Note: A conservative and optimistic forecast has been developed for each country. It is unlikely that all countries will come in at the conservative or optimistic end, so for the global forecast, conservative is (sum of conservative country forecasts + 25%*(sum of optimistic – conservative forecasts)). Global optimistic forecast is sum of conservative country forecasts + 75%*(sum of optimistic – conservative forecasts).

Source: Bloomberg New Energy Finance

PV NEW BUILD BY YEAR, HISTORICAL AND FORECAST TO 2017 (CONSERVATIVE)
CHINA PV DEMAND (GW)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.4</td>
<td>0.5</td>
<td>2.1</td>
<td>1.6</td>
<td>2.0</td>
<td>12.1</td>
<td>13.0</td>
<td>16.0</td>
</tr>
<tr>
<td>2011</td>
<td>0.5</td>
<td>2.6</td>
<td>3.6</td>
<td>12.9</td>
<td>2.1</td>
<td>0.8</td>
<td>5.0</td>
<td>17.5</td>
</tr>
<tr>
<td>2012</td>
<td>3.6</td>
<td>2.6</td>
<td>3.6</td>
<td>10.9</td>
<td>10.0</td>
<td>11.0</td>
<td>7.5</td>
<td>10.3</td>
</tr>
<tr>
<td>2013</td>
<td>12.1</td>
<td>13.0</td>
<td>11.0</td>
<td>10.0</td>
<td>9.0</td>
<td>10.0</td>
<td>5.0</td>
<td>9.0</td>
</tr>
<tr>
<td>2014</td>
<td>5.0</td>
<td>11.0</td>
<td>10.0</td>
<td>9.0</td>
<td>5.0</td>
<td>7.5</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>2015e</td>
<td>16.0</td>
<td>17.5</td>
<td>10.0</td>
<td>9.0</td>
<td>5.0</td>
<td>7.5</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>2016e</td>
<td>17.5</td>
<td>10.3</td>
<td>9.0</td>
<td>5.0</td>
<td>7.5</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>2017e</td>
<td>19.3</td>
<td>17.5</td>
<td>10.3</td>
<td>9.0</td>
<td>5.0</td>
<td>7.5</td>
<td>5.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**CONSERVATIVE**

**OPTIMISTIC**

Source: Bloomberg New Energy Finance
JAPAN PV DEMAND (GW)

CONSERVATIVE

<table>
<thead>
<tr>
<th>Year</th>
<th>0-10kW</th>
<th>10-1000kW</th>
<th>1MW+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>2.5</td>
<td>1.7</td>
<td>3.8</td>
</tr>
<tr>
<td>2013</td>
<td>7.1</td>
<td>6.0</td>
<td>1.7</td>
</tr>
<tr>
<td>2014</td>
<td>10.3</td>
<td>3.1</td>
<td>3.3</td>
</tr>
<tr>
<td>2015</td>
<td>10.2</td>
<td>5.9</td>
<td>4.1</td>
</tr>
<tr>
<td>2016</td>
<td>9.9</td>
<td>4.8</td>
<td>3.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>0-10kW</th>
<th>10-1000kW</th>
<th>1MW+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>2.5</td>
<td>3.8</td>
<td>3.3</td>
</tr>
<tr>
<td>2013</td>
<td>7.1</td>
<td>6.0</td>
<td>4.1</td>
</tr>
<tr>
<td>2014</td>
<td>10.3</td>
<td>3.1</td>
<td>3.3</td>
</tr>
<tr>
<td>2015</td>
<td>10.0</td>
<td>7.8</td>
<td>5.3</td>
</tr>
<tr>
<td>2016</td>
<td>13.7</td>
<td>7.9</td>
<td>3.8</td>
</tr>
<tr>
<td>2017</td>
<td>13.7</td>
<td>10.1</td>
<td></td>
</tr>
</tbody>
</table>

Source: Bloomberg New Energy Finance
Note: A conservative and optimistic forecast has been developed for each country. It is unlikely that all countries will come in at the conservative or optimistic end, so for the global forecast, conservative is (sum of conservative country forecasts + 25%*(sum of optimistic – conservative forecasts). Global optimistic forecast is sum of conservative country forecasts + 75%*(sum of optimistic – conservative forecasts).

Source: Bloomberg New Energy Finance
Note: Variable cost includes processing cost and SG&A; depreciation is excluded. 2015 demand estimate is 55.5-61.4GW. Assumes 6% of the demand will be supplied by thin-film modules; 24% by mono modules with polysilicon consumption of 4.52g/W; 70% by multi silicon modules with a polysilicon consumption of 5.0g/W; electronics market is estimated at 30,000 tonnes.

Source: Bloomberg New Energy Finance
Demand and Supply for PV Modules, 2006-2017E (MW/Year)

Historical

Current effective cell manufacturing capacity - at least 66GW

Future

- Supply - crystalline silicon
- Supply - thin-film silicon
- Supply - thin film non-silicon
- Demand - conservative
- Demand - optimistic

Source: Bloomberg New Energy Finance
EBIT MARGINS OF QUOTED PV COMPANIES BY APPROXIMATE VALUE CHAIN POSITION, Q4 2014

Source: Bloomberg New Energy Finance

BNEF Market Outlook, ASEF Manila, 15 June 2015
Source: Bloomberg New Energy Finance

ALTMAN-Z SCORES OF QUOTED PUREPLAY PV MANUFACTURERS, AS OF Q4 2014 OR Q1 2015 FILING

- REC Solar, 4.34
- First Solar, 3.60
- S-Energy, 2.11
- CSIQ, 1.99
- SunPower, 1.93
- Trina, 1.17
- SolarWorld, 1.82
- Hareon, 1.01
- Jinko, 0.91
- GCL-Poly, 0.84
- Trina, 1.17
- SunEdison, -0.02
- Renesola, 0.41
- Hanwha, -0.09
- Yingli, -0.18
- REC Silicon, -0.28

China

US

Europe

South Korea

Source: Bloomberg New Energy Finance
PLANNED CAPACITIES OF LARGE MODULE COMPANIES BY END OF 2015 (MW)

Source: Company files, estimates, enquiries, Bloomberg New Energy Finance
GAP BETWEEN MODULE AND CELL CAPACITIES FOR LARGE COMPANIES BY END OF 2015 (MW)

Source: Company files, estimates, enquiries, Bloomberg New Energy Finance
PROPORTION OF TOTAL SHIPMENTS SENT TO INTERNAL PROJECTS BY CHINESE MODULE COMPANIES, 2014 AND 2015 ESTIMATE

<table>
<thead>
<tr>
<th>Company</th>
<th>2014</th>
<th>2015E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jinko</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>Canadian Solar</td>
<td>10%</td>
<td>18%</td>
</tr>
<tr>
<td>Trina</td>
<td>9%</td>
<td>17%</td>
</tr>
<tr>
<td>Yingli</td>
<td>8%</td>
<td>13%</td>
</tr>
<tr>
<td>JA Solar</td>
<td>4%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Source: Company files, estimates, Bloomberg New Energy Finance
Note: C and M stand for cell and module capacities, respectively. Hanwha SolarOne is considered as a Chinese manufacturer since its headquarter is set in China although Korean Hanwha Chemical is the largest shareholder. Hanwha SolarOne was merged with Hanwha Q Cells in February 2015.

Source: Bloomberg New Energy Finance
Note: Every PV project is different and has different costs; this is a typical buildup, from quotes from developers and EPCs, intended as a global benchmark.

Source: Bloomberg New Energy Finance
LEARNING CURVES OF C-SI AND THIN FILM MODULES

Source: Bloomberg New Energy Finance

Experience curve
Historical prices (Maycock)
Chinese c-Si module prices (BNEF)
Thin-film experience curve
Cumulative capacity (MW)

Source: Bloomberg New Energy Finance
DRIVERS OF COST REDUCTIONS ALONG THE C-SI VALUE CHAIN (US CENT/W)

**POLYSILICON**

- 2015: 10.0
- 2025: 4.0

- Cheaper poly-Si: -3.0
- Thinner cells: -2.0
- Higher efficiency: -1.0

**POLYSILICON TO WAFER**

- 2015: 10.0
- 2025: 7.0

- Diamond saw: -1.5
- Higher efficiency: -1.5

**WAFFER TO CELL**

- 2015: 10.0
- 2025: 7.0

- Materials saving: -3.0
- Higher efficiency: -1.0

**CELL TO MODULE**

- 2015: 17.0
- 2025: 12.0

- Cheaper materials: -3.0
- Higher efficiency: -2.0

Source: Bloomberg New Energy Finance
PATHWAY TO HIGH EFFICIENCY MULTI C-SI SOLAR CELLS (%)

- P-type multi Al-BSF: 17.8%
- 4 or 5 BB: 0.3%
- Black silicon Rear passivation: 0.5%
- P-type multi PERC: 19.4%

Source: Bloomberg New Energy Finance
C-Si MODULE COST FORECAST (US CENT/W)

Source: Bloomberg New Energy Finance
MARKET SHARE FORECAST OF DIFFERENT C-SI SOLAR CELL TECHNOLOGIES

BNEF Market Outlook, ASEF Manila, 15 June 2015

Source: Bloomberg New Energy Finance
This publication is the copyright of Bloomberg New Energy Finance. No portion of this document may be photocopied, reproduced, scanned into an electronic system or transmitted, forwarded or distributed in any way without prior consent of Bloomberg New Energy Finance.

The information contained in this publication is derived from carefully selected sources we believe are reasonable. We do not guarantee its accuracy or completeness and nothing in this document shall be construed to be a representation of such a guarantee. Any opinions expressed reflect the current judgment of the author of the relevant article or features, and does not necessarily reflect the opinion of Bloomberg New Energy Finance, Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates ("Bloomberg"). The opinions presented are subject to change without notice. Bloomberg accepts no responsibility for any liability arising from use of this document or its contents. Nothing herein shall constitute or be construed as an offering of financial instruments, or as investment advice or recommendations by Bloomberg of an investment strategy or whether or not to "buy," "sell" or "hold" an investment.
MARKETS
Renewable Energy
Energy Smart Technologies
Advanced Transport
Gas
Carbon and RECs

SERVICES
Americas Service
Asia Pacific Service
EMEA Service
Applied Research
Events and Workshops

Unique analysis, tools and data for decision-makers driving change in the energy system

sales.bnef@bloomberg.net