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Fact Sheet
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Methodology

When assessing solar photovoltaic energy converters I felt it was imperative to focus in on the technology, benefits, efficiency, finance and cost. While evaluating these areas, I looked at where the solar systems were being installed. It turned out that policy, shocker, was a huge driving force.

I included the introductory technology section to provide basic information on what kind of phovoltaics exist, how they differ, and how the energy is converted. This is important because it gives a quick synapsis of the technology without bogging down the fact sheet with technical phrases. Also as an attempt to bring the viewer up to speed, I added a quick facts section. I thought this was a good way to demonstrate recent successes in the industry. The outlook graph I constructed provides a visual representation of current and projected growth within the industry. The figure is great for my fact sheet because it illustrates a constant trend of increasing growth into the future. One downfall to the graph is that it does not capture the exponential growth that occurred over the precious decade. That is why another reason why I chose the quick facts that I did. I felt in combination, the facts and the figure summarize the current industry trends.

In evaluating any technology it is very important to look at what 'good' the machine is producing. The benefits section of my fact sheet does exactly this. Yes, solar panels produce electricity, but it is the externalities that come with the adoption of this technology that are it's true 'good'. The positive environmental

implications, no green house gas emissions, no water pollution, and the fact that it is a renewable resource, are a huge part of why the technology is so appealing and had to be apart of the fact sheet. Given the importance of these externalities I decided to do a calculation to quantify how much the growth of solar has reduced CO_2 emissions. This would be an interesting way of spinning the data to see the positive implications of investing in renewable energies. In the Department of Energy's, 2012 Renewable Energy Data Book, they listed that the PV capacity operating in the U.S. at the end of 2012 was 7,221 MW. I calculated that if this electricity were produced from either coal or natural gas, how much CO_2 would be emitted. My steps were:

1) Convert from MW to MJ of Electricity produced
2) Then I assumed that the coal plant had an efficiency of 33% and the natural gas plant had an efficiency of 55%. This gave me the Electricity of the fuel.
3) From here I was able to use the formula Mass $CO_2=3.667*[\%C]_f*E_f/HHV$
4) For coal I assumed a %C=59% and natural gas %C=74%. I also assumed a HHV for coal to be 24.2 and for natural gas, 54.5 MJ/kg of coal.
5) I then converted my mass of carbon dioxide from kg to mega tonnes

Since the solar panels can be applied on residential or non-residential land, and for utilities it was also vital to include how the technology held up in terms of one of the greatest arguments that exist in electricity production today, Not-In-My-Back-Yard. Relative to its competitor's solar panels pose no serious environmental justice issues and can be installed in most settings, rural and urban. I included a small section titled "Hottest Industries" to show the viewer how fast solar energy is really taking off. The figure proves that solar PV is not only growing relative to itself, it is grabbing a respectable amount of the overall growth as well. I felt this was a key point. A popular negative thought toward the industry is that even though it is

growing, it is not significant growth. This figure proves that in reality, it is. I have had professors tell me that the growth is negligible and with newly developed fracking technology, the prices are dropping and solar can not compete. That is why I thought this figure was relevant to my fact sheet.

On my solar photovoltaic fact sheet decided to put a large emphasis on policy and finance. The thought process behind this was that policy impacts each and every part of the industry. I thought it was a good idea to first provide background information on what type of policy the government can and has implemented. I provided the quick fact about subsidies to point out how important and/or large the government's contributions are. The different policy options all work to make solar photovoltaics cost competitive. Since externalities are often difficult to and not even attempted to be quantified, they do not go accounted for. In this case, the government is adjusting the market to account for these externalities. After stating the different policy options, I felt it was imperative to draw a correlation between policy implementation and successful solar markets. Knowing that the majority of the policy variation comes on the state government level, I decided to look at what states were succeeding and figure out why. Upon realization that 3 of the countries top solar states in terms of installations are from the northeast, I knew it had to be due to policy. Knowing that the amount of kWh's that a panel is exposed to varies across the country and is at its greatest potential in the southeast, I included the figure to demonstrate this to the viewers. The lack of correlation between efficiencies and installations proves that policy has been able to make solar energy cost competitive. If New Jersey and Massachusetts can establish successful systems

with approximately 4/6th the amount of kWh's per day than most states in the southwest, then it is possible for these states to benefit even more.

Moving forward the cost of solar photovoltaic systems will continue to be a problem. One popular method that has been used to combat the costs is third-party financing. These systems were important to include because they encourage engagement in the industry. They do this by streamlining the process for the landowner. Whether it is a lease or a Power Purchase Agreement, third-party financing simplifies the process and makes it a safe investment. In addition to these methods, I thought it was important to put MACRS depreciation and the DOE Loan Guarantee Program on the fact sheet as examples the government further incentivizing investment. All of the policy actions included on the fact sheet have helped create certainty within the industry. Certainty, in return, yields confidence, and therefore influences the market.

In constructing the fact sheet I could not avoid a figure demonstrating the costs of solar photovoltaic technology. It was important to show the steady decrease in prices. Prices have been decreasing as we continue to further integrate the technology into our system. While the United States has not done a great job of implementing solar energy, they are still in the top 3 countries to do so. I thought it was extremely important to put the topic into a global perspective. As seen with the analysis of the states, the countries experience no correlation between efficiencies and involvement in solar photovoltaics. In consideration of price, it is also important to consider the global market because of the location of the manufacturers. I chose to display this data found on the Department of Energies report in a pie chart to

illustrate how much of the global manufacturing share is being occupied by Asia. Asia's near monopoly of manufacturing is an important thing to keep and eye on because it could have a huge say in dictating the potential cost-competitiveness of solar photovoltaics. I chose to enter the other challenges as the industry moves forward because those issues will be the main components on the agenda in the coming years.

Works Cited

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SEIA

The information that I pulled from the SEIA site regarding various policy and financial instruments was legitimate. The Solar Energy Industry Association does have a slight bias to support the solar industry. The data that I pulled was all up to date being that it was the 2013 year in review. This is extremely important because of the pace that the industry is moving. Besides the quick facts I pulled information on net-metering, feed in tariffs, the DOE's loan program, MACRS, and third party financing. The articles did not go supper in depth, but they had a high level of expertise.