NAVIGANT CONSULTING

Solar Outlook

Bimonthly Photovoltaic Industry Update >> June 30, 2009 >> Issue SO2009-3

Feature Articles

Intersolar and its Satellite Conferences Continues as a Premium Tradeshow

Held in Munich from May 27 through May 29, the annual Intersolar tradeshow at 100,000 square meters and over 1,400 exhibitors remains the standard for tradeshows in the global solar industry. Despite the downturn, the conference had an increase in exhibition space and exhibitors, with quite a few companies taking larger booth space. Exhibit halls at the New Munich Trade Fair Center were strategically arranged with each hall focused on a specific technology.

Visitors could find solar thermal exhibits in halls B1 and B2, photovoltaic system components in halls B2, B3 and B4, mounting and tracking systems in hall B5, products and services in hall B6, PV cells and modules in halls A1 and A2, and PV manufacturing equipment in hall A3. Exhibit hall design made doing business at the show easily planned with only the distance from hall B1 to hall A3 providing an obstacle.

The tradeshow's satellite conferences, PV Industry Forum, European Solar Thermal Energy Conference (estec2009) and Solar Gigawatts for North America held before and during the tradeshow, added a strong informational component to the venue.

The fifth annual PV Industry forum, held before the tradeshow, has grown from a half day overview of industry activities to a full two days where industry experts offer insight into manufacturing and business concerns currently facing the industry.

Anton Milner, CEO of Q-Cells, spoke about the EU's aggressive goal of 12% of energy from renewable by 2010, along with the EU 20/20/20 by 2020 – 20% reduction in emissions (below 1990 levels), 20% of energy from renewables, and 20% increase in energy efficiency technologies and practice. Mr. Milner defined grid parity as a point of cross over where solar electricity is equal to other energy choices in the price to the consumer. Mr. Milner noted that grid parity differs based on consumer type, region, country, and U.S. state and, most important, it is not enough. (Executive editor's note: After several years of reading and hearing the term grid parity used in a marketing fashion, to denote unlimited demand, it is refreshing to hear an industry leader offer a pragmatic definition of it.) Q-Cells manufactured its first cell in 2001, and has expanded its investment and technology portfolio to include several thin film technology start up ventures.

Dr. Karl Stegemann, vice president of technology for Signet Solar, offered an overview of activities at Signet Solar. In October 2008, Applied Solar certified the start up of commercial production at Signet. The company is currently producing single junction amorphous silicon product (a-Si) in three sizes, quarter size, (95-watt modules), half size (180-watt modules), and its full size 5.72 square meter 358-watt modules. LID (light induced degradation) for the half and full size modules is 17.7%. The large modules require specific large equipment (cranes) to install. The company passed TUV for

its 5.72 square meter panels in May of 2009. The company's a-Si product has 6.1% stable efficiency.

Dr. Stegemann said that Signet's first SunFab line is now in full production, with an average line yield of 82%. Dr. Stegemann noted that the line is missing inline control monitoring. Regarding manufacturing yield, glass breakage is the most significant issue.

An update from SulfurCell included information about the company's pilot scale production. In 2008, pilot scale production was 1.8-MWp, increasing by 39% to 2.5-MWp in 2009. Pilot scale conversion efficiency is 7.7% (goal of 10% in 2010). Noting that cycle time is a bottleneck for CIS/CIGS, SulfurCell's cycle time was 75 minutes in 2005, 10 minutes in 2007 and at 5 minutes in 2008. The low automation process has an 80% yield. SulfurCell produces framed and frame-less modules and is focused on the BIPV application.

Dr. Florian Holzapfel, CTO, Q-Cells, offered an update on the company's thin film start up, along with its other ventures. Sovello is the company's wafer-technology investment. Other investments include Sontor, micromorph technology now a 50/50 joint venture with Sunfilm that will be renamed Sunfilm, Calyxco, a CdTe technology startup in which Q-Cells has 93% ownership, Solibro, a CIGS startup in which Q-Cells has 67.5% ownership, Flexcell, a-Si on foil, in which Q-Cells has 58.1% ownership and Solaria, a company developing low concentration technology. (Suntech acquired Q-Cells interest in CSG Solar). Currently, Solibro has 30-MWp of capacity (ramping to 105-MW by the end of 2009), Sontor/Sunfilm has 25-MWp of capacity, Calxco has restarted its 25-MWp pilot line, Flexcell is currently ramping its pilot scale production. Solaria is ramping up test production and is currently viewed by Q-Cells as a strategic partner in that in the future, it will take unused capacity.

According to Dr. Holzapfel, the start-ups are funded for a specific period of time, so, as long as the companies do not run out of money, they are funded. Dr. Holzapfel said that all the current ventures have funding for about one year, and during this time a exit or stay decision will be reached.

Dr. Steffen Schuler, head of technology for Global Solar Energy Germany, spoke about the company's progress with its flexible CIGS technology. Founded in 1996, the company is headquartered in Tucson, Arizona. Total capacity for the company's manufacturing in its Tucson/Berlin locations is 75-MWp, with ramp up to 175-MWp in 2010. The company's main technology is flexible CIGS strings, which are 18 cells long. The cells are 210 mm x 100 mm. Dr. Schuler noted that advanced evaporation process control is key for large area homogeneity Global Solar's TCO deposition is sputtering and co-evaporation with short cycle times. Global Solar has a long term supply contract with Solon.

Dr. Subhendu Guha, Uni-Solar, presented a paper about Advances in Flexible Thin Film Silicon Technology. Dr. Guha began by offering some company history. The company had 2-MWp of capacity in 1991, 5-MWp in 1996, its first BIPV product in 1997, and 180-MWp of capacity currently. Uni-Solar has been a pioneer in developing products for the BIPV application. Uni-Solar has strong relationships with its channel partners. The company is currently working on improving throughput and its conversion efficiency, and is developing an innovative back reflector. The company installed a 12-MWp roof system in Zaragoza, Spain. ■ Paula Mints

Correction: On Page 10 of SO 2009-2, in an article titled, Incentives Tour Around the Globe, the feed-in tariff in Ireland quoted at €0.19 EUR in Table E is actually $0.24 USD (not $0.14). The corrected table is presented below:

Table E
Ireland Feed-In Tariff Program

System Size	2008 Tariff (€/kWh)	2009 Tariff (USD/kWh)	Term (years)	Cap
	$1 USD =€0 .77 cents EUR			
< 50-kWp	0.190	0.254	15	4,000 projects over 2009, 2010, 2011

The View From the Selling Channel

The views of the writers of this column do not necessarily reflect those of the Solar Outlook editorial staff

Alternate Paths to Accelerating Solar Energy Markets

By: Dr. Marc van Gerven, Executive VP, Marketing and Sales, Solaria Corporation and Philipp Kunze, Managing Director, Solaria Germany GmbH

Many believe that the solar industry's rapid growth around the world is a result of uniform, generous government support in every major market. A closer look, however, reveals that each of today's fast-growing solar markets has a unique structure due to key differences in government incentive programs. These differences are worth understanding, as some solar markets—such as Italy's and California's—move closer to grid-parity and, thus, independence from incentive programs.

Italy and California have emerged as the solar markets with the biggest potential for growth in the world. A variety of factors common to both led to this, including high electricity rates, favorable policy frameworks and similar electricity demand patterns. But as much as these markets have in common, in terms of strong foundations for the growth of solar, the two will likely grow further apart due to key differences in their market structures.

Most importantly, Italy offers a feed-in-tariff (FIT) incentive structure that requires electric utilities to buy renewable energy at above-market rates set by the government. This is also the structure used by a number of other European countries. The FIT turns solar systems into attractive investments for owners via a guaranteed revenue stream for the energy that's fed back into the electric grid.

By turning solar systems into fixed-income investments, the FIT structures the Italian solar market so that system owners evaluate their solar investments purely on an internal rate of return basis. Essentially, they compare a solar installation with a bond or another long-term asset. This simple and lucrative incentive structure was designed to create, and has led to, explosive growth in Italy and is expected to triple the country's installed solar capacity by 2010.

The U.S. and California, on the other hand, operate more like a traditional electricity market. The largest solar incentive is the federal investment tax credit (ITC), a one-time, 30-percent tax credit or rebate for solar system purchases. After the ITC is applied, however, the value of solar systems is not based on a government-determined price for electricity fed back to the grid, as in Italy. Instead, system owners merely offset their own electricity consumption, or in the case of third-party project developers, sell the electricity at competitive rates to their customers. In this way, owners compare electricity rates from utilities with those produced by a solar system and then decide which is a better deal. This makes California one of the few markets in the world where solar actually competes with conventional electricity rates.

By far, California is the largest U.S. solar market, representing about 60 percent of grid-connected U.S. installations in 2008. Like in Italy, high electricity rates, sunny climates and strong policies (in addition to the ITC) are driving fast growth in the state. Not only are California and Italy both racing toward global market leadership, but the two are also racing to be the first to reach grid parity—where the price of solar energy equals that of traditional electricity.

Grid parity is often referred to as "the holy grail" of renewable energy. Once reached, the market opens broadly, leading to a paradigm shift in the way energy is produced and consumed. In the case of solar, grid parity is expected by some to lead to a massive increase in decentralized power generation. Decentralized, or distributed power reduces the amount of energy lost in transmitting electricity because the electricity is generated where it is used, often in the same building. This also potentially reduces the size and number of power lines, substations and other power assets that must be constructed.

At the same time, most decentralized installations will remain tied to the electricity grid, meaning they will change the overall electricity generation and consumption patterns on the grid. As decentralized solar systems become more ubiquitous, these changes and their effects on the electricity market should not be overlooked.

California may, in fact, be the first solar market ready to test the impact of grid parity and widespread adoption of solar. As solar deployments increase in California, the state plans to decrease its solar incentives, which will steadily bring solar into direct competition with grid electricity. Consequently, normal market forces should serve to encourage solar technologies that address real-world electricity demand patterns in the state.

Already, electric utilities in California are exploring how solar can be used to improve operations. In 2008, this exploration was lent support by an extension of the ITC that for the first time allowed electric utilities to take advantage of the tax credits. This is likely to continue pushing decentralized installations toward power plant-like operation,

where systems are designed to address specific patterns of electrical demand.

Tracking is one technology helping solar systems achieve power plant-like operation. Trackers orient solar systems toward the sun throughout the day, increasing production during afternoon peak electricity hours, when electricity demand is highest and production most valuable. Since trackers help solar systems produce 20 to 30 percent more energy throughout the day, they boost the value of a solar system when the value is based on a FIT, and even more so, when regular demand patterns and the time-dependent cost of electricity generation is taken into account. That is why in the U.S. the majority of utility and commercial PV installations are moving to single-axis tracker installations.

As solar moves toward grid parity, FIT countries will need to adjust their policies so that solar technologies become standard energy technologies, addressing the needs of the electricity markets. In allowing owners of small PV installations to use their solar generated electricity themselves, the Italian PV legislation has already moved in this direction. To achieve a market where PV is regarded as a fully recognized part of the solution, larger installations and utilities have to be included in this mechanism too -- like they have recently been included in the ITC legislation in the U.S. ■

The views of the writers of this column do not necessarily reflect those of the Solar Outlook editorial staff

Buying and Selling PV

By: Joel Davidson, Owner SOLutions in Solar Electricity joel.davidson@sbcglobal.net

This article appeared 25 years ago in the "The PV Network News," a newsletter mailed to about 3,000 solar electric users. At the time, I was sales manager for the William Lamb Company, the world's first PV distributor, PV production was 25 MW and President Ronald Reagan and Congress' anti-solar policies were driving PV manufacturing out of the U.S. Much has changed since 1984. PV manufacturing moved to Japan, then to Germany, and now to China. Yet, the "frontier market" mentality remains despite the fact that PV is mature, multi-billion dollar industry.

Marketing photovoltaics (PV) resists standard marketing methods. PV is a unique technology. Never before in the history of civilization has a product been available that produces power yet should not need replacement like a car or refrigerator. PV is still so new that no one really knows how long the modules will last. But it appears that the 20 year design life is a realistic estimate.

PV is a new frontier technology and like the wild frontier anything goes. We have watched ideas and products and personalities come and go in the past ten years. Rumors and price wars abound. Millions of real and imaginary dollars push and pull at the industry.

How is PV marketed? How does PV get from the production line to the end user and put into actual use? Typically, manufacturers sell their products through distributors. The reason is simple. The manufacturer would rather concentrate on making the product and let someone else sell it. By passing on distribution costs, the manufacturer can make more money. Cut your operating expenses and increase your profit. That's simple.

The distributor, in turn, sells equipment to dealers who sell equipment to the end user. Dealers design, size, price, sell, install and service PV at the end user level. Distributors need dealers working at the local level. Dealers need distributors who can inventory equipment and provide low prices and prompt service. The end user wants the best possible equipment and service at the lowest possible price.

Under normal circumstances, the manufacturer - to distributor- to dealer - to end user process works well. It is the foundation for national and international commerce providing an efficient path for one PV module to leave the factory and end up in the possession of the end user. For tens of thousands of modules (manufacturer), to thousands of modules (distributor), to hundreds of modules (dealer), that one module changes hands through established trade routes at the lowest possible cost. Therefore, its end user price is the lowest possible price.

However, in a frontier technology the normal distributor chain is vulnerable and can be broken. This has obvious advantages for the end user who wants to "get a deal" or lower price. But often this same user exploits the distribution chain by taking hours of time asking dealers and distributors questions and requesting product information. If denied this information, the potential end user accuses the industry of withholding the technology, making it hard to do-it-yourself and fixing prices for greater profits.

Dealers are also guilty of exploiting the distribution chain. When first getting started, they use the distributor to get low prices and service. Once established, some dealers go around the