Investor Day

Our development in Solar

Jean-Pierre FLORIS
Les Miroirs, November 15, 2010
Solar in Saint-Gobain

I. Solar power market dynamics

II. Saint-Gobain's growth in solar

Conclusion
Solar power: context

- An **inexhaustible** source of energy
- The greatest **growth potential** among renewable energies
- **Centralized and decentralized** productions
- A **drop in photovoltaic costs** towards grid parity
- **PV integrated in buildings**: a factor in the **Habitat strategy**
- **Unique Saint-Gobain expertise** (mirrors, coated glass, ceramics, plastics...)
Concentrated Solar Power market

Growth in installed capacity

- 2010: 0.8 GW
- 2015: 12.2 GW
- CAGR 10-15%: +36%

Trend in installed technologies

- 2010: 97% Parabolic concentrators, 2% Solar towers, 1% Other
- 2015: 54% Parabolic concentrators, 25% Solar towers, 18% Fresnel, 3% Stirling dish

Capacity under construction: 1.8 GW
Capacity installed: 0.8 GW

Parabolic concentrator
Solar tower
Fresnel
Stirling dish
PV market located mainly in Europe

Demand growth for PV coming mainly from Europe

- Market driven by Germany in 2010 but by other European countries in 2011
- Spain suffered a brutal halt in 2009 but retains a potential for growth

**World PV installed market (GWp)**

Source: EPIA may 2010, Saint-Gobain Solar Systems estimates

**European PV installed market (GWp)**

Source: EPIA may 2010, Saint-Gobain Solar Systems estimates
Saint-Gobain’s vision of photovoltaic solar energy

- A component of the **house of the future**

- A contributor to building **energy efficiency**
Towards an economic equilibrium without feed-in-tariffs

The objective:

- Decrease in PV electricity costs towards an economic equilibrium without Feed-In-Tariffs (from €1.8 to €2.0 per installed Wp)
- Integrated PV then becomes a construction norm supporting the objectives of RT 2020 for positive energy new constructions

Coherence with Saint-Gobain’s technological choice:

- Avancis thin films will enable to reach this equilibrium (target module price of €0.5/Wp for an installed system at less than €2.0/Wp)

<table>
<thead>
<tr>
<th>Decrease in PV systems cost*</th>
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<tbody>
<tr>
<td>Estimations in €/Wp</td>
</tr>
<tr>
<td>Module</td>
</tr>
<tr>
<td>Mounting system</td>
</tr>
<tr>
<td>Electrical kit</td>
</tr>
<tr>
<td>Installation and services</td>
</tr>
<tr>
<td>Price of PV system</td>
</tr>
</tbody>
</table>

a €1.8-2.0 system cost implies an electricity cost around 10c/kWh**

Assumptions:
*1,000h sunshine per year during 20 years
**No financial costs directly linked to consider (norm)
Maintenance/rental done by the owner
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1. Saint-Gobain structure
2. Components
3. Modules (Avancis)
4. Saint-Gobain Solar Systems

Conclusion
To combine its solar offer, Saint-Gobain set up Saint-Gobain Solar in 2009

Three activities

- **Components supply:**
  - for the **PV solar** markets
  - for the **CSP** markets
- **Avancis**: photovoltaic modules
- **Saint-Gobain Solar Systems**: distribution, integration and mounting of full PV systems

Strong assets

- Unique positioning along the whole value chain
- Innovative products for every market
- **Unique Saint-Gobain expertise** (mirrors, coated glass, ceramics, plastics...)
Present across the entire solar value chain

<table>
<thead>
<tr>
<th>Components</th>
<th>Products</th>
<th>User Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz crucible for silicon ingots</td>
<td>Solar glass, films, foams...</td>
<td>Saint-Gobain Solar Systems</td>
</tr>
<tr>
<td>SiC grains to cut silicon wafers</td>
<td>CIS Modules</td>
<td></td>
</tr>
</tbody>
</table>

Sales around €300m en 2010, i.e. +50% versus 2009 including over €200m in Flat Glass
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   i. CSP (Concentrated Solar Power)
   ii. Solar photovoltaics: PV
3. Modules (Avancis)
4. Saint-Gobain Solar Systems

Conclusion
Saint-Gobain’s components offer for CSP

SiC ceramics for high temperature receivers

Extraclear mirrors
High Reflectivity & durability:
- Flat for solar towers and fresnel power plants
- Curved for parabolic concentrators (Saint-Gobain Solar Covilis)

High performance foam bonding tapes

Maintenance free, low friction PTFE bearings
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Conclusion
Saint-Gobain, European leader in cover glass

Protect and optimize the sun energy transmission

An offer for c-Si modules

- SGG ALBARINO®
  High energy transmittance
  extra-clear patterned glass

- SGG DIAMANT SOLAR®
  High energy transmittance
  extra-clear float glass

- SGG PV-AR®
  Anti-Reflective Coating

An offer for thin-films modules

- SGG PV-Mo®
  = Planilux® + Mo layer
Saint-Gobain accompanies the growth of the PV glass market

- **Global PV glass Market**: annual market growth rate around 20%

- Large-scale **industrial projects** to accompany the manufacturing shift to Asia

- Possibility to sell the equivalent **production of 2 to 3 floats in 2015 compared to 1 today**

- Solar glass: **continuous innovations**

- **Manufacturing facilities** are sufficiently **flexible** between solar / non-solar
HPM components for the PV market

- **SiC Wiresaw**
  - Silicon Carbide grains to wire saw silicon wafers

- **Crystals**
  - Quartz crucibles for the processing and growth of high-purity silicon ingots

- **Performance plastics**
  - Plastic films
  - Foams

1. Flexible front coating
2. Encapsulating
3. Frame
4. Ribbon for junction box
A worldwide presence to provide local customer support
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   5. Objectives

Conclusion
Avancis today

- **30 years of experience** in thin films
- One existing plant with a **20 MWp** capacity
- **200 employees**
- **Two plants** launched/under construction for an additional capacity of **200 MWp**

*Gen 2 (plant 1)*

*Gen 3 (project)*
Thin films are gaining in maturity

Thin films could represent around 30% of the market in 2015 (23% of which CdTe and 8% CIS)

- First Solar (CdTe) gained market share between 2008 and 2010
- Amorphous silicon (a-Si) is slipping back

Source: Navigant Consulting, 2010
Among thin films, CIS has considerable assets

- **Similar production processes and costs per m²** to thin film technologies

- The **lowest cost per Wp** will come from the most efficient technology

- **CIS technology** offers very good prospects:

<table>
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<tr>
<th></th>
<th>Cell efficiency world record (%)</th>
<th>Estimated industrial efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Si</td>
<td>20</td>
<td>15 – 16</td>
</tr>
<tr>
<td>CdTe</td>
<td>17</td>
<td>6 – 10.5</td>
</tr>
<tr>
<td>CIS</td>
<td>20</td>
<td>8 – 12</td>
</tr>
</tbody>
</table>

Source: US National Renewable Energy Laboratory

*Avancis already at 12%*
Avancis is at the leading edge of CIS technology

Main key strengths of Avancis
- Very competitive design (Gen 3 modules)
  - Sodium control
  - Absence of Cadmium
- Full process control
- State-of-the-art technology: close ties with the University of Erlangen, specialized in solar

Avancis aims for:

Efficiency comparable to that of crystalline Silicon …
- 15% efficiency* on 30x30cm surfaces (world record for thin films in January 2010)
- 12% efficiency for a module currently in production

…with the cost per Wp of thin films
- Target: €0.50/Wp

* “aperture efficiency”
Partnership with Hyundai Heavy Industries

- First joint production facility in Ochang (Korea)

- Investment:
  - 100 MW Capacity
  - Operational in March 2012
  - Distribution & sales: 50% Avancis, 50% HHI

- HHI Experience
  - Crystalline Silicon, 650 MW installed by end-2010
  - Sale of solar farms
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III. Conclusion
Saint-Gobain Solar Systems: PV systems supplier

- **Photovoltaic system**: a set of components to mount the solar solution in an effective manner
  - Components offer
  - Range of services

- An **offer to suit every kind of roof**
  - Residential (tiles and panels)
  - Apartment blocks, industrial, farm buildings and non-residential (tiles and panels)

- Offer completed by the **Building Distribution sector** for sale to **small diverse customers** and **pooling of purchases**
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- A solar market still **growing fast** but **yet to find its profitability** without public subsidies.
- An **organization** in place: **Saint-Gobain Solar** became a **reality in 2009**.
- **CSP**: Grow sales of components, particularly through **partnerships**.
- **PV Components**: deliver **glass growth** through **innovation** (deep structures, AR, TCO) and **geographic expansion** (Southern Europe, China).
- **Avancis**: reinforced confidence in the **technology**.
- **Solar Systems**: growth through **innovation** (products and services) and by envisioning **external growth**.
Objectives

- A strong ambition in Avancis modules and in integrated PV systems
- The Components activities (Glass, Mirrors, SiC, Crystals and Plastics) supporting growth within the Group’s traditional businesses
- Investments (~ €200m/y) to be completed without delay, either alone or through partnerships
- Sales of €2bn achieved by 2015
- Medium term profitability meeting the standard returns of the Innovative Materials sector
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