PV Group – An Introduction to SEMI’s Global Photovoltaic Initiative

Bettina Weiss
Sr. Director, Photovoltaics
SEMI PV Group
February 10, 2010
Outline

- About SEMI
- Why PV?
- Establishing PV Group January 2008
- Strategic Guidance – PV Advisory Committees
- Expanding SEMI Core Competencies to PV
- Strategic Partnerships – A Core Principle
- Special PV Group Initiatives
- Plans for 2010
- Semiconductor-to-PV Equipment Survey Data
- Conclusions
SEMI®: The Global Association

- Global industry association with offices in US, Brussels, China, Taiwan, Singapore, Korea, Japan, Russia, and India
- 1,900+ member companies (370+ PV)
- Established 1970 to serve the semiconductor supply chain
- Today serves members currently in the following industry’s
  - Semiconductor, Photovoltaic, Flat Panel Display
  - Emerging Markets – MEMS, LED/SSL, Printed Electronics, and Nanotechnology
- Board of Directors structure combined with regional advisory committees
SEMI represents the collective interests of its membership, and is an advocate for the industry. We engage with important influencers on a global basis to shape a positive future for our members and the world.

- Government & Trade Relations
- Industry Collaboration and Promotion
- Market Intelligence
- Environmental Health & Safety
- Technology roadmaps
- Expositions and Conferences
Why PV?

• Over the past 5 years, SEMI members and other industry stakeholders in the semiconductor and FPD industries have expanded their business into PV
• As a semiconductor technology, PV is a natural extension of our members’ product portfolio
• Increasingly favorable legislation in mature and new markets and historic technology know-how have created significant opportunities for our members
• And… PV pure players need representation on a regional and global level
Equipment Demand Similar to Semiconductors

Forecast of demand for equipment (in annual sales volume)

Source: Yole Developpment
How Can We Collectively Accelerate the PV Learning Curve?

• Industry Standards that reduce cost and spur innovation
• Industry information that guides investment and planning decisions
• Industry advocacy and promotion
• Effective Buyer-Seller collaboration on critical issues
  – Green Supply Chain (EHS)
• High performance, global supply chain

PV Group Mission

The PV Group will be the global industry association of choice for the photovoltaic solar supply chain represented by companies that provide cells, modules, equipment, and materials. The PV Group will provide increasing member value by delivering timely products and services that support continuous manufacturing cost reduction and global market expansion.

Read “The Perfect Industry” white paper
PV Group: A Global Opportunity

- PV is a semiconductor technology that will benefit from chip industry experience
- Similarities in
  - Materials
  - Processes
  - Process Integration
  - Equipment
  - Yield
  - Innovation
  - Learning Curve Acceleration
- Leverages expanding existing core competencies
  - Supply Chain Collaboration
  - International Standards development
  - Industry research and statistics
  - Global public policy and advocacy
  - Global PV events and conferences

Unique Challenges
- Policy driven
- Industry structure (vertically integrated, turn-key systems, etc.)
- Deployment bottlenecks
Establishing PV Group – January ‘08

• Mission

– SEMI will be the global industry association of choice for the photovoltaic solar manufacturing supply chain represented by companies that provide the equipment, sub-systems & components, materials, cells and modules to the global solar energy industry.

– SEMI will provide increasing levels of member value by delivering timely products, services and solutions that support continuous manufacturing cost reductions while enabling our long term vision to be realized, through:
  • Standards development
  • Public policy advocacy
  • EHS initiatives
  • Market research and statistics
  • Events (executive conferences & expositions)
The PV Manufacturing Supply Chain – PV Group Current Focus (c-Si example)

- More than **370 SEMI member companies** form PV Group, many of them with history and expertise in semiconductor manufacturing
- 65 PV “pure players” have joined since January 2009
Strategic Guidance – Advisory Committees

- Established PV Advisory Committees in Europe, US, Korea, Taiwan, China and India within the past 18 months
- Committees are comprised of equipment and materials suppliers, cell/module manufacturers, academia, other interests depending on region/market
- Designed to provide strategic guidance for PV Group activities in a given region and raising awareness for regional issues on a global scale
- White Papers produced for China, India, Taiwan in 2009, primarily on policy
- Grid Parity White Paper in the works from NA PV Advisory Committee
Expanding SEMI’s Core Competencies – Public Policy and Advocacy

- Support through SEMI Washington, D.C. and other regional offices
- Work with other PV association to align positions where possible (SEIA, Solar Alliance, calSEIA, OSEIA)
- Held PV lobbying day in D.C. October 1, 2009
- Global Feed-In Tariff White Paper released on December 8, 2009
Expanding SEMI’s Core Competencies – Industry Standards

• Active PV Standards committees in place in EU, NA, TW, JP as part of SEMI’s International Standards Program
• First 3 PV Standards published in ’09
• Biggest task: leverage existing semi, FPD and EHS documents and get them “PV ready”
• Biggest challenge: Engaging cell/module manufacturers to participate and contribute
Expanding SEMI’s Core Competencies – EH&S/Sustainability / Market Intelligence

- **PV EH&S/Sustainability**
  - Developing agenda for PV critical issues such as
    - End-of-life treatment of hazardous materials
    - Module recycling and take-back programs
    - “Solar Care” program (stewardship, ethics)
  - Strategic alliances with other organizations are key – EPIA (Europe), SEIA (US), JPEA (Japan), others
    - Semiconductor safety organizations entering PV space as well

- **PV Industry Research & Statistics**
  - Providing PV market updates in all key markets
  - Strong relationships with analysts and market research firms for specific data (US thin film market, global capacity forecasts, etc.); regular contributions to “Grid” newsletter
Expanding SEMI’s Core Competencies –
*Global PV Events 2010*

## Event Strategy
- Rationalize events worldwide (reduce number, improve quality, etc.)
- Establish industry partnerships in support of member interests

### Expositions 2010

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLARCON Korea ‘10</td>
<td>Feb 3-5</td>
</tr>
<tr>
<td>(in conjunction with SEMICON Korea)</td>
<td></td>
</tr>
<tr>
<td>SOLARCON China ‘10</td>
<td>Mar 16-18</td>
</tr>
<tr>
<td>(in conjunction with SEMICON China)</td>
<td></td>
</tr>
<tr>
<td>Intersolar (Europe) ‘10</td>
<td>Jun 9-11</td>
</tr>
<tr>
<td>PVJapan 2010</td>
<td>Jun 30-Jul 2</td>
</tr>
<tr>
<td>Intersolar North America ‘10</td>
<td>Jul 13-15</td>
</tr>
<tr>
<td>(in conjunction with SEMICON West)</td>
<td></td>
</tr>
<tr>
<td>SOLARCON India ‘10</td>
<td>Jul 28-30</td>
</tr>
<tr>
<td>PV Taiwan ‘10</td>
<td>October</td>
</tr>
</tbody>
</table>

### Conferences & Other Events

- Silicon Valley PV Industry lunch forums
- Sacramento PV Lobby Day (Sept/Oct)
- PV Fab Managers Forum Europe (March)
- PV Fab Managers Forum US (July)

*See [www.pvgroup.org/events](http://www.pvgroup.org/events) for dates and locations.*
Strategic Alliances – A Core Principle

• Collaboration and strategic alliances with other organizations have been a core principle in SEMI for 40 years.
• PV supply chain dynamics demand strength in core competencies and intelligent partnerships in adjacent segments and areas of lesser expertise.
• Partners benefit from PV Group’s global footprint, strong regional communities and breadth of service portfolio.
Special Policy Initiative – Global Feed-In Tariff White Paper

- PV Committee of the SEMI Board of Directors directed the preparation of White Paper at their July meeting to support feed-in tariffs and encourage Best Practices
- PV Group promoted strong support for feed-in tariffs through GRID newsletter and trade media in September (trial message)
- PV Group released draft of comprehensive Feed-in Tariff White Paper to regional PV Advisory Committees on November 11, 2009
- Global release of White Paper on December 8, 2009
Feed-in Tariff White Paper Highlights

• Goal: Promote widespread understanding of international PV demand incentives and identify policy Best Practices to create steady demand and profitable investments
  – Intended as serious and credible support for general policy principles, not as support for any specific legislation or policy action in any country, region or municipality.

• Key Principles:
  – Stable and predictable public policies
  – Transparent and streamlined
  – Open and accessible

• Best Practices include:
  – Technology differentiation
  – Generation cost-based rates sufficient to spur demand
  – Purchase and interconnection requirements
  – Fixed price and long-term payments
  – Predictable declines and sun-setting
### Special Initiative – *Roadmapping and Industry Collaboration*

<table>
<thead>
<tr>
<th>PV Group global PV industry collaboration survey released in September 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Distributed to all supply chain segments</td>
</tr>
<tr>
<td>- 392 responses (4,000+ sent)</td>
</tr>
<tr>
<td>Results Webinar November 18</td>
</tr>
<tr>
<td>- Results indicate clear need/desire for collaboration and focus on policy</td>
</tr>
<tr>
<td>- Solicited feedback on key priorities and suggestions for path forward</td>
</tr>
<tr>
<td>- Recording posted at <a href="http://www.pvgroup.org/NewsArchive/CTR_033052">http://www.pvgroup.org/NewsArchive/CTR_033052</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What Have We Learned?</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Stakeholders in all segments indicate need for collaboration</td>
</tr>
<tr>
<td>- Needs vary greatly and need to be prioritized</td>
</tr>
<tr>
<td>- International effort preferred</td>
</tr>
<tr>
<td>- Favorable policies continue to be essential for accelerated solar energy deployment in all major markets</td>
</tr>
<tr>
<td>- Identify ways to bridge local, regional, global as well as segment-specific issues, take holistic view where possible without impacting ongoing developments</td>
</tr>
</tbody>
</table>
Respondents agreed with these statements:

>50% of respondents favor some form of collaboration
2010 Strategic Initiatives and Plans

• Establish industry collaboration/roadmap framework (scalable)
• Strengthen PV Advisory Committee engagement, especially with cell/module manufacturers and integrators
• Continue to build strategic alliances with regional/national solar organizations and standards bodies
• Develop offerings for India and China (advocacy, EH&S, Standards)
• Investigate and understand role of utilities in key markets
Semiconductor Equipment and Materials Supplier Survey – June/July 2009

• Survey launched in partnership with Greentech Media June 15 – July 10, 2009
  – Survey intended to gauge the sentiments and perceptions of leading semiconductor market participants on:
    • The opportunity to participate in the PV market
    • Building a manufacturing base for PV in the US
    • Choosing the right technologies and strategy for success
    • Identifying winning policies to support a robust PV manufacturing base in the US

• 106 survey responses received, including
  – Semiconductor Manufacturers (16%)
  – Materials Suppliers (14%)
  – Equipment Suppliers (16%)
  – PV Manufacturers (14%)
  – R&D Labs (2%)
  – Financial services, investors (4%)
  – Consulting (15%)

Source: Greentech Media/PV Group July 2009
An Opportunity... But Not Yet a Necessity

Source: Greentech Media/PV Group July 2009
Majority Has already Made the Move...

**Firm's Near-term Involvement with the PV Industry**

- No near-term plans to enter PV
- Very interested; formulating a decision
- Plan to enter the PV market in the next twelve months
- Already have a manufacturing presence in PV

Source: Greentech Media/PV Group July 2009
Acquisition More Attractive than Developing PV Manufacturing In House

Source: Greentech Media/PV Group July 2009
Staying Close to Home when Picking Winning Technologies in PV

Source: Greentech Media/PV Group July 2009
But… Long-term Bet is on Next Gen PV Technologies

Which PV Technologies will the U.S. Maintain a Global Competitive Edge?

- Next-generation PV technologies
- Cadmium Telluride (CdTe)
- Copper Indium Gallium Diselenide (CIGS)
- Crystalline silicon-based technologies
- Organic PV/DSC
- Amorphous silicon (a-Si)

Source: Greentech Media/PV Group July 2009
R&D Talent is Seen as a Key Draw in the US

The Advantages of PV Manufacturing in the U.S.

Source: Greentech Media/PV Group July 2009
Politicians Take Note: It’s About Jobs!

Benefits of a Sustainable PV Manufacturing Industry in the U.S.

- A strong U.S. PV manufacturing base will drive significant job creation
- It contains enormous potential for economic profit
- It will foster the development of a domestic market
- It will drive a significant uptick in exports

Source: Greentech Media/PV Group July 2009
Tax Incentives Work

Critical Policies to Foster Growth in U.S. PV Manufacturing

US PV manufacturing will be robust and sustainable with or without policy support from governments

Tax incentives for PV manufacturers

Availability of loan guarantee programs for PV manufacturers

Feed-in tariff for PV energy generation

Restriction of federal investment tax credit to “made in USA” modules

Source: Greentech Media/PV Group July 2009
Transition Will be Painful, But There is Confidence

Rating the Ease of Transition from Semi to PV

- Smooth transition because of similar foundation technologies
- Greater than incremental adjustment would be required
- "Re-invention" of the wheel would be required in all probability

Source: Greentech Media/PV Group July 2009
Concerns About the Immaturity of the PV Market

The PV Industry's Most Sizeable Challenge Going Forward

- The lack of universal manufacturing standards as exists in the semiconductor industry
- Excessive presence of companies with sub-optimal cost structures and business models
- The lack of a robust supply chain that could render the industry vulnerable to future supply bottlenecks
- Lack of significant industry experience for most top-level PV management

Other, please specify

Source: Greentech Media/PV Group July 2009
Conclusion

• There is ample opportunity for semiconductor companies to be successful in PV manufacturing
• But the PV learning curve has to be accelerated in order for PV/solar to become a competitive renewable energy source
• Policy will continue to drive market development in the foreseeable future
• PV industry collaboration and efficient supply chain management are key to growth, cost reduction, environmental stewardship and accelerated deployment of solar energy

Source: Greentech Media/PV Group July 2009
Join Us

• Join the leaders in the PV supply chain in collectively addressing the critical issue of our time
• Work with us to find ways to collectively reduce costs, accelerate innovation, and profitably advance the industry
• Help us serve the industry for our member interests, for our children and our planet.

www.pvgroup.org

WE CAN CHANGE THE WORLD TOGETHER
Thank you!