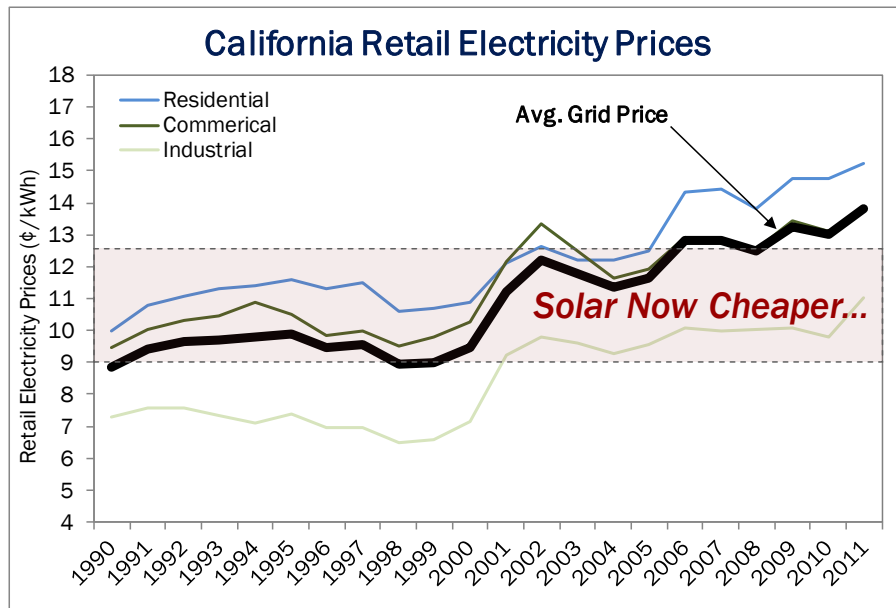
Solar Facts

Long-Lived Asset with Low Operating Risk

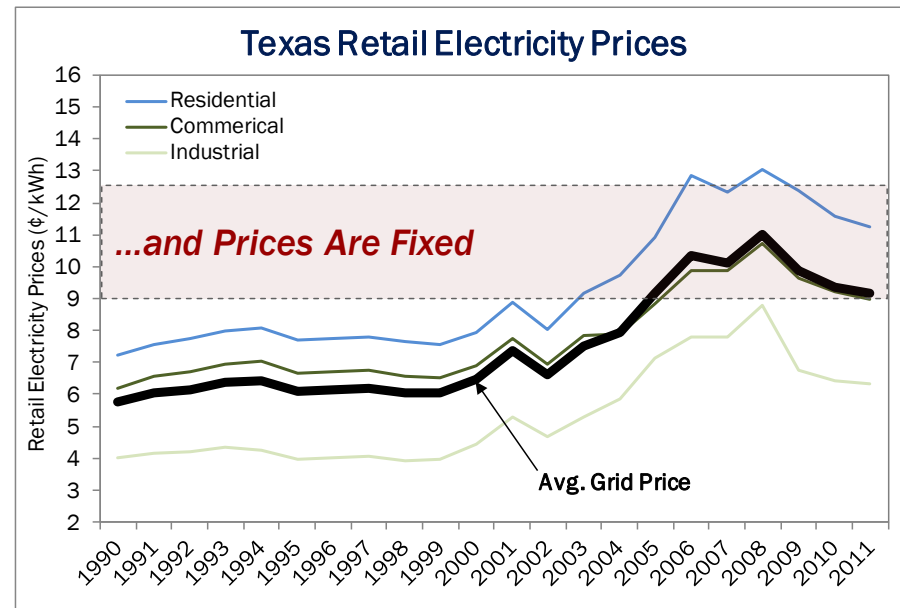
- Silicon panels are well-proven with very long tails
 - Little change in silicon panel “technology” since 1950s
 - 80% nameplate warranty for 25 years
 - No moving parts
 - Solar resource is free and dependable
 - No fuel costs – price is fixed from day 1
 - Unlike wind, actual annual output = 95% - 105% of expected
- ❖ Stable cash flows contracted for 20-25 years



Solar Pricing Is Competitive...



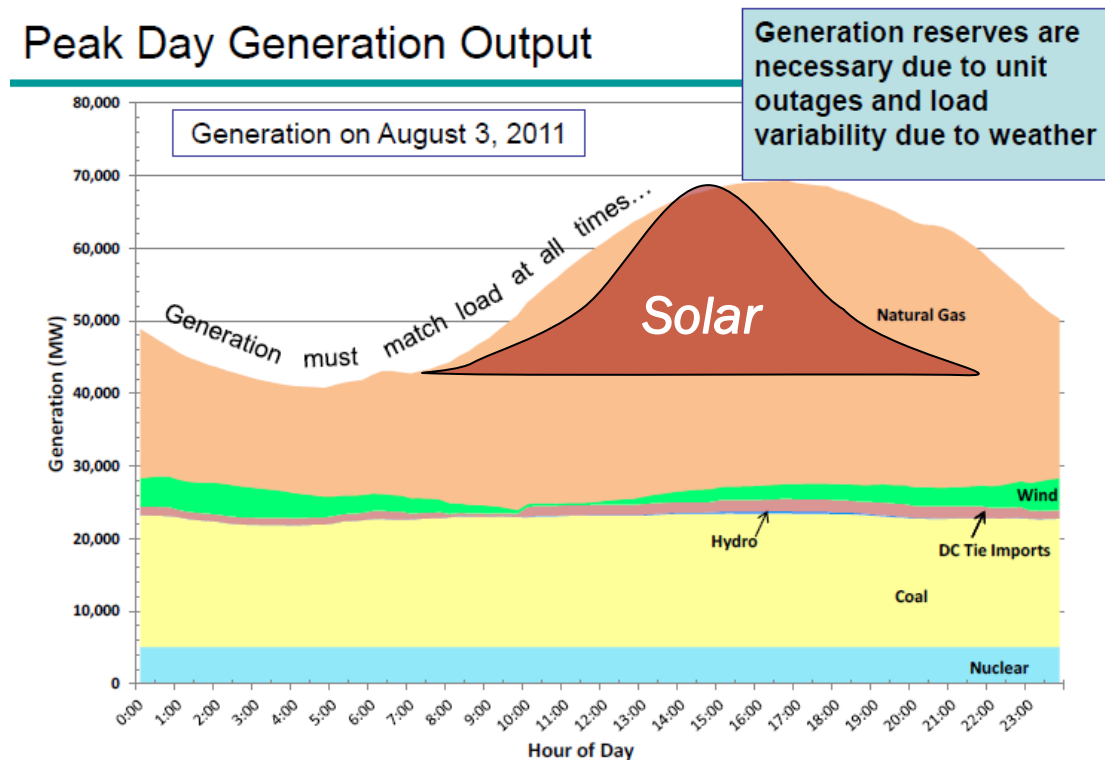
Source: EIA, Bloomberg



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- Solar costs down due to oversupply, not technological breakthroughs
- Retail electricity prices are an appropriate comp because:
 - Transmission costs can/should be mitigated by distributed generation
 - Solar PPA prices flow directly through to customers

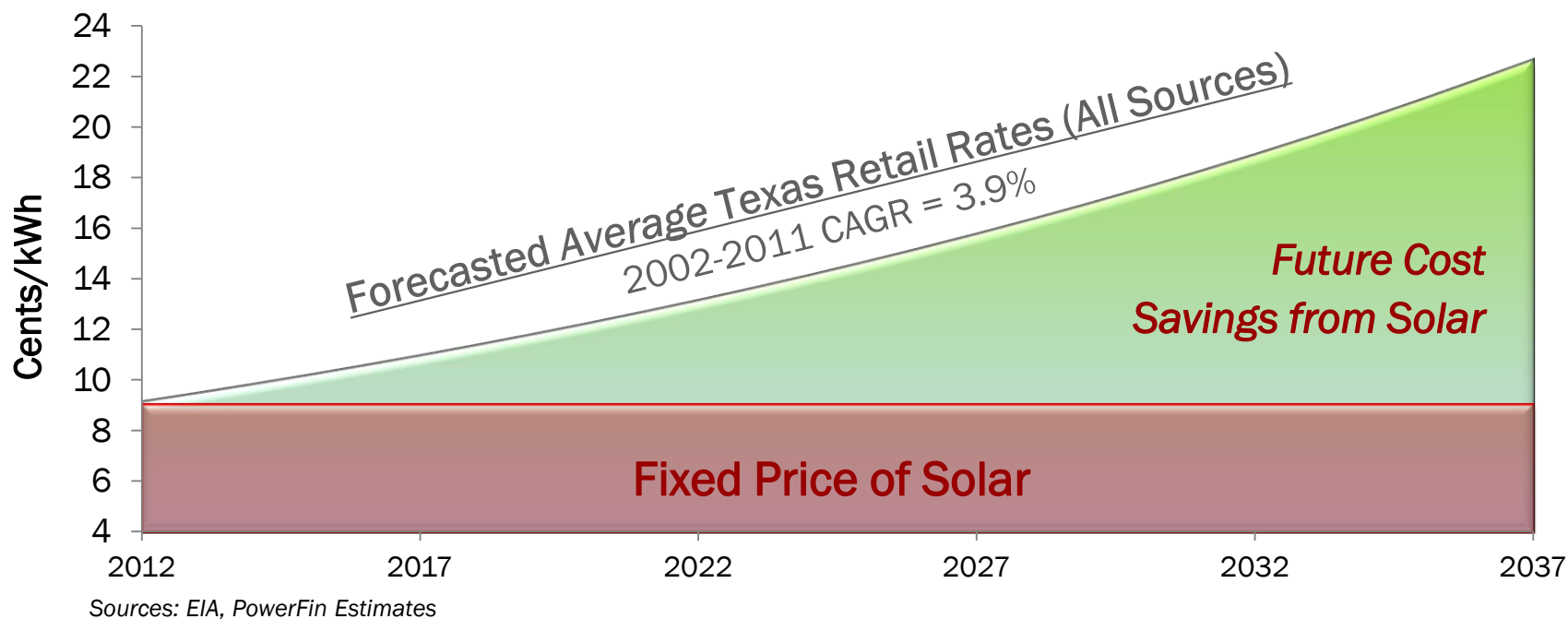
...Especially During Peak Periods of Demand...



Sources: ERCOT, PowerFin Estimates

- **\$0.044/kWh peak price premium (June 2012)**
 - West Load Zone 11:00 am – 3:00 pm = \$0.088/kWh
 - West Load Zone 24-hour average = \$0.044/kWh

...and Pricing is Fixed Forever



- ~\$30MM 25-year savings for 1MW of solar (in Central TX)
- ~\$2B 25-year savings for 70MW (1% of ERCOT) of solar

Solar Investing

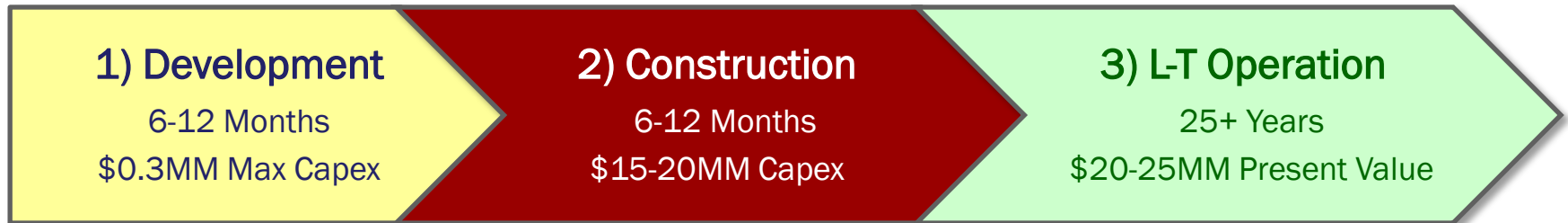
Different Ways to Invest in Solar

- Private Project Investment
 - Development Equity
 - Construction (Bridge) Equity
 - Construction (Bridge) Loans
 - L-T Equity
 - L-T Debt
 - Tax Equity
- Public Equity or Debt

Does solar management understand energy?



Three Stages of a Solar Project (10MW Example)



1) Development

- What that buys: Land rights, interconnection, permitting, PPA
- Risks: Unrealistic projects and aggressive developers

2) Construction

- What that buys: Equipment and installation
- Risks: Execution and price/market risks (deal structuring)

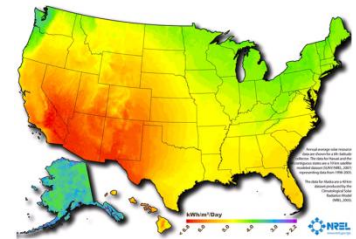
3) L-T Operation

- What that buys: 20-25 year steady (IG-type) cash flows...
- Risks: Contract abrogation, sun doesn't shine

Valuation Starts and Ends with L-T Cash Flows

$$\text{System Value} = \frac{\text{Electricity Output} \times \text{Electricity Price}}{\text{IRR} - \text{Growth Rate}}$$

- Electricity output
 - More sunlight = more value
- Electricity price (PPA)
 - Prevailing local rates, RPS, etc...
- Cost of capital (IRR)
 - Off-taker credit profile, size of project, quality of guarantees, etc...
 - Market IRRs will compress as more solar is implemented
- Growth rate
 - Panel degradation
 - Power price escalation



Disconnect Between Solar Costs and Power Prices

- Solar suppliers are price takers
 - Technology race to the bottom – can't see the energy price floor
 - No capital discipline – see stock performance
 - Solar is all about project execution and risking cash flows
 - Private capital providers have been rewarded
 - Energy Alpha – created by misguided solar “technology” firms
 - Operating assets have low-risk cash flows
 - Low Beta – the sun shines and people need electricity
- *Energy investors well-positioned to exploit inefficiencies*

Low β

High α

Investment Opportunities in Solar Energy

- Public Stocks and Bonds
 - Stocks – management teams still don't understand energy
 - Bonds – few syndication opportunities
 - Private Project Investments
 - Development Companies – most pipelines not bankable
 - Construction (Bridge) Funding – feasibility analysis is critical
 - Opportunities to exploit solar supplier inefficiencies
 - Operating Projects – value is added by optimizing cap structures
 - Opportunities to warehouse and recap projects
- ✓ *Valuing solar in the context of energy markets is critical*
- ✓ *PowerFin adds value by de-risking projects*



Thank You

PowerFin Partners

Tuan Pham, CFA

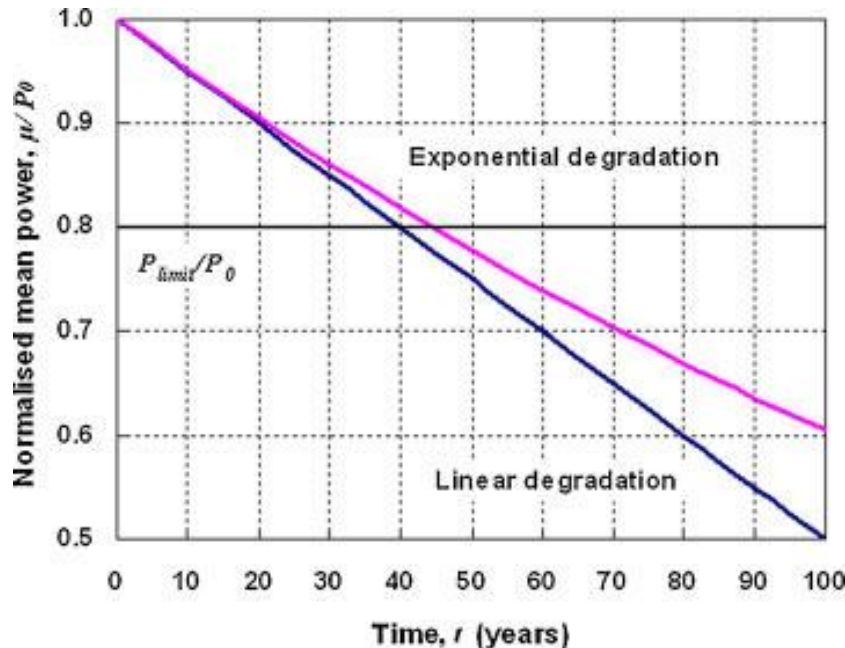
www.powerfinpartners.com

tpham@powerfinpartners.com

(512) 394-8767

Solar c-Si Projects Have a Very Long Tail

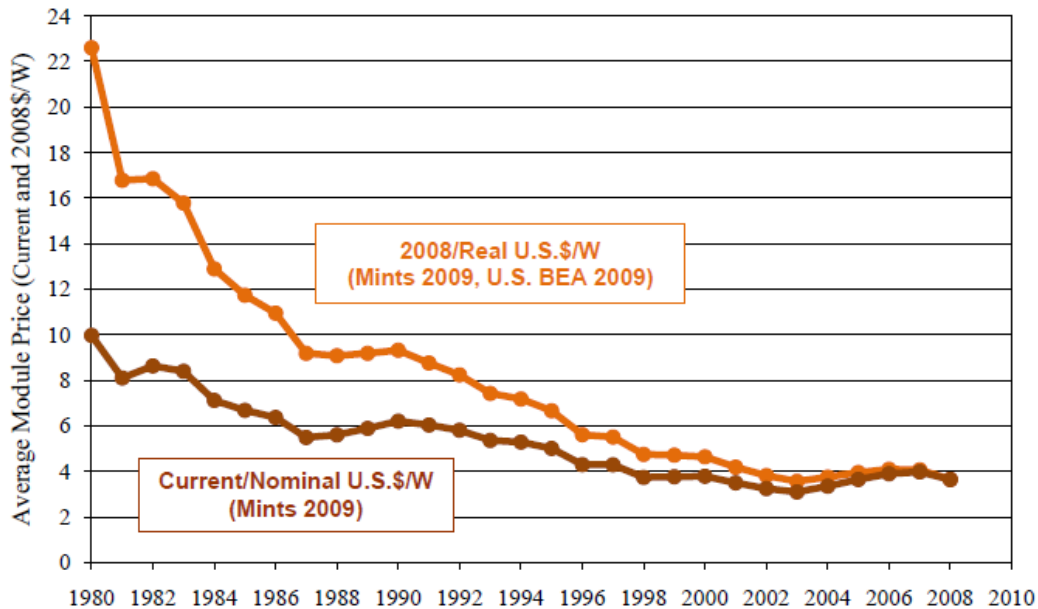
c-Si Panels Observed to Degrade at 0.4% to 1.0% Per Year



- Panels last for 30+ years
- PPAs last for only 20-25 years
- 80% output warranty for 25 years
- What is the proper amortization?

Source: Manuel Vazquez & Ignacio Rey-Stolle, "Photovoltaic Module Reliability Model Based on Field Degradation Studies," *Progress in Photovoltaics Research and Applications*, Published Online March 3, 2008 www.interscience.wiley.com

Panel Prices Are Approaching \$0



Source: US National Renewable Energy Lab, "Solar Technologies Market Report, January 2010."

- Panel prices are now \$0.70/Watt, which is a lot closer to \$0/Watt than \$10/Watt in 1980
- A cyclical bottom is approaching
 - Cost reductions have come from increased supply, not Moore's Law
 - Polysilicon is made by commodity chemical companies, not technology companies like Google or Apple