Silicon Solar PV Technology Challenges

- Current Silicon Solar technology is less competitive than CdTe technology, led by First Solar
- Silicon Solar technology needs to achieve significant cost reduction to reach the goal of grid-parity

Levelized Cost of Electricity (LCOE) Comparison with CdTe technologies

- High Insolation
- Low Insolation

(cSi) CdTe

307 282
219 201

Levelized Cost of Electricity (LCOE) Comparison with Electricity Price

- Grid Wholesale Prices
- Grid Retail Prices

Germany California

225 114
67 29
Silicon Solar PV Industry Need: Lower Cost/Watt

- **c-Si is expected to gradually lose its market share over thin-film technology.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Thin-film</th>
<th>c-Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>2008</td>
<td>13%</td>
<td>87%</td>
</tr>
<tr>
<td>2009</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>2010e</td>
<td>23%</td>
<td>77%</td>
</tr>
<tr>
<td>2011e</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>2012e</td>
<td>26%</td>
<td>74%</td>
</tr>
</tbody>
</table>

- **Highly competitive industry, suffering from overcapacity.**

  **Solar PV Competition Technology M/S**

  **Solar PV Demand & Supply Forecast**

  To win and survive in the solar PV market, c-Si players have to find a way to significantly reduce their manufacturing costs.
Better Silicon

Better Silicon improves Silicon Solar PV cost/watt by increasing cell efficiency by 10-25% through a proprietary, low cost semiconductor material enhancement.

The technology is adaptable for different Solar Cell manufacturers.

Seed Funding for Product Prototype: $2M
ROI: 13-16X
Technology Platform and Product

Future Markets

- Polymers
- Semiconductors
- Silicon wafer
- Metals
- LED

Current Markets

- Si Solar PV cell

Theoretical Model - Platform
- Model and predict advanced material properties
- Accelerates and lowers the cost of materials R&D

Better Silicon - Product
- Method of changing the properties of silicon through a proprietary process
- Impact: Solar cell efficiency increased by 10-25%
# Key Enablers to Reduce c-Si Manufacturing Cost

<table>
<thead>
<tr>
<th>Cost Savings</th>
<th>Polysilicon Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>By applying Better Silicon technology, solar cells can achieve the same level of</td>
</tr>
<tr>
<td></td>
<td>efficiency with “dirtier polysilicon” (less purity, thus cheaper polysilicon)</td>
</tr>
<tr>
<td>Decrease Wafer Thickness</td>
<td>By applying Better Silicon technology, solar cells can achieve the same level of</td>
</tr>
<tr>
<td></td>
<td>efficiency with thinner wafers (less silicon)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revenue Generation</th>
<th>Cell Efficiency Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assuming using the same thickness wafer made from the same purity polysilicon,</td>
</tr>
<tr>
<td></td>
<td>solar cells can achieve higher level of efficiency</td>
</tr>
</tbody>
</table>
Benefit of Better Silicon Technology: Reduce c-Si Manufacturing Cost

- Patent pending
- Significant impact: -$0.39/W
- No major retooling required by PV manufacturers
- Applicable for all kinds of silicon
- Quick Implementation
- World Renowned Scientist Advisory Board
  - Marvin Cohen, Steven Louie, Alex Zettl

Better Silicon Cost Advantage

\[ \text{Better Silicon PV Cost} = \text{Avg Solar PV Cost} - \text{Solar PV Cost With Better Silicon} \]

\[ \text{Better Silicon Cost Saving} = \text{Solar PV Target Cost} - \text{Solar PV Cost With Better Silicon} \]

$0.39/W Cost Saving assuming 25% efficiency gain
High Growth Market Potential

- Solar PV market is expected to grow 24% annually over the next five years
- Better Silicon plays with any Silicon Solar incumbent
- Expected to be online by 2011

Contribution Potential: $3.9B industry savings in 2011
## Business Model Options

<table>
<thead>
<tr>
<th></th>
<th>CAPEX</th>
<th>Potential Market Share</th>
<th>Ability to raise capital</th>
<th>Time to Market</th>
<th>Competition</th>
<th>Control of Value Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option1: IP License</strong></td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Short</td>
<td>Few</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Option2: PV Manufacturer</strong></td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Long</td>
<td>Many</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
</tbody>
</table>
Start-up Business Structure

- **IP License**
- **Customized Solution Sublicense**
- **10-25% Increased Output**
- **Sublicensing Fees**
- **Upfront Fee**
- **Running Royalty**

**Licensing Fees**

**R&D**

**Sublicense**

**PV Manufacturer**
Timeline to Commercialization

**Phase I**
- Build & Test Prototype
- Start Business Dev & Sales
- Incorporation of Devco
- Team Recruitment
- Licensing IP from LBNL
- Computer Infrastructure

**Phase II**
- Expand Team
- R&D of Customized Solution
- Marketing and Sales
- IP & Sublicensing Contracts

**Phase III**
- Develop New Products with Theoretical Model

**Round 1**
Seed Funding

**Round 2**
Series A

**3 Years**
“The 2\textsuperscript{nd} most attractive segment”

“The most attractive segment”
Financials Forecast

Expected Revenue and Net Income

- **Net Income**
- **Total Revenue**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Revenue ($)M</th>
<th>Net Income ($)M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>0.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.4</td>
<td>-1.0</td>
</tr>
<tr>
<td>Year 3</td>
<td>1.9</td>
<td>-0.9</td>
</tr>
<tr>
<td>Year 4</td>
<td>4.9</td>
<td>-0.2</td>
</tr>
<tr>
<td>Year 5</td>
<td>8.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Year 6</td>
<td>16.3</td>
<td>2.7</td>
</tr>
</tbody>
</table>

- **Installed Capacity (MW)**: 0, 30, 60, 150, 300, 600

**Round 1**: Seed Funding
**Round 2**: Series A
Capital Needs and Expected Return

- **Capital Raise**
  - **Seed Capital (Y0)**
    - $2M
    - ROI: 13-16X
  - **Series A (Y1)**
    - $4M
    - ROI: 10-12X

<table>
<thead>
<tr>
<th>Round 1</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build &amp; Test Prototype</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>Startup Costs &amp; Legal Fees</td>
<td>$110,000</td>
</tr>
<tr>
<td>Recruit Team</td>
<td>$550,000</td>
</tr>
<tr>
<td>Super Computer</td>
<td>$50,000</td>
</tr>
<tr>
<td>Other Expenses</td>
<td>$90,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,000,000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Round 2</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D Customized Solutions</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Marketing &amp; Sales</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>IP Costs</td>
<td>$250,000</td>
</tr>
<tr>
<td>Payroll</td>
<td>$750,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$4,000,000</strong></td>
</tr>
</tbody>
</table>

- **Exit Value (Y6): $85M**
Current Status

- Patent pending for Better Silicon
- Proof of concept developed
- Scientists ready to start DevCo as soon as possible

Actively seeking $2M in seed funding to start prototype development