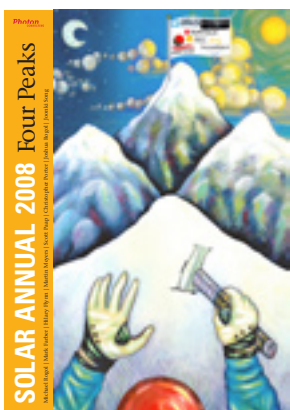


SOLAR ANNUAL 2008 Four Peaks

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EXECUTIVE SUMMARY



The solar power sector continues its rapid ascent. In volume terms, the sector is on a path to grow from 3.9GW of cell/module production in 2007, to more than 7GW in 2008, 14.7GW in 2009 and at least 52GW by 2012. This equates to a 68% CAGR, with significant upside potential for both silicon and thin film production. Despite this very fast growth rate, we continue to see strong demand drivers (low interest rates, rising grid prices, ongoing policy expansion) and expect only 7% compound annual price declines for global weighted average system and module prices. The combination of rising volumes with modest price declines means that solar sector revenue is poised to expand from \$27bn in 2007 to \$274bn by 2012. With increasing economies of scale and incremental improvements in manufacturing process, cost reductions will continue at a pace that enables solar sector operating margins to remain above 30% through 2012. The result is a sector operating profit pool that will expand rapidly, from \$8bn in 2007 to over \$86bn by 2012 (61% CAGR). Given the volume, revenue and profit outlook, we reiterate the view from our 2007 report that solar power represents *Big Things in a Small Package*.

While solar's rapid ascent will continue, we also recognize that the sector is approaching four "peaks" within the next three years. These four peaks – volume growth, price, operating profit margin and peak electricity – add complexity to our outlook on the sector and are an important focus of this year's *Solar Annual* report. Overall, our outlook for sector fundamentals through 2012 remains strong (volume increases of +68% CAGR, system price declines of only 7% CAGR sector profit margins above 30% through 2012), but there are increasing downside risks including slowing growth rates, decreasing prices, declining profit margins and challenges from traditional electricity players. The increasing complexity of this outlook requires sector participants do more than simply pursue "volume-up/cost-down" strategies. This report highlights six solar players that are separating from the rest of the solar pack by pursuing electron-level strategies to ensure their continued ascent despite the complex terrain: First Solar, Q-Cells, REC, SolarWorld, SunPower and Suntech.

Four Peaks

52GW by 2012 but YoY growth rates are likely to slow

Peak #1: Volume growth. The solar power sector will continue to grow very quickly, with 82-107% YoY volume growth from 2008 through 2010. Evidence clearly suggests that even more volume will come online than our previous estimates due to increases in silicon and thin film production. High purity silicon is rapidly expanding from 71,000 tons of production volume in 2008 to 122,000 tons in 2009 and likely more than 340,000 in 2012. Thin film production is expected to grow from 1.2GW in 2008 to at least 4.5GW in 2012, with significant upside. That being said, we believe that there will likely be a decrease in % YoY volume growth after 2010 with peaking growth rates stemming from pent up supply that will be released in 2008-2010. It is important to note that the rapid growth of the sector will continue, but noticeable friction and tightening of supplies at every step of the supply chain will present challenges in maintaining current growth rates despite very strong demand.

Remarkably strong pricing is giving way to modest price declines

Peak #2: Price. With so much volume coming, the central question for the sector remains: When will prices crash? Our answer: No time soon. We continue to see very strong demand based on core demand drivers: low interest rates, rising grid prices and expanding incentives. These drivers provide customers in many markets with IRRs from solar installations well above discount rates, and make it difficult for solar prices to crash. Yet the very strong pricing environment enjoyed by the solar sector over the last five years appears likely to recede modestly due in large part to the rapid growth in supply, resulting in more installations in lower price markets. The result: we expect a 7% compound annual decline in global weighted average system and module prices 2007 to 2012, with the strongest YoY price declines in 2009. The biggest risk to this view is interest rates – a significant increase in long-term interest rates would push down solar prices at a much faster rate.

Peak #3: Operating margin. In combination with modest price reductions, the sector is also facing slightly slower cost reductions throughout the supply chain due to tight feedstocks and equipment. For example, electricity costs are rising for silicon producers, graphite prices are rising for ingot makers, silver paste prices are rising for cell makers and glass prices are rising for module makers. Overall, these factors are slowing – though not eliminating – cost reductions at each step of the supply chain. The combination of lower prices coupled with slower costs reductions means that sector-wide operating profit margins are unlikely to expand beyond current levels and may contract slightly through 2012. Profit margins are one example of the overall sector peaking, but we expect several companies to expand margins as the result of vertical integration, falling contract prices for key feedstocks and faster than average cost reductions.

High OP margin through 2012, but sector unlikely to expand beyond current levels

Peak #4: Electricity. Perhaps the most important implication of solar’s rapid volume growth is that it will quickly “converge” into traditional electricity markets, taking over a substantial portion of peak electricity consumption in several markets. By 2012, we suspect the rapid growth of solar may drive anti-solar reactions from existing utilities and regulators in key solar markets such as Germany, California and Japan. This resistance, combined with larger-scale solar production in 2011-2012 (41-52GW each year), raises concern of saturation in the largest solar markets soon after 2012. Potential saturation in key solar markets – a topic that has not received enough attention from many solar companies – creates a strategic imperative for solar companies to build defensible selling positions in higher-price end-customer markets over the next three years or face risks of commoditization and more extreme price reductions after 2012.

“Convergence” into traditional energy increases complexity and risks

Peak players: Six “solar sisters.” The overriding message in *Solar Annual 2008* is that solar market fundamentals are shifting from an “all-positive-with-upside” to “highly positive-but-with-downside.” Increasing competition along the supply chain and the need to secure reliable end-customers will strengthen the drive for vertical integration to the electron level. Historically, a similar dynamic occurred in the oil sector where the “seven sisters” pursued strategies to capture value along the entire supply chain - from oil feedstock to the gasoline pump. Today, there are six solar companies pursuing strategies to address how solar will merge into traditional energy markets. These companies are First Solar, Q-Cells, REC, SolarWorld, SunPower and Suntech. Collectively, we expect these companies to deliver \$48bn in revenue and \$19bn in operating profit (40% operating margin) by 2012. Assuming a 10X multiple on operating profit, this suggests that these six companies alone could attain a collective market capitalization of roughly \$200bn by 2012.

Six solar companies are breaking from the pack

Table 1: Outlook for the solar power sector - Overall sector data

	2006*	2007	2008	2009	2010	2011	2012
Production (GW)	2.6	3.9	7.1	14.7	28.8	40.9	52.3
Production growth (% YoY)	58%	50%	82%	107%	96%	42%	28%
Average factory gate module price (\$/watt)	\$4.01	\$3.78	\$3.98	\$3.55	\$3.17	\$2.91	\$2.66
Factory gate module price growth (% YoY)	15%	-6%	5%	-11%	-11%	-8%	-8%
Average wholesale module price (\$/watt)	\$4.21	\$3.97	\$4.18	\$3.73	\$3.33	\$3.06	\$2.80
Average installation price (\$/watt)	\$7.67	\$7.43	\$7.56	\$6.74	\$6.05	\$5.66	\$5.30
Installation price growth (% YoY)	8%	-3%	2%	-11%	-10%	-7%	-6%
Revenue pool (\$bn)	\$17.9	\$26.6	\$50.7	\$96.0	\$170.5	\$228.3	\$274.4
Operating profit margin (%)	30%	29%	34%	34%	33%	32%	31%
Operating profit pool (\$bn)	\$5.3	\$7.8	\$17.4	\$32.6	\$56.3	\$73.7	\$85.9

Source: PHOTON Consulting. Note: All data are rough estimates. *Average price estimates for 2006 do not include thin-films.