

## ESADE CASE

# Designing Business Models for the Photovoltaic Solar Cells Industry

Written by Jordi Vinaixa and Lourdes Urriolagoitia  
ESADE Business School - Universidad Ramón Llull, 2013

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This case is intended to be used as the basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation.

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# Designing Business Models for the Photovoltaic (PV) Solar Cells Industry

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Solar Photovoltaic systems consist of panels of cells that convert sunlight directly into electricity. Solar Photovoltaic cells use semiconductor materials principally made of silicon that absorb sunlight to displace electrons that cause an electrical current to develop (See exhibit 1).

Because of their high costs and low conversion efficiency, photovoltaic cells were originally developed to generate ultra-high-cost power where costs were not a consideration and other energy sources did not exist such as in satellites. However, government incentives and scientific research gradually raised the conversion efficiency of photovoltaic cells. As a result, the use of photovoltaic cells in large-scale power generation began in the mid 1980s. With rising conversion efficiencies<sup>i</sup> solar power rose in the 2000s and as 2009 it was the world's fastest-growing energy production technology<sup>ii</sup>. Worldwide demand for solar power was driven by energy prices and more often by government policies and had been doubling globally every two years, growing by an average of 48 percent annually since 2002<sup>iii</sup>. Solar photovoltaic power grew an average of 41% each year between 2003 and 2006 and was expected to grow 40% annually through 2011<sup>iv</sup>.

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There are five key stages in solar power's value chain: silicon production, ingot/wafer manufacture, solar cell manufacture, solar module manufacture, project development, and system installation (See exhibit 2). The way firms operated in the industry differs considerably, as well as the consequences derived from those operating ways. By analyzing how a company decides to operate and make money, we are determining the business model for this company. A business model describes how an organization creates, delivers and captures value.

## **SunPower**

SunPower designed, manufactured and delivered high-performance solar electric systems worldwide for residential, commercial and utility-scale power plant customers. The company was founded in 1987 after its co-founders were awarded grants to support their solar power explorations. In the 1990s, SunPower took off when its solar technology was used to power some of the most innovative applications for solar power racecars and airplanes. In 2005, the company became publicly listed on the NYSE and two years later the company began volume production of its record breaking high efficiency solar cell, averaging 22.4% of conversion efficiency, a measurement of the amount of sunlight converted by the solar cell into electricity. By 2012, of all the solar cells available for the mass market, SunPower solar cells had the highest conversion efficiency, 24%. As a result, they generated up to 50% more power per unit area than conventional solar cells<sup>v</sup>. Besides, SunPower solar cells made a more efficient use of silicon, the key raw material used in its manufacture.

Another distinctive feature was its uniformly black surface design that eliminated highly visible reflective grid lines and metal interconnect ribbons resulting in roof-mounted products with superior aesthetics. On the other side, since the SunPower solar roof tile weighted less than three pounds per square foot and could be stacked for shipping, more kilowatts per pound could be transported using less packaging, allowing lower distribution costs.

### **Business 1:**

#### **SunPower Solar Power Plant Product and Services**

SunPower offered several types of ground-mounted and rooftop solar products. It built light impact, utility-scale solar power plants combining its high-efficiency solar panels and smart,

single-axis trackers. Specifically, the SunPower Oasis power plant was a full-integrated solution built with cost-optimized photovoltaic power blocks seamlessly integrated into a turnkey energy solution. High-density, 1.5 MW solar power blocks were designed to maximize energy output and follow the contours of a land for optimal production on a solar energy site (See exhibit 3).

SunPower provided its solar power plant customers end-to-end management of the project lifecycle, from early stage site assessment, financing support, and project development, including full-scale environmental and construction permitting, through engineering, procurement, construction, and commissioning. Once tested, the company offered operation and maintenance services monitoring, tracking and reporting photovoltaic system performance and energy output through its Energy Management Services segment.

In order to improve solar cell efficiency through enhancement of their existing products, development of new techniques such as concentrating photovoltaic power, and reducing manufacturing cost and complexity, SunPower engaged in extensive research and development efforts. The research and development team had agreements with the United States federal government and California state agencies to develop new technologies and pursue additional research opportunities while helping to offset its research and development expense. Also, they worked closely with the manufacturing facilities, equipment suppliers and customers. In addition, they worked closely with current and potential suppliers of crystalline silicon to develop specifications that meet the company standards and ensure high quality, while at the same time controlling costs.

SunPower worked with development, construction, system integration, and financing companies to deliver solar power systems to wholesale sellers, retail sellers, and retail users of electricity. In the United States and Europe, commercial and electric utility customers typically choose to purchase solar electricity under a power purchase agreement with an investor or financing company. End-use customers typically paid the investors and financing companies over an extended period of time based on the amount of energy they had consumed from the solar power systems, rather than paying for the full capital cost of purchasing the solar power systems.

SunPower also sold components, including huge volume of sales of solar panels and mounting systems to third parties, sometimes on a multi-year firm commitment basis in North America,

Europe, the Middle East, Asia, and Australia, principally in regions where government incentives accelerated solar power adoption.

## **Business 2:**

### **SunPower Residential Solar Power**

SunPower offered a complete solar energy solution controlling the entire manufacturing process, from highest-efficiency solar panels and inverters to mounting system and energy monitoring. Residential solar panels from SunPower produced the most energy of all solar panels on the market. This meant that fewer panels produced the energy needed, and they took up significantly less space on the roof than other solar energy solutions on the market. As a result, solar panels from SunPower generated more energy over the lifetime of the system than other panels and saved more money on the electric bills. For instance, The SunPower 225 signature black solar panel provided a revolutionary combination of high efficiency and attractive, sleek appearance to blend elegantly with the roof (See exhibit 4).

For residential solar power, the company had dealer representatives located in Australia, France, Germany, Greece, Italy, Japan, Korea, Spain, Switzerland, and the United States. In order to warrant that each dealer representative solar energy installers were the most qualified and professional installers of residential solar systems, Sun Power trained them to the highest standards in the industry. In fact, SunPower was the only solar panel manufacturer with an ISPQ-accredited technical training program, an international standard that ensured continuity, consistency and quality in the delivery of training. The company even inspected dealers' work to ensure that the highest quality standards are upheld. Dealers were sorted into three tiers depending on the level of SunPower-specific training completed and the overall level of customer satisfaction. The three tiers were SunPower Authorized Dealer, Premier Dealer, and Elite Dealer. In 2011, the dealer network comprised 1.800 companies worldwide.

## Business 3:

### 1BOG (One Block off The Grid)

After negotiating a complex maze of solar pricing and encountering a labyrinth of federal, state, and local incentive information in order to get a solar system at home, Sylvia Ventura and Dan Barahona, a San Francisco couple realized that a business model that would create an easier, more transparent way for homeowners to get a fair quote from a reputable solar installer, all without any hard sell tactics or deceptive pricing had been born.

Ventura and Barahona met Dave Llorens, a solar sales consultant and the co-founder of SolarPowerRocks.com, a site providing solar information. The three agreed to join forces and build 1BOG, a company that organized community buying of solar power to make the process more affordable and transparent for residential consumers, and to foster an environment of community activism and responsibility<sup>vi</sup>. Ventura called it a "consumer advocacy group for community-based purchasing of renewable energy solutions for residential use. In simpler terms: we are an enabler, we educate people"<sup>vii</sup>. The name was derived from the phrase "one block off the grid," a reference to the goal of rounding up groups of homeowners willing to install solar-power systems on their houses, therefore, removing one block from a city's electrical grid.

Most of 1BOG's functions were performed online. The company invited people to become a member by signing up through its online registry. Once registered as members, 1BOG requested them data such as their electrical usage and made an evaluation of their roof using satellite photography to figure out if their home was good match for solar. This was totally free and no obligation. If they decided to purchase solar, 1BOG coordinated everything for them, initiating a competitive bidding process to, as Ventura said in an interview by a local magazine "ensure the best overall pricing, terms and services for its members. We negotiate pricing based on numbers of registrants, the bigger the group, the larger the savings".

"The cost of buying or leasing and installing a solar-power system varies by neighborhood. Each location has its own protocol for metering, permits and rebates"<sup>viii</sup>, said Llorens, chief executive and co-founder of 1BOG. In 2008, 1BOG successfully completed its pilot campaign in San Francisco. During a two-month period 1BOG had over 180 residents register for the program

and 70 residents prequalified to receive a complete on-site solar evaluation. In three weeks, 35 homes contracted to have solar installations.

By the end of 2008, Virgance, a company that scaled new activism ideas through online social networks to create positive social change, announced the acquisition of 1BOG. “By growing innovative ideas into large-scale, citizen-powered global campaigns, Virgance will amplify what we've accomplished in 3 months to the tenth power; the next 6 months will be thrilling,” declared to the press Sylvia Ventura co-founder of 1BOG.

Since 2008, 1BOG provided hundreds of deals in over 40 U.S. states gathering homeowners into buying groups that allowed the company to negotiate a reduced solar-installation rate from a single contractor. The rate was typically 15% below market average. In 2010, 1BOG added new solar leasing options to its line-up. When 1BOG started a “campaign” in a city, it relied on its consumer participants to recruit more consumer participants. “The reason we call it a campaign is that we run it like a political campaign — house parties, signs in yards, bumper stickers,” Steve Newcomb, Virgance C.E.O. said<sup>ix</sup>.

1BOG tended to offer the most number of deals in states and cities with strong residential solar incentives and it launched new ones every month, so any homeowner could sign up and if the company offered a deal in his area, it would let him know. If 1BOG was offering in an area and a homeowner from this area decided to lease or purchase solar, it coordinated everything for him, so the process went smoothly. Also, it provided them with education and information on all their available options (See exhibit 5).

Solar installers paid fees in exchange for customer referrals. Every time 1BOG took a whole community and gave a solar installer access to everyone in that group, they were getting a lot of new customers, and they paid to 1BOG a referral fee per home. The referral fee was the same regardless of which installer won, it was a small fraction of the actual discount, so it did not affect the decision about which installer to select. For instance, one of the participants in 1BOG’s inaugural program in San Francisco cut 43% off list price, according to Ventura. For the average customer, the benefit was closer to about 20% off, or \$1.50 per watt installed. Applying that to a \$25,000 solar system, customers saved \$5,000 On that \$25,000 solar system alone,

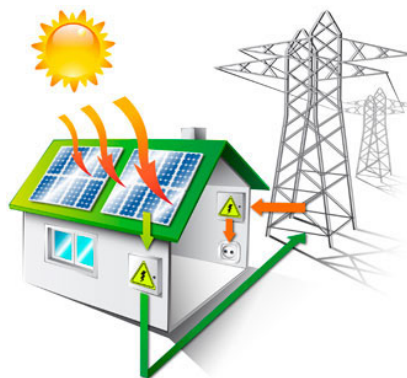


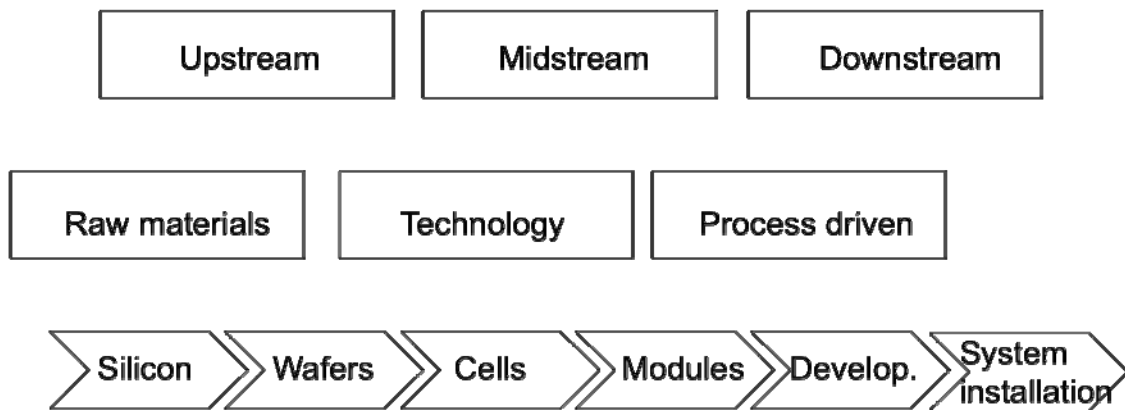
Virgance made almost \$1,000 dollars<sup>x</sup>. With hundreds or thousands of participants, the numbers add up.

How would you describe the three businesses explored in this paper? How they generate products and services and how they make money?



## Exhibit 1: Photovoltaic Solar Power



**Exhibit 2: Photovoltaic Value Chain****Exhibit 3: SunPower Oasis Power Plant****Exhibit 4: SunPower 225 signature black solar panel**

**Exhibit 5: 1 BOG (One Block of the Grid)**



## References

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<sup>i</sup> The conversion efficiency of a photovoltaic (PV) cell, or solar cell, is the percentage of the solar energy shining on a PV device that is converted into electrical energy, or electricity. Improving this conversion efficiency is a key goal of research and helps make PV technologies cost-competitive with more traditional sources of energy (Source: U.S Department of Energy/Energy Efficiency & Renewable Energy [http://www.eere.energy.gov/basics/renewable\\_energy/pv\\_cell\\_conversion\\_efficiency.html](http://www.eere.energy.gov/basics/renewable_energy/pv_cell_conversion_efficiency.html)).

<sup>ii</sup> Adapted from First Solar, Inc. in 2010.

<sup>iii</sup> Ibid, cit.

<sup>iv</sup> Adapted from SunPower: Focused on the Future of Solar Power case.

<sup>v</sup> For more information see <http://us.sunpowercorp.com/about/the-worlds-standard-for-solar/most-efficient-solar/>

<sup>vi</sup> For more information watch the video <http://video.foxbusiness.com/v/3969606/power-in-numbersliterally/>

<sup>vii</sup> Kilduff, P. 2008. "Shining a light on S.F. solar options" San Francisco Chronicle <http://www.sfgate.com/bayarea/article/Shining-a-light-on-S-F-solar-options-3190689.php>

<sup>viii</sup> Glazer, E. 2011. "Explore costs of going solar" The wall Street Journal, August, 14 2011, [http://online.wsj.com/article/SB10001424053111903918104576506733020411072.html?mod=googlenews\\_wsj](http://online.wsj.com/article/SB10001424053111903918104576506733020411072.html?mod=googlenews_wsj)

<sup>ix</sup> Walker, R. 2009. "Panel discussion" The New York Times, <http://www.nytimes.com/2009/04/05/magazine/05wwln-consumed-t.html?ref=earth&r=0>

<sup>x</sup> Morrison, C. 2008. "Virgance snaps up 1 Block Off the Grid to give solar buyers more power" Venture Beat, <http://venturebeat.com/2008/11/11/virgance-snaps-up-1-block-off-the-grid-to-give-solar-buyers-more-power/>



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