

# Why Crystalline PV Remains King In A Dynamic Solar Market

With pricing no longer favoring thin films, crystalline PV has only increased its dominance.

■ Sam Wilkinson

The beginning of the year brings about an opportunity to reflect on the past 12 months and look at what lies ahead. Here is my round-up of the past year and the 2011 forecast for crystalline silicon (c-Si) PV:

2010 was, without a doubt, a remarkable year for the entire PV industry. It was a year that saw incentive levels slashed in Germany (the world's largest market) and the market temporarily halted by a severe shortage of key components for PV inverters.

Yet despite these factors, 2010 was expected to see PV installations completed at more than double the level seen in 2009. It was an exceptional year for nearly everyone in the PV industry, but most notably for suppliers of crystalline modules, with their combined shipments reaching nearly 16 GW.

By doubling the amount shipped in 2009, c-Si modules recaptured much of the market share that they had lost to competing thin-film technologies in the past.

In 2009, led by First Solar - then the market leader and still by far the largest thin-film PV supplier - thin film increased its share significantly. Helped by having the lowest cost base of all suppliers, First Solar thrived, while most companies struggled with

the aftermath of the global economic crisis, the collapse of the Spanish market (the largest at that time), and diving silicon prices that made many investors adopt a "wait and see" approach. Largely as a result of this one company's success, thin-film PV modules accounted for 18% of modules shipped in 2009.

However, the sky-high demand of 2010 was met by the ambitious capacity expansion of First Solar's crystalline ri-

vals, which had been able to grow their shipments dramatically throughout the year. While First Solar remained comparatively capacity-constrained - expanding its capacity by approximately 20% - the three largest c-Si PV module suppliers almost doubled their capacities and were easily able to convert this into sold and shipped modules.

Crystalline's recovery was certainly helped by the narrowing of the price differential between it and thin film. In the past, thin-film modules had been offered at prices that made them highly competitive - particularly in large ground-mounted systems, where their lower efficiency is less of an issue than in other installations, as space is not so limited.

However, 2009 saw silicon prices decline rapidly, and as a result, crystalline module costs (and, therefore, prices) at the start of 2010 were significantly lower than what was seen at the same time in 2009. Average thin-



*This 102 kW PV array in Mō'ili'ili, Hawaii, uses Sharp monocrystalline PV modules.*

*Photo courtesy of GreenPath Technologies.*

film costs did not decrease to nearly the same degree, and in the first quarter of 2010, they were just 15% lower than average crystalline prices, having been closer to 25% a year before. As a result, many in the industry now argue that thin film's price advantage has disappeared.

As well as becoming increasingly accepted in large ground-mounted systems, crystalline continues to dominate rooftop installations, where its higher efficiency allows a higher power system to be installed on the limited space available.

However, thin-film modules are favored for some specific rooftop applications. A small number of suppliers (e.g., Uni-Solar) offer flexible thin-film modules that are designed to be rolled out across large industrial roofs. Due to its generally lighter weight than crystalline, thin film can also be favored in situations where the weight on the roof must be considered.

### Eastern module suppliers

The module shipment leader board changed significantly over the course of 2010 (as of the time of this writing in December 2010). Interestingly, almost all of the market share gains within the top ten come not only from crystalline suppliers, but also from Chinese crystalline suppliers.

The largest module supplier in 2010 will almost certainly be Suntech, which abandoned its amorphous silicon (a-Si) thin-film efforts during 2010 and was expected to grow its shipments by more than 120% over 2009's numbers to account for around 8% of the modules shipped during the year. Other gains came from suppliers such as Trina Solar, Canadian Solar and Solarfun - all Chinese suppliers whose shipments jumped dramatically in 2010.

Once led by the Japanese, the crystalline PV market is becoming increasingly dominated by Chinese suppliers. Four out of the five largest crystalline module suppliers are Chinese, and nearly 60% of those

modules are now shipped by Chinese companies. With their aggressively expanding capacities reported to be almost sold out for 2011 already, this trend looks set to continue.

The lingering impact of the global recession has not helped Western suppliers in their attempts to compete with the low-priced modules of their Asian rivals, whose cost structures are significantly lower than those of their Western counterparts.

In short, Chinese crystalline module manufacturers are offering prices that are simply out of reach for many of the West's domestic suppliers. Yet they are still achieving gross margins that are often greater than 30% and

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maintaining a healthy bottom line. In comparison, many Western suppliers have been posting losses for a large part of the last two years.

Unable to compete on price, many of these Western crystalline module suppliers have been forced to pursue marketing campaigns that are based on claims of higher quality and that appeal to their domestic market's sense of patriotism. Unfortunately for them, in a market that - in reality - is driven by investors, and not patriots or eco-warriors, the lowest price will generally win - especially given that the larger Chinese suppliers, in particular, have long since proven the reliability of their products.

Some leading European crystalline suppliers, seeking the lower cost structures of their competition, have adopted an "if you can't beat them, join them" attitude and have begun developing large manufacturing plants in Asia. Q-Cells and REC, which in the past had manufactured their cells

and modules exclusively within Europe, have built large manufacturing facilities in southeast Asia and reduced their European manufacturing operations. Both now produce more products in Asia than in Europe and have also cited this geographic shift as the reason for their improved financial performances.

Even on their own turf, in Germany and the rest of Europe, which continues to absorb the vast majority of the PV modules shipped around the world, Western suppliers are struggling to compete. The European market is flooded by Chinese modules, and despite many calls for incentives and regulations to favor local suppliers, these policies are far from becoming a reality.

The Chinese government's recently announced incentive scheme, aimed at boosting the disappointingly low number of PV installations in the country, includes a list of suppliers that investors and developers must exclusively use for all of the projects completed under the scheme.

It is, perhaps, no surprise that every one of them is Chinese. In fact, most non-Chinese suppliers have seen little point in even trying to enter what is forecast to be one of the largest markets in the world in just a few years' time.

### The PV cell market

PV cell production also now has a Chinese crystalline leader. JA Solar, which recently began manufacturing modules, became the largest producer in the third quarter of 2010 and will produce more cells than any other supplier in 2010.

Germany's Q-Cells, once the market leader in this field, now trails behind a number of suppliers, although it has recovered significantly since early 2009, when it was in deep financial trouble. Over the last year, Q-Cells has been assigning a growing proportion of its cells to its own module and system integration business, as it increases its downstream focus.

Taiwanese companies continue to rank highly among suppliers focused on cells. Although a growing number of these suppliers are beginning to assemble their own modules, the vast majority of their production continues to be sold to module suppliers with no cell production facilities. Currently, four of the six largest suppliers of crystalline cells are Taiwanese, and these companies account for nearly half of cells shipped worldwide. Their future capacity plans are aggressive, to say the least.

Production capacity soared in line with shipments throughout 2010, and the year was predicted to end with around 34 GW of annual cell production capacity installed worldwide, a 60% increase over the end of 2009. Currently, around 86% of this capacity is for crystalline technologies, a number that has also increased.

Given the rise of Asian suppliers, and the increasing tendency of Western suppliers to produce in the East, it is no surprise that over 80%

of this cell capacity is located in Asia.

These rapid increases in cell production capacity are, of course, fueled by optimism about the long-term future for PV. Indeed, the future is bright for the industry, and we forecast that PV demand will grow by an average of 35% annually from 2009 to 2014.

Although the outlook is excellent, the crystalline PV market has one true Achilles' heel: its reliance on incentive schemes, without which it would not exist.

The last two years have seen individual countries' PV markets grow at unsustainable rates and then collapse when incentive schemes were heavily adjusted, affecting the entire global market. Speculation and uncertainty over cuts had briefly accelerated demand, only for it to stall completely when changes took place.

For example, the Czech government recently took unprecedented action and introduced a massive retroactive tax on PV installations. Electricity prices had risen so sharply as a

result of the flawed feed-in tariff (from which mostly foreign investors were benefiting) that it faced a backlash from its population. The new tax and policy change may cause what is currently the world's third-largest market to disappear off the map altogether.

The next two years are unlikely to be any different. Major markets continue to implement, amend or even suspend their incentive schemes, and unhealthy swings in demand will continue as a result. Two crucial things are needed to change this. First, the PV market needs to be less dependent on a few individual countries. (Germany, Italy and the Czech Republic will account for 70% of installations in 2010.) Second, solar electricity production costs must reach parity with non-renewable electricity sources. ☞

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