

Cleanest & Greenest

Why Solar is Heating Up

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Imagine an industry that grew 67% last year. The biggest problem for most of the companies is meeting demand and some have several years' worth of orders. Even the politicians who rarely have anything good to say about corporations or capitalists have blessed these companies, and Hilary recently called for a greater investment here. Most states will pay part of the cost of purchasing one of these systems and the Federal government will also chip in some incentives. Meanwhile, these companies have barely scratched the surface of what is a huge potential market. To make things more interesting, these stocks are mostly undiscovered by Wall Street analysts and institutional investors.

We're From the Government and We're Here to Help

It was fascinating to watch Congress conduct a recent show trial of oil company executives to find out what was behind the increase in energy prices. Although this was probably nothing more than an attempt to extort campaign contributions by using the threat of an excess profits tax, several things stood out. One was that everyone in Congress appears to be clueless about economics. Simple ideas such as prices go up when demand begins to exceed supply appear way too complex for our ruling class. More importantly, the other thing that stood out from their comments is that we're probably going to throw a lot more taxpayer dollars at alternative energy in general and solar in particular.

Why Solar?

The major alternative energy technologies include fuel cells, solar, and wind. Of these, solar panels are the cleanest and safest method of power generation, don't require new infrastructure, generate power at the intended site, don't require transmission lines, can be connected to the existing electricity grid, produce completely renewable power, produce maximum power during periods of peak demand, require little maintenance, and can last up to 45 years. The biggest problem is that these are still a very expensive way to produce electricity. However, manufacturing economies of scale are steadily reducing the cost, and solar is expected to become competitive with retail power prices around the end of the decade.

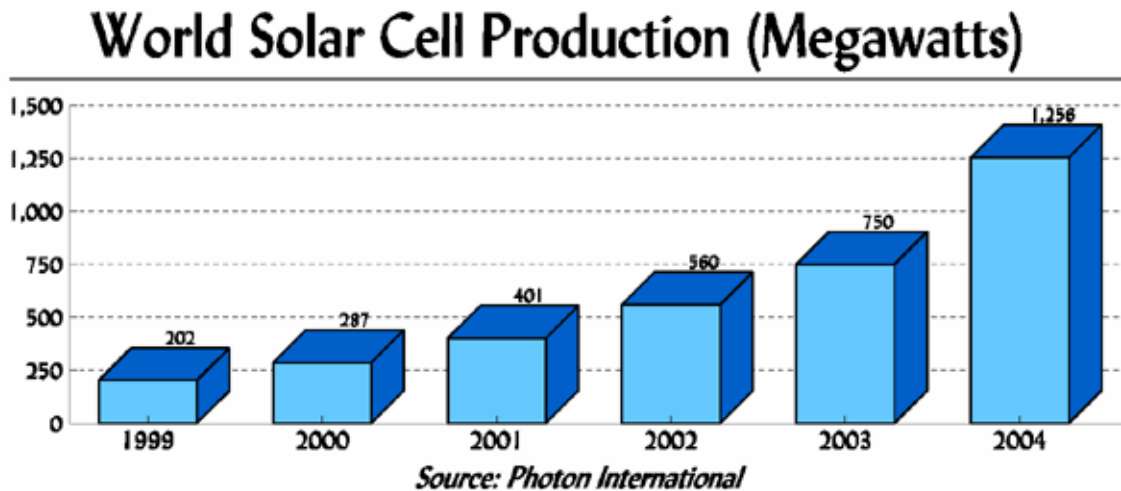
In the meantime, subsidies are required to make the economics work for most applications. To date, the United States accounts for about 9% of solar installations, well behind Germany and Japan, which have more generous subsidies. These countries have higher power generation costs, but subsidies are also being driven by concern over the impact of fossil fuels on climate change. The U.S. is intent on closing the gap, as Texas, California, and other states are on the verge of huge new incentive programs for solar. Other countries with similar concerns, led by Italy and China, are also getting on this bandwagon. The result is that subsidies are likely to keep this industry expanding at double-digit rates until solar becomes viable on its own.

The Market

Although solar cells were developed about 50 years ago, they were a very expensive way to produce power and had limited use for many decades. However, as costs came down, solar became cost effective for some remote locations not covered by the electricity grid and also became useful in growing third world countries that have a constant problem with power reliability and availability. As production continued to increase, costs came down at about 7% per year until solar began to make sense as an alternative in countries with high electricity generation costs. Add concern over climate change and subsidies in more parts of the world, and demand increased further.

Like a rock rolling down a hill, solar is gaining momentum. For the last five years, this industry has grown at 44%. However, according to Photon

International, solar cell production increased 67% to 1256 megawatts in 2004. Not only is this one of the most rapidly growing industries that Wall St. analysts don't follow, but growth is currently accelerating.



These installations translated into global revenues of about \$7 billion in 2004. According to industry sources, revenues are expected to increase to around \$30 billion by 2010. Given current order rates and the new markets opening up, this expected growth rate of 23% may turn out to be conservative. Even if these forecasts pan out, solar will still account for less than 1% of overall electricity production in the U.S in 2010. However, once it becomes competitive without subsidies, solar will be poised to take a much larger share of the market for electricity, which is now around \$275 billion in the U.S. and several times that on a global basis <http://www.eia.doe.gov/>.

Why Costs Will Keep Coming Down

Solar cells use semiconductor materials to convert sunlight into electricity using a process known as the photovoltaic effect. The percentage of sunlight converted to electricity, known as the efficiency rate, currently tops out at a bit over 20% although there are exotic materials in development that may improve that rate dramatically.

This industry is experiencing the same thing that has happened to many other technologies. As production increases, the cost per unit is coming down due to

efficiencies of scale. According to some executives in this industry, the cost of producing solar modules declines by 20% each time output doubles. Given current growth projections, this should translate into cost per unit reductions of about 5% per year. Efficiency rates are also expected to improve a bit, which could add another percentage point or two to annual cost reductions.

Running Out of Sand

In addition to bringing down the cost, one of the biggest challenges facing this industry at present is a shortage of the polysilicon used to produce solar panels. As this is essentially made from sand, it's hard to imagine a shortage. However, surging demand for solar panels is getting ahead of the production capacity for polysilicon. As a result, the primary raw material cost for solar panels may keep rising until more capacity comes on in 2008, and solar panel production will probably lag behind orders in the next few years as a result.

Without going into excruciating detail, the production process for solar panels begins with silica and eventually spits out a silicon wafer, which is assembled into modules that become solar panels. However, the process differs at some key steps and several types of wafers result.

Mono-crystalline Wafers

These result when silicon is melted at very high temperatures and grown into a single crystal ingot. These are then sawed into wafers that produce the highest efficiency (18-21%) solar panels with the longest life, up to 45 years. If you have limited roof space and want to generate the maximum amount of power, these are the ticket. However, these are also the most expensive to produce which is a big problem when raw materials costs are also going up. The key players here are Sunpower (SPWR), Shell Solar, GE Solar, Sanyo, BP Solar, Isofoton, Suntech, Motech, Deutsche Cells, and Q-Cells.

Multi-crystalline cells

These don't require an expensive and energy intensive crystal-growing furnace, so cost less to produce. Molten silicon is poured into a square mold to form an ingot, which is then sawed to produce wafers. This produces solar panels with lower efficiency (around 15%), a lifespan of around 25 years, and somewhat lower costs, although this process is still relatively expensive. This is the largest segment of the market, ending up in about half the solar panels produced. Key players here are BP Solar, Kyocera, Sharp Solar, Suntech Power (STP), Motech, Deutsche Cells, and Q-Cells.

Polycrystalline String Ribbon

This eliminates ingot creation and wafer sawing, which eliminates expensive steps in the process. Here, two sets of strings are pulled through molten silicon. The molten silicon spans the strings and then freezes. This string is then cut into wafers using a process that produces significantly less loss of silicon than sawing a wafer from an ingot. This is the current state of the art in solar panel production and some estimate that these companies use 35% less silicon to produce the same amount of power in a solar panel. Improvements are continuing, and according to one company in this industry, this percentage reduction could eventually approach 50%.

When silicon prices are going up and polysilicon is in short supply, this technology offers a huge competitive advantage. While the competition is using 12-14 metric tons of polysilicon and a more expensive process to produce solar panels with an output of one megawatt, this technology requires only about 8.5 tons. The downside is these are a bit less efficient (around 13%) and require more roof space to produce the same amount of power. The two players here are Evergreen Solar (ESLR) and RWE Schott Solar.

Amorphous Silicon Solar Cells

In this process, a thin film of silicon is deposited onto metal, glass or plastic, which can then be produced in a number of different shapes. These use a very small amount of silicon and have little exposure to the shortage as a result. These also have the lowest efficiency (about 8%) so need a much larger area to produce the same amount of power. However, not everyone wants something

that looks like a science project on their roof and these can be shaped into roof tiles, eliminating the eyesore factor. The major players here are Energy Conversion Devices (ENER), Sanyo, and Kaneka.

Where's Wall Street?

Wall Street and institutional investors are still recovering from a hangover caused by the bursting of the Internet bubble and the resulting bear market from hell. Although the line of people waiting to sue them has finally gone down, the last thing most want to hear about is a group of companies that are losing money and bleeding cash in an industry that needs handouts from the government and more money from investors to survive. With the current oversupply of lawyers, the attitude of most is that the risks of sticking your neck out far outweigh the potential rewards.

Catalysts

The most important thing these companies can do to get the attention of investors is to become profitable. Once that point has been reached, many of the objections to these companies will disappear and analysts will begin to focus on the backlog of orders and industry growth prospects. Continuing to reduce costs and become a technology that's viable without subsidies is probably the other major hurdle. We have a high degree of confidence that both are going to happen, as some of the key players are already profitable. However, it's pretty tempting to jump the gun.

Everyone remembers the Internet bubble, but most have forgotten that too many institutional investors throwing too much money at too few real companies were the ultimate cause. Although there are some VERY interesting solar stocks trading on the OTC Bulletin Board, Evergreen Solar (ESLR), Energy Conversion Devices (ENER), Sunpower (SPWR), and Suntech Power (STP) look like the only companies the pros would take seriously. All have fairly small stock market capitalizations. Now, imagine banks & trust companies, mutual funds, and investment advisors deciding to invest a portion of their energy holdings in alternative energy, deciding that solar is the most attractive segment, and throwing all that money at four companies....

Sorry, the greed gland started flowing a bit. Actually, there's another potential catalyst that isn't that far fetched. There's a great deal of angst over global climate change in some circles and these stocks are now about as politically correct as you can get in the stock market. Public retirement plans in blue states have a history of meddling in the investment process for any number of politically correct reasons and it wouldn't be surprising to see at least some of them mandate that a small portion of their assets be invested in alternative energy.

The Companies

At present, we've found 10 publicly traded companies that derive all or a significant portion of their business from solar, some of which are traded on the OTC Bulletin Board. We expect a few new solar companies to come public each year, as there are some very intriguing solar technologies in the development stage. For the time being, however, Evergreen Solar (ESLR) appears to be the pick of the litter with its breakthrough technology, enormous backlog, triple-digit business growth, and huge potential market. We'd like to see profits also, but expect those to come soon enough.

As disclosed previously, Odyssey Advisors has already invested in Evergreen Solar for selected clients. We do NOT recommend this company for the risk averse, and suggest that everyone do their own research before making any investment decision.

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