Strategic Report for First Solar, Inc



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Executive Summary

First Solar is a renowned leader and the largest worldwide producer of thin film cells in the solar energy sector. The company designs and manufactures photovoltaic solar modules using a proprietary thin film semiconductor technology, based on the use of cadmium telluride, to convert sunlight into electricity. This solution has enabled First Solar to achieve lower production costs relative to those of traditional crystalline silicon solar module manufacturers. In 2008, First Solar predominantly operated in Germany, with ninety percent of its sales coming from six major clients — Blitzstrom, Colexon Energy, Conergy, Gehrlicher Umweltschonende Energiesysteme, Juwi Solar, and Phoenix Solar. The company has also signed long-term solar module supply contracts with 12 European project developers and system integrators. First Solar has also recently begun to expand its US operations through the acquisition of Optisolar. This \$400 million dollar transaction gives First Solar access to Optisolar's extensive photovoltaic project pipeline.ⁱ First Solar has also recently announced plans to build the largest photovoltaic power plant in the US, scheduled to be completed by 2010ⁱⁱ.

Despite First Solar's recent success, Oasis Consulting believes the company will inevitably face several major obstacles in the future. In the short term, First Solar must address the drop in demand for solar panels and the possible oversupply in the market caused by the bad economy. In the long term, we anticipate that First Solar's use of cadmium telluride in future production processes could hinder its production costs. An additional obstacle we anticipate is the development of more efficient, cheaper substitutes for First Solar's low efficiency panels. In order to prepare for these problems, First Solar needs to invest in research and development, take advantage of its good cash balance by acquiring new talent, know when to transition to a new technology, and possibly invest in creating a synergy with an inverter developer to reduce installation costs for customers.



Company Overview

Company History

Inventor and entrepreneur, Harold McMaster, first founded Glasstech Solar in 1984 with the goal to produce cost-effective solar arrays. In 1990, after spending six years and twelve million dollars on attempting to develop amorphous silicon technology, McMaster decided to attempt a different thin-film technology, cadmium telluride, creating a new venture – Solar Cells Inc. SCI quickly became a clear industry leader in thin-film photovoltaic technology and by 1997 had developed a prototype production machine.

Change in the ownership took place in February 1999, when True North Partners, an investment arm of the Walton family, owners of Wal-Mart, purchased what soon was to be called First Solar from McMaster. Although results were not immediate and fell short from being efficient, commercial product became available in 2002. By 2005, production reached 25MW.

In 2006, First Solar entered into long-term solar module supply contracts (the "Long Term Supply Contracts") with six European project developers and system integrators for the period from 2006 to 2011 for manufacture and sale of 795 MW of solar modules. To cope with increasing demand, the company tripled production capacity in the US by adding additional line in Perrysburg, Ohio, and built four lines in Germany. In 2006, annual production reached 75 MW and First Solar announced the further creation of 16 lines in Malaysia. Later that year, First Solar completed an Initial Public Offering, placing the company on NASDAQ under the symbol FSLR.

In November 2007, expanding the target market to the United States, First Solar completed the acquisition of Turner Renewable Energy, a privately held company which designed and deployed commercial solar projects for utilities in the United States. TRE currently operates as a wholly owned subsidiary under the name of First Solar Electric. Later that year, First





Solar signed an estimated \$1 billion long-term module supply agreement with a subsidiary of Babcock & Brown and with Ecostream Switzerland GmbH from 2008 to 2012. In order to meet this demand, First Solar chose to construct its fourth manufacturing plant in Malaysia.

First Solar achieved the lowest manufacturing cost per watt in the industry, \$1.08/watt, for the third quarter of 2008 and expanded the annual production to over 700MW by the end of the year. In early 2009, First Solar announced a \$0.99/watt milestone. The company also recently began delivering solar modules to SolarCity, which lets small businesses and homeowners in Arizona, California, and Oregon lease solar panels, rather than buying expensive panels.

Business Model

First Solar PV (photovoltaic) modules represent the latest advancements in thin film solar module technology. First Solar PV modules are manufactured in a streamlined production process that gives the company a cost/watt advantage over other thin film producers. First Solar's PV modules use small amounts of cadmium telluride; compared with typical crystalline silicon solar modules, only 1-2% of the semiconductor material is needed. Cadmium telluride has also proven to effectively generate energy within the module throughout its 25+ year lifetime. *iii*

First Solar's main research and development campus is housed in Perrysburg, Ohio. Production facilities are located in Ohio and Germany, with a recent expansion into Malaysia. First Solar modules are used in three applications: 1) in free field (solar farms); 2) in commercial rooftop; and recently in 3) residential rooftop solar power plant applications. Small commercial rooftop and residential rooftop solar power plant applications are contracted through SolarCity, a solar power and solar leasing company in the United States.

Competitive Analysis

Summary Table

FORCE	STRATEGIC SIGNIFICANCE
Internal Rivalry	High
Supplier Power	Medium
Buyer Power	Medium
Entry and Exit	Medium
Substitutes	High
Complements	Weak

Rivalry

First Solar competes with a number of firms in the growing market for solar energy (see Table 1). Factors favoring the growth of the solar power industry include: the rising price and falling supply of competing nonrenewable energy sources, climate change, politics related to national security/dependence on foreign oil, increasing private-sector solar investment, and growing public-sector support of solar energy.

These factors all contribute to the likelihood of further growth in the solar energy industry, which for First Solar, could mean more intense rivalry. However, it is important to note that given the poor economic climate, demand for solar energy has increased at a slower rate than projected. As a result, there is an excess supply of panels. Given First Solar's \$/watt advantage, the company will most likely have less trouble than other companies finding demand for its products.



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U.S. Solar Power Market: Estimated Total Dollar Sales (\$ Millions)							
	Solar-Electric		Solar-Thermal				
	Systems/Products		Systems/Products		TOTAL		
	¢	%	¢	%	¢	%	
Year	Ψ	Change	Ψ	Change	Ψ	Change	
2007	\$3500	52%	\$320	33%	\$3820	50%	
2006	2,300	64	240	166	2,540	70	
2005	1,400	47	90	6	1,490	44	
2004	950	27	85	6	1,035	25	
2003	750		80		830		

Another factor contributing to the intense rivalry in the industry is the lack of product differentiation. Solar energy products have different efficiency ratings and cost structures, but it is easy to figure out the amount of energy per dollar made in an investment, which makes the industry focused on providing low-cost, high-output solar power products rather than on cultural or superficial aspects of the product. As the market matures, other factors such as product lifecycle and performance may become more significant as more products have been tested in the marketplace.

A factor that makes rivalry in the solar energy market especially intense is the diversity of competitors. First Solar operates in the industry for thin film Photovoltaic cells, but this market is a subset of the renewable energy market. As renewable energy is considerably more expensive than alternatives, the industry is driven by a focus on costs per watt of electricity. First Solar is not only competing with a few thin film manufacturers, but also with many other forms of renewable energy. To be competitive, First Solar has to be ahead of the curve on introducing new, cheaper ways to harness solar power and must keep its manufacturing costs lower than the competition.



Substitutes and Complements

The thin-film solar panel industry has several prominent substitutes including silicone based photovoltaic cells and other types of photovoltaic cells; other types of renewable energy including wind, biofuel, fuel cell, geothermal, and micro-hydroelectric power; and non-renewable energy products (components of the U.S. electricity market, which is thoroughly dominated by coal, natural gas, and nuclear power). First Solar currently has the cheapest \$/watt solar panels, but given the abundance of alternative types of energy, the threat of substitutes is strong.

Complementary technology for solar panels includes solar water heating systems that can be installed jointly with solar panels, mostly on residential rooftop solar power plants. Until recently, most of First Solar's sales were to solar farms and large buyers that would not use solar water heating systems, thus the power of complements has been weak in the past. However, with the acquisition of Optisolar, First Solar has taken over projects with SolarCity to furnish residential and commercial rooftops with solar modules. As a result, solar water heating systems have will likely become stronger complements with First Solar's products. Also, inverters, which are required to turn raw energy into useable energy, will become stronger complements.

Buyer Power

Buyer power in the industry for solar energy is relatively strong. In the solar sector, the products are primarily differentiated on the basis of its cost/watt efficiency, which enables buyers to be very discriminating. In addition, there are minimal switching costs and no network economies locking customers to a particular brand. Also, there are relatively few buyers compared to the number of suppliers; First Solar generated over half of its revenue from sales to five clients in 2007. Finally, since the sale of solar panels is dependent on subsidies, "reduced growth in or the reduction, elimination or expiration of government subsidies, economic incentives and other support for on-grid solar electricity applications



could reduce demand for solar modules, leading to a reduction in net sales and adversely impact operating results"^{iv}. Overall, buyer power is strong, which is currently not a threat for First Solar because it currently has the cheapest \$/watt thin film panels.

Supplier Power

Supplier power in the thin film industry is also strong. First Solar faces intense competition from manufacturers of crystalline silicon solar modules, thin film solar modules and solar thermal and concentrated photovoltaic systems. If global supply exceeds global demand, it could lead to a reduction in the average selling price for photovoltaic modules. Also, the company manufactures its solar cells using a cadmium telluride compound, which is mainly produced as a by-product of copper refining and its supply is therefore dependent upon demand for copper. Currently, First Solar purchases these raw materials from a limited number of suppliers. If First Solar's current suppliers or any future suppliers are unable to perform under its contracts or purchase orders, operations could be interrupted or impaired. In addition, because suppliers must undergo a lengthy qualification process, First Solar may be unable to replace a lost supplier in a timely manner and on commercially reasonable terms. First Solar's supply of cadmium telluride could also be limited if any current suppliers or any future suppliers is unable to acquire an adequate supply of tellurium in a timely manner or at commercially reasonable prices. If competitors begin to use or increase their demand for cadmium telluride, supply could be reduced and prices could increase. If current suppliers or any future suppliers cannot obtain sufficient tellurium, First Solar could substantially increase prices or be unable to perform under its contracts. First Solar may be unable to pass increases in the cost of raw materials through to customers because customer contracts do not adjust for raw material price increases and are generally for a longer term than raw material supply contracts. A reduction in production could result in an inability to meet commitments under Long Term Supply Contracts, all of which would have an adverse impact on financial results.^V



Barriers to Entry

There are several barriers to entry in the solar power industry. One of the main barriers to entry is the vast amount of research and development required to be able to manufacture a competitive technology at a competitive price. Given the state of the economy and the vast number of solar power ventures already in progress, there is a limited amount of capital going towards new investments in solar technology.

However, recent government and cultural interest in the green technology and renewable energy make the solar sector attractive to new firms. In President Obama's stimulus package, there are several federal tax cuts and other measures intended to increase investment in renewable energy products. Incentives include^{vi}:

- A large sum for energy efficiency, including \$5 billion for low-income weatherization programs; over \$6 billion in grants for state and local governments; and several billion to modernize federal buildings, with a particular emphasis on energy efficiency.
- \$11 billion for "smart grid" investments.
- \$3.4 billion for carbon capture and sequestration demonstration projects (otherwise known as "clean coal"). \$2 billion for research into batteries for electric cars.
- \$500 million to help workers train for "green jobs."
- A three-year extension of the "production tax credit" for wind energy (as well as a tax credit extension for biomass, geothermal, landfill gas and some hydropower projects).
- The option, available to many developers, of turning their tax credits into direct cash, with the government underwriting 30 percent of a project's cost.

While a large amount of this money will most likely go to firms already operating in the solar sector, it is possible that the incentives will be strong enough for other companies to enter



the market, especially for firms that already have infrastructures in place to produce similar technologies.

SWOT

Strengths

- Cost-per-Watt Advantage: First solar company to break below \$1/watt, by far the cheapest thin film producer on the market.
- Replicable Production Facilities: Streamlined production process is easy to replicate, allowing First Solar to efficiently respond to increase in demand.
- Long Term Supply Contracts: Predictable sales make planning easy and also demand predictable.
- Good Cash Balance: First Solar's strong cash balance gives the company room to develop new technologies and weather any supply/demand fluctuations better than its competitors.

Weaknesses

- Raw Materials Suppliers: Most of the materials come from a few suppliers, so any interruptions in the supply-chain could have disastrous consequences for First Solar's production line.
- Dependence on Cadmium Telluride: Cadmium is a highly toxic material. Some governments have strict regulations on its use which may limit First Solar's ability to operate in some areas. Telluride is also a very rare metal, so there may be a limit to the number of solar panels First Solar can construct using the Cadmium Telluride compound.



Opportunities

- Expansion of Manufacturing Capacity: First Solar could build new plants, possibly in areas of the United States greatly affected by unemployment (i.e. Detroit) to have access to cheap, skilled labor and to meet market demand for solar panels.
- Growth of Photovoltaic Industry: The photovoltaic industry is thought to be largely untapped. First Solar has the opportunity to increase demand through lobbying efforts.
- Acquisition of an Inverter Producer: First Solar has the opportunity to create a synergy with an inverter producer that would lead to lower manufacturing costs and thus less expensive power.

Threats

- Third Generation Solar Panels: It is only a matter of time before third generation solar panels are able to be produced and applied efficiently enough to make second generation thin film cells, such as those produced by First Solar, obsolete.
- Threat from Competitors and Substitutes: The global photovoltaic industry consists of over 100 firms that manufacture solar cells and modules, which makes competition for First Solar intense. Also, any breakthroughs in alternative renewable energy solutions (solar thermal, wind, geothermal, tidal, hydro, biomass) might make thin film cells obsolete.
- Lack of government subsidies or other incentives: Currently First Solar's products are sold with the help of subsidies or other incentives; if these are taken away, First Solar's sales might suffer.



Financial Analysis

Profitability

Measures of Profitability									
				TTM=1 F	railing 12 iscal year	Months -end:12			
	2004	2005	2006	2007	2008	TTM			
Return on Assets %	-45.7	-9.0	1.2	16.2	20.0	20.0			
Industry Rank	76	65	13	9		9			
Return on Equity %	-77.6	-36.1	1.9	21.0	26.7	26.7			
Industry Rank	92	69	22	9		9			
Industry Rank (100=Worst)									
ROE Breakdown									
Net Margin%	-124.0	-13.4	2.9	31.4	27.9	27.9			
Asset Turnover	0.4	0.7	0.4	0.5	0.7	0.7			
Financial Leverage	1.8	7.8	1.4	1.2	1.4	1.4			

Table 2

Source: Morningstar

First Solar has been able to establish an industry competitive return on assets and return on equity (20% and 26.7% in 2008, respectively). Before 2005, First Solar was unprofitable, but since then the company has been able to consistently earn increasing and substantial profits. Both return on assets and return on equity have grown, propelling First Solar to become the leader of the industry and making it one of the most valuable solar company stocks. Also, the company's increasing return on assets and return on equity reflect its increasing efficiency in being able to turn investor's money into net income. First Solar's asset turnover is relatively high; it has been able to push its products to meet market demand without overcrowding its warehouses. This high asset turnover is partly due to the subsidization of solar power, but it is also due to the fact that First Solar is the leader among



its peers and has a competitive product. Even in the bad financial times of 2008, First Solar has been able to keep asset turnover stable.

Solvency and Liquidity

Measures of Solvency and Liquidity								
	2006	2007	2008	Qtr				
Long-Term Debt \$Mil	61	69	164	164				
Total Equity \$Mil	411	1,097	1,513	1,513				
Debt/Equity	0.1	0.1	0.1	0.1				
S&P 500	0.9	0.9		0.9				
Financial Leverage	1.4	1.2	1.4	1.4				
S&P 500	4.0	4.2		4.9				
Current Ratio	7.5	4.4	2.8	2.8				
S&P 500	1.7	1.7		1.7				

Table 3

Source: Morningstar

First Solar approached the financial downturn with a healthy stock of cash, which has helped position them perfectly for entering the current financial situation. In 2008 the company increased its cash balance by \$311 million to \$716 million. First Solar's major competitor Evergreen Solar ended 2008 with a cash balance of \$29 million; SunPower ended 2008 with a cash balance of \$200 million. Relative to First Solar, other solar companies are strapped for cash and are having trouble finding demand for their products while First Solar's good cash balance and competitive product has enabled them to expand its business in bad times (see Table 3). First Solar is in the position to continue expansion through vertical or horizontal integration. First Solar has also made an aggressive effort to keep its debt/equity ratio low and has managed to secure the lowest ratio among its competitors. This puts the company in a strategic position to weather future economic downtown.



Stock Performance

First Solar has consistently outperformed industry averages and the S&P 500, as well as several Renewable Energy and Solar ETFs (the Claymore/Mac Global Solar Index aims to capture the performance of the solar industry, while the PowerShares WilderHill Clean Energy ETF tracks the performance of the entire renewable energy sector).



Figure 1vii

Claymore/MAC Global Solar Index – NYSE:TAN (Green) PowerShares WilderHill Clean Energy – NYSE: PBW (Orange) First Solar – FSLR (Blue) S&P 500 Index – (Red)

First Solar seems to be trading within a set price range which could be an indication of the cyclicality of the solar industry. First Solar recently expanded into producing modules for commercial and residential rooftop solar power plants and may want to continue diversifying its product line to continue growth.



Strategic Recommendations

Strategic Recommendation One: Lobby Governments to Invest in Solar Energy

Given that renewable energy accounts for such a small percentage of total energy around the world (and makes up less than 1% of total energy used in the United States), First Solar has the opportunity to lobby both state governments and various world governments to ensure the company benefits from shared enthusiasm for renewable energy. State Governments have recently taken an active role in increasing energy efficiency and creating more green energy by providing various incentives to residents and businesses. As of early 2009, forty-five states had at least one incentive for investments in renewable energy, and some states had as many as 9 (See Table 4).

State Incentives for Green Initiatives ^{viii}							
			Low				
	Renewable	Energy	Emission	Alternative	Green Transport		
	Energy	Efficiency	Vehicle	Fuel	Infrastructure		
Number							
of States							
Providing	45	24	22	36	24		
Incentives							

Table 4

At the federal level, President Obama has also expressed a strong interest in making renewable energy both a short term and long term priority for his administration. Congress approved new tax benefits for making homes more energy efficient, including up to \$3500 in tax breaks for installing photovoltaic systems in a home. There is likewise a strong international interest in fostering the growth of the renewable energy industry. Japan and



China have also recently announced large subsidies geared towards stimulating investments in renewable energy.

For example, the German government has fixed the price of solar energy at a high level for the next decade, which has created an incentive for citizens to install panels on their property and sell the energy they produce back to the grid. While this has made energy in Germany very expensive, the country expects to have nearly 30% of its energy from renewable sources by the year 2015. Although it is doubtful that the United States or other world governments would be amenable to such drastic legislation, there is certainly room to create incentives other than tax breaks for investing in solar technology. Since First Solar has the cheapest \$/watt modules, the company can make a strong case from a cost perspective to secure government contracts to develop more green energy. Oasis Consulting recommends that First Solar accomplish this by promoting its commercial rooftop solar power plant systems to local and state governments to build installations on municipal buildings. Lobbying in such a manner will help First Solar secure contracts and drive up its revenues in the shortterm.

Strategic Recommendation Two: Invest in Research and Development in order to Transition Away From Using Cadmium Telluride

In addition to lobbying the government, First Solar should begin making preparations for transitioning from production of second generation solar cells to third generation cells or some substitute technology. There are three generations of solar cells. The first generation of cells requires high labor inputs and produces low power outputs, making that generation of cells less cost effective than other solar solutions. Second generation cells are based on thin film technology (like First Solar's cadmium telluride photovoltaic cells). They are generally less efficient than first and third generation cells but are currently the cheapest to produce. Third generation solar cells are a group of technologies in development that aim to enhance the poor electrical performance of second generation solar cells while maintaining



very low production costs. Current research is targeting conversion efficiencies of up to 30-60% while retaining low cost materials and manufacturing techniques.^{ix} With third generation cells projected to be cheaper and more efficient than current technologies, it is likely that all second generation cells, including First Solar's products, will be unable to compete when they enter the market.

Also, as mentioned earlier, First Solar uses a proprietary technology in its photovoltaic sales that has enabled the company to have the cheapest production of solar cells in the world. This technology is based on the usage of cadmium telluride, a compound made from cadmium and tellurium. Although the usage of this material has initially placed First Solar ahead of its competition, in the near future it may prove to be a major caveat in First Solar's production process.

Cadmium is a toxic chemical element that is dangerous for the environment. It is one of six substances banned by the European Union's Restriction on Hazardous Substances (RoHS) directive, which bans certain hazardous substances in electronics. Even though First Solar's panels contain a small amount of the substance, the company has chosen to implement a costly recycling program to collect and properly dispose of the cadmium in the solar cells. Telluride is a compound of tellurium, one of the nine rarest metals on earth. The year-end price for tellurium in 2004 was US\$13 per kilogram. In more recent years, the price of tellurium has been driven up by increased demand, causing prices to reach an estimated high of US\$215 per kilogram in 2008.^x Even if second generation cells do not become obsolete in the short-term, the rising price of tellurium and the toxicity of cadmium are strong enough reasons for First Solar to invest in different materials and technologies to produce solar modules.

Strategy Recommendation Three: Invest In New Talent

First Solar's success in recent years has given the company a valuable cash balance. As mentioned earlier First Solar recently acquired Optisolar. This acquisition is right on track with Oasis Consulting's recommendations for the company. In addition to giving First Solar access to Optisolar's project pipeline and solving any over supply problems, the deal also gave First Solar access to the talent behind Optisolar's technology. First Solar should continue to exploit its advantageous cash position by acquiring new talent. This will keep the company ahead of its competitors and ensure that it remains the leader of the industry.

Strategy Recommendation Four: Diversify Product Line

First Solar has taken on considerable risk by focusing all of its efforts on the perfection of a single product in a market filled with many young competing technologies. In order to address this risk, we recommend that First Solar diversify its product line. Oasis Consulting recommends First Solar achieves this by focusing on generating more sales of its new commercial and residential rooftop solar power plant product lines, which the company has begun doing through a partnership with SolarCity. Another method to diversify is to create a synergy with technologies related to solar panels. Solar panels harness energy from the sun, but in order to use the energy, an inverter is needed to change direct current into alternating current. In addition to being used with solar panels, inverters are also used with wind power and other forms of electricity generation. Since First Solar recently began expanding its product line to include residential rooftop solar power plants, more inverters will be needed with each installation. An investment in an inverter company will allow First Solar to diversify its risk, as there are multiple uses for inverters, and enable First Solar to tie in sales of its inverters with sales of its solar modules to drive down production costs. The company can either take advantage of the lower costs through increased profit margins or it can offer discounts to customers in order to expand its sales.

Final Thoughts

First Solar is a strong company whose success is expected to continue into the near future. As the economy continues to suffer, First Solar will likely emerge as one of the few standing thin-film producers. In the short-term, First Solar will benefit from aggressive lobbying to ensure that its products receive the most subsidies from world governments as possible. In



the long-term, the company must diversify its product line and invest in third generation solar cells before second generation cells become obsolete. If First Solar implements the aforementioned suggestions, it will continue its growth and remain as an industry leader for years to come.

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