

William Graves
June 10, 2012
Business Policy and Strategy
Professor Fowler

Industry Analysis: Commercial Scale Photovoltaic Developers

Introduction

Leaps in technology, combined with government subsidies and an increase in industry expertise have led to the exponential growth of the renewable energy industry. The solar industry specifically grew from an industry valued at \$6.5 billion in 2000 to \$91.6 billion in 2011. Falling manufacturing costs for photovoltaic (PV) solar modules has dramatically reduced the installed cost per watt, and the economics of the industry are such that achieving grid parity will be a reality instead of a pipedream. Despite many roadblocks that face the commercial scale PV industry, the industry is poised for continued growth due to falling technology and installation costs, increased standardization and securitization of projects, and a rise in consumer demand for renewable energy.

Commercial scale PV developing is a nascent industry, with no one firm dominating the entire market. Currently, the largest firms in this space include SunEdison, SunPower, SPG Solar Inc., Solar City, and REC Solar. Competition in this industry is stiff and constantly evolving. Industry analysts point out that technological innovation is not the only way to gain the upper hand, constant business model innovation is also a major key to competitive growth in this young industry.¹ Firms operating in this space are still working to find the right business model to fit their strategy and meet their overall goals.

¹ Pentland, William. Forbes, "Skyline Innovations Bets Big on Better Business Models." Last modified June 06, 2012. Accessed June 11, 2012. <http://www.forbes.com/sites/williampentland/2012/06/03/skyline-innovations-bets-big-on-better-business-models/>.

Commercial scale PV developers specialize in the construction of large-scale PV installations. In order to build commercial scale systems, the developers must work with module manufacturers (suppliers), investors/financiers, government agencies, and utility companies. The process for taking a project from the planning stages all the way through to completion is arduous, and bringing a project online is no small feat. Developers must acquire permitting and government clearance for their installations, find an investor willing to finance the project, negotiate investing terms to which both parties can agree, enter into a long term contract with a utility company for the sale of electricity (these are known as power purchase agreements or PPAs), and work with module manufacturers to ensure the delivery of high-quality solar panels. Once the developer completes these steps, the company must still install the system and usually maintain the system over the life of the project (between 20 and 30 years). These installations begin at around 1 MW in size and top out at around 5 MW.

History of the Industry

In 1954 Bell Labs produced the first solar cell which produced useful quantities of electricity, and by 1958 they were being used for small commercial and scientific applications. However, it was not until the oil crisis of the 1970s that interest in the large scale use of solar began to grow. Extremely high prices hindered the growth of the industry and more economical solar hot water heaters became the first choice of renewable energy consumers. Despite this development, the interest in solar PV development generated during this period sparked a cycle of research and cost reduction which continues through to today.² It wasn't until the early 2000s that solar energy began to make economic sense (with

² Solar Energy Industries Association, "About Solar Energy: History." Accessed June 17, 2012. <http://seia.org/cs/history>.

government incentives) for residential and commercial applications.³ After 2000, both state legislatures and the national government began implementing incentives which promoted the growth of solar. These policies helped lead to dramatic reductions in costs as well as the increased implementation in key states across the nation. These states benefited from not only national level incentives, but robust state incentives such as generous Renewable Portfolio Standards (RPS) programs with solar specific carve-outs. RPS Solar carve-outs are a policy tool that states use to encourage the growth of higher-cost renewable energy technologies. They mandate that solar installations contribute a certain percentage to a utility's overall RPS goals.

The combination of state and national level incentives made the construction of solar very attractive in certain markets, primarily New Jersey and California. It is out of these two markets that the solar industry has grown, achieving a very diverse geographic presence within the United States. As costs drop, the growth of solar will continue to increase and the energy flows solar installations produce will be a presence in our everyday lives.

Current Industry Conditions and Recent Trends

After the financial crisis of 2008, the solar commercial development industry began a rapid recovery as both federal and state level policies encouraged growth. Projects were constructed at an unprecedented rate and many new competitors entered into the market. Additionally, the expanding flow of cheap Chinese solar panels made the construction of a solar installation cheaper than ever. Solar installations saw their highest growth, and second-

³ Solar Energy Industries Association, "The History of Solar Energy: A Look at the Uses of Solar Energy from BC to ITC." Accessed June 17, 2012. http://www.seia.org/galleries/FactSheets/Factsheet_solar history.pdf.

highest growth in Q4 2011 and Q1 2012 respectively, however the nascent industry is not without many obstacles and challenges.⁴

2011 was a year of explosive growth within the commercial PV industry and the first quarter of 2012 indicates that developers may be in the midst of another record year. Last year commercial developers installed a record 800 MW of capacity across America.⁵ This represents 127% growth over 2010, and large traditional energy players such as Exelon and NRG Energy began to enter into the space as equity investors. Further, installed prices fell 13.9% from 2010 to 2011, making it easier and faster to regain a company's initial investment through incentives and the sale of electricity.⁶ Industry experts predict 2012 to be another excellent year of growth, with projections forecasting 3200 MW of additional installed PV capacity with the commercial development space being responsible for most of that growth.⁷ This is excellent news as developers work quickly to take advantage of government incentives and market optimism among investors.

The confluence of several important factors made this growth possible. According to industry experts, 2012's optimistic forecast is due in large part to "greater-than-expected first quarter growth in the New Jersey commercial market, the number of safe-harbored projects that will still qualify for the U.S. government's expired 1603 Treasury Program, and overall positive outlooks for the California, Massachusetts and Hawaii markets."⁸ Currently New Jersey and California have the most mature state level incentive regimes. However, states

⁴ Sustainable Planet, "U.S. Solar Installations Surge Despite Industry Challenges." Last modified June 18, 2012. Accessed June 18, 2012. <http://www.sustainableplant.com/2012/06/u-s-solar-installations-surge-despite-industry-challenges/>.

⁵ Solar Energy Industries Association, GTM Research, "U.S Solar Market Insight Reports." Accessed June 18, 2012.

⁶ Solar Energy Industries Association, GTM Research, "2011 Year-In-Review." Accessed June 19, 2012.

⁷ Koller, Jocelyn. Green Chip Stocks, "Solar Growth Report 2012." Last modified June 18, 2012. Accessed June 19, 2012. <http://www.greenchipstocks.com/articles/solar-growth-report-2012/1976>.

⁸ Sustainable Planet, "U.S. Solar Installations Surge Despite Industry Challenges." Last modified June 18, 2012. Accessed June 18, 2012. <http://www.sustainableplant.com/2012/06/u-s-solar-installations-surge-despite-industry-challenges/>.

such as Massachusetts, Hawaii, Arizona, and Colorado are beginning to emerge as viable solar markets as well. This is good news for solar developers as they move into these markets, take advantage of the state incentives available, install capacity, and reap the profits. Further, about 1 GW of modules and inverters were “safe-harbored” at the end of 2011, and therefore still eligible to qualify for the currently expired 1603 Cash Grant Program. This program allows for renewable energy system owners to apply for a cash grant which covers 30% of the system cost.⁹ Although the 1603 Cash Grant Program expired at the end of 2011, its repercussions will still be felt throughout all of 2012. Due to these factors solar commercial developers should see record breaking growth, even in the face of serious problems with which the industry must soon contend.

Despite the incredible growth of the solar industry over the last two years, the commercial developing industry faces many obstacles which may hinder expansion. First and foremost, developers must begin to position themselves for operation in a post-subsidy world. Although not the only national level incentive, the 1603 Cash Grant Program was a boon to the industry nationwide, and Congress let it expire in late 2011. The 1603 Cash Grant Program encouraged rapid solar growth by helping to make the economics attractive to developers and investors alike. In the wake of the 1603 Cash Grant, developers and investors are now looking to tax equity financing as one way to take advantage of national incentives in addition to relying on state level incentives for additional support. Tax-equity financing is problematic for developers because it adds significant complications to any deal and raises transaction costs. As a result, many commercial developers will have the capacity and capability to create new projects, but only a few will be effectively financed, creating a

⁹ Sol Systems, LLC, "Life After the 1603 Grant: The Road Ahead." Last modified November 2, 2011. Accessed June 19, 2012.

development bottleneck through at least 2013.¹⁰ Some companies are already lining up tax-equity investors for the next year while others are working to safe-harbor as many modules and inverters as possible. However, many small to medium sized companies will be shut out of the tax-equity sprint and these firms will likely be bought by larger companies, or pushed out of the market. According to reports, the industry was able to safe-harbor around 1 GW of components in the last quarter of 2011 to which the 1603 Cash Grant Program still applies. These components will be allocated to different projects throughout the year and will certainly help bridge the gap between the number of projects in the development pipeline and the number of projects which will actually be invested in and completed.¹¹

Another problem facing the solar commercial development industry is the lack of standardization. There currently is no one recognized way to finance and complete deals for commercial solar projects. Each state has different incentives, each developer has different documentation, and each investor has their own preferences as to how risk should be mitigated or avoided. The industry-wide lack of standardization is having a detrimental impact on solar commercial developers as it can affect whether a project receives financing. Investors typically try and avoid projects which will require costly contract rewrites, no matter the underlying economics and profitability.¹² Companies such as Sol Systems, LLC are working to remedy the project finance space by providing standardized project risk underwriting contracts as well as a project marketplace (SolMarket) where investors can shop

¹⁰ *ibid.*

¹¹ Sustainable Planet, "U.S. Solar Installations Surge Despite Industry Challenges." Last modified June 18, 2012. Accessed June 18, 2012. <http://www.sustainableplanet.com/2012/06/u-s-solar-installations-surge-despite-industry-challenges/>.

¹² Yonkin, Dan. Sol Systems, LLC, "Securitization of Commercial Solar Projects." Last modified April 17, 2012. Accessed June 20, 2012. <http://www.solssystemscountry.com/blog/2012/04/17/securitization-of-commercial-solar-projects/>.

developer projects.¹³ Further, SolMarket is beginning to rate projects based on riskiness and group them into asset classes. This first step toward standardization and securitization is necessary if commercial solar developers are to reduce the soft costs associated with project development as well as encourage further investing in commercial projects.

Globalization has had a profound and unique impact on the solar industry as supply chains, development pipeline, and financing are all impacted by this trend. The supply chain of the solar industry is very integrated into the global marketplace. This has a noteworthy impact on module prices, as cheap Chinese foreign panels greatly reduce the cost of an installation. The supply chain is very “sliced-up” as components, inverters, and modules are manufactured all over the world (including within the United States) and shipped to the location at which they will be assembled and installed. In addition to this, many investors and companies are not averse to working in foreign countries if the incentives and markets are mature enough to support the development of a commercial system. Globalization has made it easier than ever to collaborate on projects with overseas financiers or developers.

Internationally, the United States is still considered an emerging market. If U.S. developers meet projections, the nation will become the fourth largest PV market with 11% of the market share worldwide. However, the United States’ growth in the international solar market is not without consequences. America’s recent success makes it an attractive place for foreign direct investment and the more experienced European investors (relative to those based in the US) will be quick to snap up American projects.¹⁴ American commercial solar developers are likely to maintain a competitive advantage for a time because they are

¹³ Sol Systems, LLC, “SolMarket.” Accessed June 20, 2012. www.solmarket.com.

¹⁴ Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 20, 2012.

intimately familiar with the competitive landscape in addition to the local and state level incentives available. However, Europeans are more experienced within the space and are currently operating at a much lower installed cost per watt than their American counterparts. For example, the Germans currently boast an installed cost per watt at around \$2.24, while the US average for commercial installations still hovers around the \$4.40 mark.¹⁵ A rush of European investors should force down the soft costs of projects over time, leading to a reduction in overall costs. Similarly, American investors and developers are also making their way abroad as they develop projects located in various international markets.

American territories and Caribbean Islands are the current hotspot, but as industry expertise grows, developers may be able to branch out even further. In many places in the Global South solar energy is already at or below grid parity. Globalization's impact on the solar industry is great as it impacts supply chains, international investing flows, and where projects are developed. As globalization continues, there will certainly be even more international linkages in the commercial solar development industry.

Analysis of the General Environment

There are many factors and trends at work both for and against the solar industry in the general environment. Although these aspects of the general environment are external relative to the industry, their implications can have deep ramifications for those working within the solar commercial development space. Economic, technological, political-legal, and

¹⁵ Wesoff, Eric. Green Tech Media, "German Solar Installations Coming In at \$2.24 per Watt Installed, US at \$4.44." Last modified June 19, 2012. Accessed June 20, 2012. <http://www.greentechmedia.com/articles/read/German-Solar-Installations-Coming-in-at-2.24-Per-Watt-Installed-U.S-at-4/>.

sociocultural factors are all at play, and must be considered when analyzing the general environment and its influence on the industry.

The political-legal landscape of the United States is one of the most impactful external factors on the solar industry. A lack of national incentives exists today because of party politics and gridlock within Congress. Further, Congress has recently allowed the expiration of several solar incentives which were crucial to driving forward the growth of the industry. Most notably among these is the 1603 Cash Grant Program.¹⁶ Luckily, at least some state legislatures are taking action despite the political halt in our nation's capital. These states, such as California, New Jersey, Massachusetts, and others have passed legislation to promote the continued growth of the industry.

Another important political-legal trend to keep in focus is the growth of supranational environmentalism as well as the rise of powerful international fossil fuel lobbies. On June 22nd, 2012 a worldwide environmental conference, Rio +20, concluded with no clear action plan on how the countries of the world can improve their sustainability and eco-friendliness.¹⁷ Many believe this occurred because vested business interests, such as the fossil fuel lobby, hijacked the meeting and inserted their own agenda.¹⁸ Those working within the solar industry must be aware of the forces working both for and against them in the political-legal environment. Lobbies are working to stay relevant as the businesses they represent are threatened by the rise of the solar industry and the government at the national level is unwilling at this time to add additional incentives to the scant few already in place.

¹⁶ Sol Systems, LLC, "Life After the 1603 Grant: The Road Ahead." Last modified November 2, 2011. Accessed June 19, 2012.

¹⁷ Harris, Richard. NPR: National Public Radio, "Rio 20 Summit Sustains Little More Than Sentiment ." Last modified June 23, 2012. Accessed June 24, 2012. <http://www.npr.org/2012/06/23/155619036/rio-20-doesnt-get-further-than-vague-declaration>.

¹⁸ Confino, Jo. "Rio 20: the Earth Summit diaries, Friday 22 June." *Guardian* [London] 22 June 2012, n. pag. Web. 24 Jun. 2012. <<http://www.guardian.co.uk/sustainable-business/rio-20-earth-summit-diary-22-june1?newsfeed=true>>.

The commercial solar developing industry is not immune to macroeconomic trends, and these have sometimes helped, but also hurt the growth of the industry in recent years. One major factor that hurt the growth of the industry was the Great Recession of 2008/2009. Nations worldwide cut back their solar incentives programs in an effort to redirect the spending to other portions of their economies.¹⁹ This led to a global slowdown in solar development and greatly hurt the manufacturers who supply the industry. However, the industry has bounced back since 2009 and posted record years of growth in both 2010 and 2011.²⁰

The shale gas boom in the United States is another very important economic trend that may greatly impact the solar commercial development industry. Over the past few years liquid natural gas has grown in popularity among both consumers and energy providers. Industry experts such as Scott Sklar see the rise of natural gas as a necessary step toward a renewable energy future.²¹ However, the glut of natural gas is currently negatively impacting the solar industry because investment in the solar industry is being redirected to natural gas.²² Further, natural gas is very cheap and an attractive substitute. It's still too early to determine exactly how large of an impact the natural gas boom will have on the solar industry, but it has the potential to be very devastating.

Technological changes in the general environment also have an impact on how the industry develops and grows over time. Improvements in solar panel manufacturing

¹⁹ Osborne, Mark. PV Tech, "Major market decline forecasted for the solar industry in 2009, according to iSuppli." Last modified April 17, 2009. Accessed June 24, 2012. http://www.pv-tech.org/news/major_market_decline_forecasted_for_the_solar_industry_in_2009_according_to.

²⁰ Solar Energy Industries Association, GTM Research, "2011 Year-In-Review." Accessed June 19, 2012.

²¹ Sklar, Scott. "A Renewable Energy Future? What will it look like in 2030?." American University. Washington, DC. 7 March, 2012. Lecture.

²² Lesser, Adam. GigaOM, "How the natural gas craze will impact renewable energy." Last modified March 27, 2012. Accessed June 24, 2012. <http://gigaom.com/cleantech/how-the-natural-gas-craze-will-impact-renewable-energy-2/>.

techniques and increases in efficiency have the potential to greatly reduce the cost of solar installations over time. Research labs all over the United States are working to improve panel efficiency and increase the amount of electricity each panel sends to the grid. Beyond this, manufacturing businesses are innovating new techniques for cutting silicon and creating panels more cheaply than ever before. Recently a new process for cutting crystalline silicon blocks into very thin sheets was unveiled in the United States, resulting in panels that can be produced for as low as 50 cents per watt (projected). At this price, these panels can compete with hydrocarbons without subsidies or feed-in tariffs.²³ Advances in the general technology environment are very important to the continued growth of the commercial solar development industry, especially as developers move into a post-subsidy era.

Finally, the importance of sociocultural factors cannot be ignored as they also can impact the commercial solar developing industry. The rise of the Green Movement and the increased importance people put on living sustainably is having a huge impact on the growth of the solar industry. One important growth driver is the USGBC's LEED rating system, which promotes the construction of renewable energy on a building's site or purchasing green energy through various green energy purchasing programs.²⁴ Additionally, people are taking action in support of solar energy by calling their local legislators and asking them to create regulations which favor the industry. These lifestyle and belief changes all have had a positive net effect on the growth of the solar industry and should continue to encourage growth within the industry for many years.

²³ Anthony, Sebastian. Extreme Tech, "Solar panel made with ion cannon is cheap enough to challenge fossil fuels." Last modified March 13, 2012. Accessed March 13, 2012. <http://www.extremetech.com/extreme/122231-solar-panels-made-with-ion-cannon-are-cheap-enough-to-challenge-fossil-fuels>.

²⁴ United States Green Building Council, "LEED for New Construction and Major Renovations." Accessed June 24, 2012. <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>.

There are trends in the general environment working both for and against the solar industry. These trends range from anti-solar lobbying firms, to macroeconomic recessions, to important improvements in technology. The factors at play in the general environment are important and those working in the commercial solar development space must note them in order to mitigate threats and take advantage of the external opportunities.

Analysis of Industry Structure

The structure of the solar commercial development industry is unique in that there are several large firms in the market, but there are also a plethora of small and medium sized enterprises vying for market share as well. Utilizing Porter's Five Forces, one can quickly analyze and understand many of the underlying mechanisms driving industry shifts and strategy. Currently, the industry is very attractive due to high barriers to entry, generous government handouts, a lack of bargaining power among suppliers, and the relative lack of rivalry among existing firms.

One very attractive element of the commercial solar development industry is the general lack of bargaining power among suppliers worldwide. After the rapid growth of the industry between 2000 and 2008, suppliers greatly expanded their production as the cost of modules, inverters, and components began to fall. This led to complete international oversupply, threatening the future of dozens of manufacturing companies, in addition to simply putting many out of business.²⁵ At the same time, the weakening demand for modules in Europe, the largest solar market worldwide, further hindered both the sales and bargaining

²⁵ Sustainable Planet, "U.S. Solar Installations Surge Despite Industry Challenges." Last modified June 18, 2012. Accessed June 18, 2012. <http://www.sustainableplanet.com/2012/06/u-s-solar-installations-surge-despite-industry-challenges/>.

power of suppliers.²⁶ Due to these factors, there is now a huge surplus of panels in the marketplace, forcing manufacturers to heavily discount their product in order to sell them to developers.²⁷ The oversupply in the panel markets is a huge boon to developers as they can now buy panels (easily the greatest expense associated with construction) at lower prices than ever before. This phenomenon is greatly spurring the growth of the industry and one of the reasons behind the rapid increase in installed capacity nationwide.

Another force which improves the allure of the commercial solar developing industry is the relatively high barriers to entry. The industry is very capital intensive in that it requires large expenditures on panels, inverters, and components in order to build a commercial solar installation. Depending on the financing structure of the project, the installation may remain on the firm's balance sheet for up to 30 years. All of the initial capital expended in its construction will be tied up as returns are steadily realized over the life of the installation.²⁸ However, with solar panels forecast to continue their rapid drop in price, barriers to entry will also be lowered as more competitors will be able to afford the capital outlays associated with industry entrance.

Human capital requirements also pose a significant obstacle to industry entry. Developers looking to get into the commercial solar industry must hone their expertise in navigating different incentive structures as well as strategies for risk mitigation if they are to be successful. According to one report, "Most existing industry participants have experience

²⁶ SolarTown, "<http://www.solartown.com/community/news/view/solar-manufacturers-cut-output-as-solar-panel-oversupply-continues/>." Last modified October 26, 2011. Accessed June 23, 2012. <http://www.solartown.com/community/news/view/solar-manufacturers-cut-output-as-solar-panel-oversupply-continues/>.

²⁷ Franzen, Carl. TPM Idea Lab, "Report: U.S. Solar Power Shines, Will Increase 75 Percent This Year." Last modified June 15, 2012. Accessed June 23, 2012. <http://idealab.talkingpointsmemo.com/2012/06/report-us-solar-power-shines-will-increase-75-percent-this-year.php>.

²⁸ Bollinger, Michael. Lawrence Berkeley National Laboratory (University of California), "Financing Non-Residential Photovoltaic Projects: Options and Implications." Last modified January, 2009. Accessed June 23, 2012. <http://escholarship.org/uc/item/9xp274dr>.

putting together solar projects abroad, where favorable government legislation has led to dramatic increases in solar output. New firms that lack expertise will have a hard time navigating how to start a firm in this industry.”²⁹ Based upon this analysis, it is clear that barriers to entry do exist, making it an attractive industry for either those currently working in it, or those with enough resources to hurdle the barriers. However, the barriers are quickly falling, and this will hurt the overall profitability and attractiveness of the industry as more competitors enter the space.

The lack of strong rivalry among firms is also hugely beneficial to those working within the commercial solar development industry. Certainly competition is stiff, but not any more so than another industry. One reason behind this is the geographic diversity across the United States in terms of incentives. Only the largest commercial solar developers have the resources and are capable of navigating all of the different state markets. Further, many solar developers like to carve out a niche in which they hone their expertise. This can be illustrated by a developer gaining lots of market share and projects within a particular state or within a certain size segment of projects (i.e. focusing only on projects in the 100-500 kW range).³⁰ However, the largest competitors in the industry generally work across all project sizes and all “hotspot” states. The main competitors include Tioga, Borrego Solar, SunPower, SunEdison, SPG Solar Inc., and Solar City. Interestingly, many of these companies are transitioning to roles as investor/developers. An investor/developer works with various developers within the industry to finance their project and help get the project constructed.³¹ The company most

²⁹ Molavi, Justin. American Bankers Association: Commerical Insights, "Sunny Days for Solar Power in the United States." Last modified July, 2011. Accessed June 23, 2012. <http://www.ibisworld.com/Common/MediaCenter/Solar-ABA-Article.pdf>.

³⁰ "Top 8 Project Developers/EPCs." (2012): n.pag. *Energy Acuity*. Web. 23 Jun 2012. <<http://web.energyacuity.com/Subscriber/Start.asp&xgt;>.

³¹ Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 20, 2012.

heavily involved in this trend is SunEdison as they are working to finance projects large and small through the United States.³²

The threat of substitute products does pose a serious problem to those working in the commercial solar space, and can be seen as a major detractor of the industry. Not only do other forms of renewable energy pose a threat to the solar industry (wind, biomass, geothermal, and microhydro), but more conventional and institutionalized forms of energy (coal, nuclear, natural gas, and oil) also greatly impact what occurs in the solar space. All of these forms of energy are in essence substitutes for solar energy. Further, most of them have much lower installed costs per watt and therefore provide cheaper electricity to our nation's energy matrix. In this respect, the commercial solar development industry faces an uphill battle as competitors outside of the industry pose a huge threat to the viability of the industry itself. Because of this, incentives such as investment tax credits (ITCs) and production tax credits (PTCs) in addition to state-level policies such as RPS with solar carve outs are so vital to the survival and growth of the industry.³³ The incentives are not going to last forever, and if solar energy does not achieve grid parity by the time solar incentives dry up, it may spell the end of solar energy within the United States.³⁴ Clearly the impact of substitutes is dangerous for firms within the industry, and they must constantly work toward achieving grid parity and mitigating the risks associated with relying on government incentives for support.

Regardless of the future of government incentives, today they are integral to the growth of solar in that they reduce energy buyer's power over solar developers. Normally, a utility company would produce and then distribute whichever type of energy is cheapest.

³² "SunEdison: Projects." (2012): n.pag. *Energy Acuity*. Web. 23 Jun 2012. <<http://web.energyacuity.com>>.

³³ Molavi, Justin. American Bankers Association: Commerical Insights, "Sunny Days for Solar Power in the United States." Last modified July, 2011. Accessed June 23, 2012. <http://www.ibisworld.com/Common/MediaCenter/Solar-ABA-Article.pdf>.

³⁴ Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 20, 2012.

Today, that is generally a mix of coal and natural gas, although nuclear and hydro energy also supply a significant amount of energy to the grid. However, state RPS requirements with solar carve outs force utility companies to purchase a certain amount of solar energy for grid distribution. If the utility company fails to meet the specified amount (generally given as a percentage of overall energy sales), the utility company must pay an alternative compliance fee (ACP).³⁵ Policy mechanisms such as RPS requirements greatly hinder the buying power of utility companies as the government forces them to purchase or support a certain amount of solar electricity every year. A weakening in the power of buyers is good for the commercial solar development industry, and developers are able to either negotiate higher Power Purchase Agreements (PPAs) with the utility or obtain higher values for the solar renewable energy credits (SRECs) produced by their installation. Again, the hand of the government can be seen as it attempts to spur the growth of the solar industry. The lack of power among buyers over solar energy developers is instrumental in making this industry much more attractive and lucrative.

After using Porter's Five Forces to analyze the industry, it appears to be not quite as competitive as one might first expect. Solar developers have relative power over both buyers and sellers and government incentives help to make projects more feasible and economical. Intra-industry competition remains high, but not any higher than most other industries. Finally, barriers to entry are also high, although they are coming down quickly. However, the industry may become much more competitive in the next few years as government incentives begin to disappear and developers are required to become much more competitive with each other. Moreover, small and medium sized enterprises are likely to be bought out by much

³⁵ Database of State Incentives for Renewables and Efficiency, "Current RPS Data." Last modified May, 2012. Accessed June 23, 2012. <http://www.dsireusa.org/rpsdata/index.cfm>.

larger energy companies if it can be shown that their industry expertise and business model is valuable. One must also be sure to note the looming threat of substitutes and their potential to destroy the industry. Despite this, today's solar industry is both attractive and profitable. Additionally, many believe it still has its best years ahead.

The Future of the Solar Industry

If the correct policy structures are in place, the solar industry should see continued growth and success. Increased international cooperation and collaboration will help bring down installation costs and technology diffusion. Further, as new markets are tapped the number of project host sites upon which investors and developers are willing to construct. In addition to this, drops in technology costs and soft costs should further spur the growth of the industry. However, to truly predict the nature and scope of future growth one should analyze how the decentralization of communications occurred over the last two decades. Former SEIA president Scott Sklar likens the rise of solar to the rise of cell phones or personal computers and their respective roles in today's society.³⁶

Initially, all communications were centralized and based around land lines. The same is true for computers in that there were a few mainframes at certain universities and businesses around the nation. Both technologies were originally highly centralized, but as advances made it possible to use these technologies "on the go", the entire paradigm began to shift. The Information Age arose out of the shift from a centralized model to a distributed model. The shift was powerful, revolutionary, and changed the way billions of people live and work. It's not a far stretch to apply this concept and its potential implications to the energy

³⁶ Sklar, Scott. "A Renewable Energy Future? What will it look like in 2030?." American University. Washington, DC. 7 March, 2012. Lecture.

industry. Citing this paradigm, energy and economics expert Jeremy Rifkin describes a powerful distributed energy network, akin to how a network of computers works together to store and transmit data.³⁷

Currently the energy industry is highly centralized as a few hundred large power plants deliver energy to millions of customers across America. However, many believe that the nature of energy is not centralized, but instead distributed. If this is the case, the solar industry is poised to be one of the fastest growing, most profitable industries in recent history. Energy expert Jeremy Rifkin envisions a fundamental economic shift arising out of this paradigm shift which he calls the “Third Industrial Revolution”. He foresees a fundamental economic shift where millions of homeowners, businesses, and buildings begin producing their own energy through various forms of renewable energy. In essence, each producer is only a small energy player, but combined they have the potential to radically change how energy is produced and at a significantly smaller environmental and economic cost than current energy production.³⁸ Solar energy and commercial developments in particular are certain to be a part of this provocative future.

If the predictions made by renewable energy experts are even half true, then the commercial solar developing industry is on the edge of rapid expansion and growth in relation to its importance in the American economy. Rifkin asserts that there are many benefits to switching to this system, including the creation of millions of green jobs, an economic jumpstart, and a major step toward curbing the anthropogenic causes of climate change.³⁹ His

³⁷ Rifkin, Jeremy. "Jeremy Rifkin on global issues and the future of our planet." March 7, 2011. June 23, 2012. http://www.eenvandaag.nl/binnenland/35444/toeconoom_rifkin_niemand_ziet_de_crisis_die_komt_.

³⁸ Rifkin, Jeremy. World Financial Review, "The Third Industrial Revolution: How the Internet, Green Electricity, and 3-D Printing Are Ushering in a Sustainable Era of Distributed Capitalism." Last modified March 28, 2012. Accessed June 23, 2012. <http://www.worldfinancialreview.com/?p=1547>.

³⁹ Rifkin, Jeremy. "Jeremy Rifkin on global issues and the future of our planet." March 7, 2011. June 23, 2012. http://www.eenvandaag.nl/binnenland/35444/toeconoom_rifkin_niemand_ziet_de_crisis_die_komt_.

analysis is indicative of current industry trends, as investors and developers are steadily moving away from utility scale solar installations and more into distributed energy (commercial and residential scale solar).⁴⁰ However, there are still numerous economic, political, legal, and technological obstacles which threaten to derail the growth of distributed renewable energy. The solar industry has the potential to grow into what Sklar and Rifkin envision, but it still has a long way to go before the realization of their visions.

Opportunities and Threats

Based on the analysis above, there are many opportunities and threats developers must be aware of if they are to maximize their profit potential and position themselves for future growth. If developers do not acknowledge these important trends, they may not be able to survive as other firms move to take advantage of the opportunities and mitigate the threats. Opportunities in the space include exploiting niche incentive programs, taking advantage of incentive programs and falling costs at the right time, and taking one's expertise abroad to new, emerging markets. Threats to the industry vary, but the main two with which solar developers should be concerned is the threat and impact of political change as it relates to continued incentives, and the looming presence of natural gas as a very competitive energy substitute.

In terms of threats, there are many which face the industry and pose a danger to developers working within the space. One of the largest threats is the ability for cheap natural gas to act as a viable, long-term substitute for energy consumers. As mentioned above, the presence of natural gas in the marketplace has the ability to not only redirect energy

⁴⁰ Hoiium, Travis. Daily Finance, "The Next Solar Energy Challenge." Last modified March 9, 2012. Accessed June 23, 2012. <http://www.dailyfinance.com/2012/03/09/the-next-solar-energy-challenge/>.

consumers away from solar power, but also investment spending. This may have a detrimental impact on solar research and development, which could significantly retard the cost declines which the industry has experienced over the last decade.

Another looming threat is that of political change and its impact on both national and state-level incentives. Democrats today are the largest supporters of solar installations, but traditionally Republicans were also in the corner for the industry. Due to the rise of the Tea Party and increased political pressure to reduce government spending, this is no longer the case.⁴¹ A Republican in the presidency or a Congress controlled by the right could have devastating effects on an industry that isn't quite ready to survive in a post-subsidy world.

Despite a multitude of threats confronting the industry, there are also many opportunities developers should be aware of as they continue to navigate the solar landscape. Sol Systems Associate and industry insider Andrew Gilligan asserts that many of the short-term opportunities lie in taking advantage of smaller, local incentive programs.⁴² Developers must look to carve out a niche in the smaller, more focused incentive plans as the larger incentive structures attract more competitors and therefore each individual project is less likely to be constructed. Those zoning in on a few local incentive structures have a greater chance of taking advantage of the incentives and getting their firm's projects built.

Another great opportunity for developers remains on the horizon, but is so important that developers should begin to strategically position themselves now. In the years 2015 and 2016, the solar market will hit a "sweet spot" as development and supply costs continue to fall and the 30% ITC tax credit is in its final two years. These two forces combined will make it

⁴¹ Carus, Felicity. PV Tech, "Solar optimists strategize to survive austerity and future-proof industry." Last modified May 1, 2012. Accessed June 25, 2012. http://www.pv-tech.org/editors_blog/solar_optimists_strategise_to_survive_austerity_and_future_proof_industry.

⁴² Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 25, 2012.

very economical, and lucrative, for businesses with ample roof space (warehouses, factories, big box stores) to invest in solar energy. According to Gilligan, this phenomenon will lead to a widespread boom which has the potential to propel the industry into stability over at least a five year period.⁴³

The final expanse of opportunities lies in the exploitation of emerging markets. Many of these markets have already reached grid parity, but the risk associated with investing there is currently unpalatable for investors. However, working with international development banks may be a viable answer for developers looking for investment if they can prove that they are up to the task.

It is clear that there are both opportunities and threats present within the commercial solar development industry. The firms with the best strategy to deal with the respective opportunities and threats will likely survive any industry shakeouts and even begin to thrive as panel prices fall and margins begin to rise.

Conclusion

Despite the threats and internal weaknesses of the industry, solar commercial development has a bright future ahead. Most analysts agree that many of the bankruptcies and buy-outs present in the industry today show that the solar industry is growing, not dying out. These processes are a natural part of the maturation process for any industry.⁴⁴ Finally, if the subsidies are continued until grid parity is reached, the solar industry has the potential to radically reshape not only the American energy matrix, but also the way it impacts its citizens' everyday lives.

⁴³ Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 25, 2012.

⁴⁴ Aanesen, Krister, Stefan Heck, and Dickon Pinner. McKinsey & Company, "Solar Power: Darkest Before Dawn." Last modified May, 2012. Accessed June 25, 2012.

Works Cited

- "Top 8 Project Developers/EPCs." (2012): n.pag. Energy Acuity. Web. 23 Jun 2012.
<<http://web.energyacuity.com/Subscriber/Start.asp&xgt;>.
- Aanesen, Krister, Stefan Heck, and Dickon Pinner. McKinsey & Company, "Solar Power: Darkest Before Dawn." Last modified May, 2012. Accessed June 25, 2012.
- Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 20, 2012.
- Andrew Gilligan, (Sol Systems Associate), interview by William Graves, Washington, DC June 25, 2012.
- Anthony, Sebastian. Extreme Tech, "Solar panel made with ion cannon is cheap enough to challenge fossil fuels." Last modified March 13, 2012. Accessed March 13, 2012.
<http://www.extremetech.com/extreme/122231-solar-panels-made-with-ion-cannon-are-cheap-enough-to-challenge-fossil-fuels>.
- Bollinger, Michael. Lawrence Berkeley National Laboratory (University of California), "Financing Non-Residential Photovoltaic Projects: Options and Implications." Last modified January, 2009. Accessed June 23, 2012. <http://escholarship.org/uc/item/9xp274dr>.
- Carus, Felicity. PV Tech, "Solar optimists strategize to survive austerity and future-proof industry." Last modified May 1, 2012. Accessed June 25, 2012. http://www.pv-tech.org/editors_blog/solar_optimists_strategise_to_survive_austerity_and_future_proof_industry.
- Confino, Jo. "Rio 20: the Earth Summit diaries, Friday 22 June." Guardian [London] 22 June 2012, n. pag. Web. 24 Jun. 2012. <<http://www.guardian.co.uk/sustainable-business/rio-20-earth-summit-diary-22-june1?newsfeed=true>>.
- Database of State Incentives for Renewables and Efficiency, "Current RPS Data." Last modified May, 2012. Accessed June 23, 2012. <http://www.dsireusa.org/rpsdata/index.cfm>.
- Franzen, Carl. TPM Idea Lab, "Report: U.S. Solar Power Shines, Will Increase 75 Percent This Year." Last modified June 15, 2012. Accessed June 23, 2012.
<http://idealab.talkingpointsmemo.com/2012/06/report-us-solar-power-shines-will-increase-75-percent-this-year.php>.
- Harris, Richard. NPR: National Public Radio, "Rio 20 Summit Sustains Little More Than Sentiment ." Last modified June 23, 2012. Accessed June 24, 2012.
<http://www.npr.org/2012/06/23/155619036/rio-20-doesnt-get-further-than-vague-declaration>.

Hoiuim, Travis. Daily Finance, "The Next Solar Energy Challenge." Last modified March 9, 2012. Accessed June 23, 2012. <http://www.dailyfinance.com/2012/03/09/the-next-solar-energy-challenge/>.

Koller, Jocelyn. Green Chip Stocks, "Solar Growth Report 2012." Last modified June 18, 2012. Accessed June 19, 2012. <http://www.greenchipstocks.com/articles/solar-growth-report-2012/1976>.

Lesser, Adam. GigaOM, "How the natural gas craze will impact renewable energy." Last modified March 27, 2012. Accessed June 24, 2012. <http://gigaom.com/cleantech/how-the-natural-gas-craze-will-impact-renewable-energy-2/>.

Molavi, Justin. American Bankers Association: Commerical Insights, "Sunny Days for Solar Power in the United States." Last modified July, 2011. Accessed June 23, 2012. <http://www.ibisworld.com/Common/MediaCenter/Solar - ABA Article.pdf>.

Osborne, Mark. PV Tech, "Major market decline forecasted for the solar industry in 2009, according to iSuppli." Last modified April 17, 2009. Accessed June 24, 2012. http://www.pv-tech.org/news/major_market_decline_forecasted_for_the_solar_industry_in_2009_according_to.

Pentland, William. Forbes, "Skyline Innovations Bets Big on Better Business Models." Last modified June 06, 2012. Accessed June 11, 2012. <http://www.forbes.com/sites/williampentland/2012/06/03/skyline-innovations-bets-big-on-better-business-models/>.

Rifkin, Jeremy. "Jeremy Rifkin on global issues and the future of our planet." March 7, 2011. June 23, 2012. http://www.eenvandaag.nl/binnenland/35444/toeconoom_rifkin_niemand_ziet_de_crisis_die_komt_.

Rifkin, Jeremy. World Financial Review, "The Third Industrial Revolution: How the Internet, Green Electricity, and 3-D Printing Are Ushering in a Sustainable Era of Distributed Capitalism." Last modified March 28, 2012. Accessed June 23, 2012. <http://www.worldfinancialreview.com/?p=1547>.

Sklar, Scott. "A Renewable Energy Future? What will it look like in 2030?." American University. Washington, DC. 7 March, 2012. Lecture.

Sol Systems, LLC, "Life After the 1603 Grant: The Road Ahead." Last modified November 2, 2011. Accessed June 19, 2012.

Sol Systems, LLC, "SolMarket." Accessed June 20, 2012. www.solmarket.com.

Solar Energy Industries Association, "About Solar Energy: History." Accessed June 17, 2012. <http://seia.org/cs/history>.

Solar Energy Industries Association, "The History of Solar Energy: A Look at the Uses of Solar Energy from BC to ITC." Accessed June 17, 2012.
http://www.seia.org/galleries/FactSheets/Factsheet_solar history.pdf.

Solar Energy Industries Association, GTM Research, "2011 Year-In-Review." Accessed June 19, 2012.

Solar Energy Industries Association, GTM Research, "U.S Solar Market Insight Reports." Accessed June 18, 2012.

SolarTown, "<http://www.solartown.com/community/news/view/solar-manufacturers-cut-output-as-solar-panel-oversupply-continues/>." Last modified October 26, 2011. Accessed June 23, 2012.
<http://www.solartown.com/community/news/view/solar-manufacturers-cut-output-as-solar-panel-oversupply-continues/>.

Sustainable Planet, "U.S. Solar Installations Surge Despite Industry Challenges." Last modified June 18, 2012. Accessed June 18, 2012. <http://www.sustainableplant.com/2012/06/u-s-solar-installations-surge-despite-industry-challenges/>.

United States Green Building Council, "LEED for New Construction and Major Renovations." Accessed June 24, 2012. <http://www.usgbc.org/ShowFile.aspx?DocumentID=1095>.

Wesoff, Eric. Green Tech Media, "German Solar Installations Coming In at \$2.24 per Watt Installed, US at \$4.44." Last modified June 19, 2012. Accessed June 20, 2012.
<http://www.greentechmedia.com/articles/read/German-Solar-Installations-Coming-in-at-2.24-Per-Watt-Installed-U.S-at-4/>.

Yonkin, Dan. Sol Systems, LLC, "Securitization of Commercial Solar Projects." Last modified April 17, 2012. Accessed June 20, 2012.
<http://www.solsystemscompany.com/blog/2012/04/17/securitization-of-commercial-solar-projects/>.