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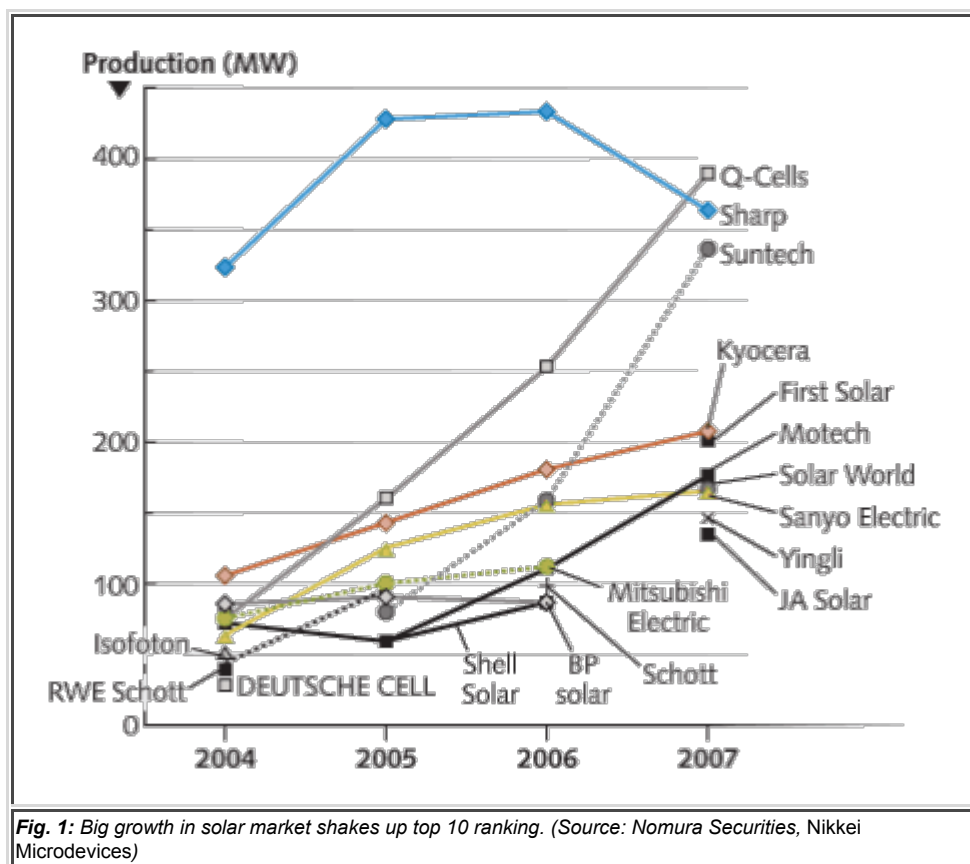
Explosive growth reshuffles Top 10 solar ranking

The explosion of photovoltaics production across the globe completely reshuffled the top companies in Nomura Securities' annual ranking of the leading companies, knocking long established Japanese players out of the top spots and putting four Asian suppliers in the Top 10. Japan's leading solar companies outline their strategies for this changing market in this report from SST partner *Nikkei Microdevices*.

Fast growing Q-Cells AG became the world's largest solar cell maker in 2007, producing nearly 400 MW worth of product. Longtime solar industry leader Sharp found itself in second place as production slipped to roughly 370MW, which the company blamed on a constrained supply of silicon. China's Suntech was close behind the leaders with more than 300MW output, pushing Kyocera and its 200MW to a distant third.

Four new companies jumped into the top ranks. CdTe-cell maker First Solar debuted at fifth place, the only US-based and only [thin-film](#) supplier on the list. Asian players Motech Industries (Taiwan), Yingli Green Energy (China), and JA Solar Holdings (China/Australia) rounded out the rankings, pushing aside some long-established players like Mitsubishi Electric, Schott AG, and BP Solar (see *Figure 1*).

Nomura notes that Japan's overall share of the solar cell market, at 50% a few years ago, is now down to about 20% and could well slip to 15% in the next few years as the rest of the world ramps up solar-cell production.



The major Japanese suppliers are aiming for major growth of their own in the next two years, with big expansions in capacity -- on the gigawatt scale at Sharp and Showa Shell Solar KK -- and on new technologies they say will significantly improve efficiency. "The next two years will determine the winners," AIST Research Center for Photovoltaics director Michio Kondo told *Nikkei Microdevices*. "Later entrants won't be able to catch up to those who put an all-out effort now into technology and scale and speed. A year from now will be too late."

Sharp's comeback strategy is a major ramp of production capacity in both [crystalline](#) and thin-film cells, and an expansion across the entire solar value chain, to assure capturing the highest value-added parts of the business and the high value of integrating the whole system, reports Tetsuro Muramatsu, GM of the company's solar systems group. He says Sharp plans 1GW of capacity for crystalline cells and another 1GW of capacity of thin-film cells by 2010, counting on the economies-of-scale from the high-volume production to reduce costs enough to bring solar electricity down to close to the target \$0.21/kWh.

Sharp figures the solar cells or modules themselves account for only 25% (for x-Si) to 40% (thin-film) of the added value of the finished total system, with materials as much as 20% (x-Si), and systems and engineering another 35%-40%. Accordingly, the firm has in recent months started its expansion across the value chain by [forming a company to develop solar production equipment with Tokyo Electron](#), by signing on to solar power production deals with utilities in Japan and Italy, and by investing in developing large-capacity, low-cost [storage batteries for solar systems](#) through Japanese Li-ion venture ELIY Power. The company eyes bringing solar systems to regions of the world with no electrical grid with government supported lease financing.

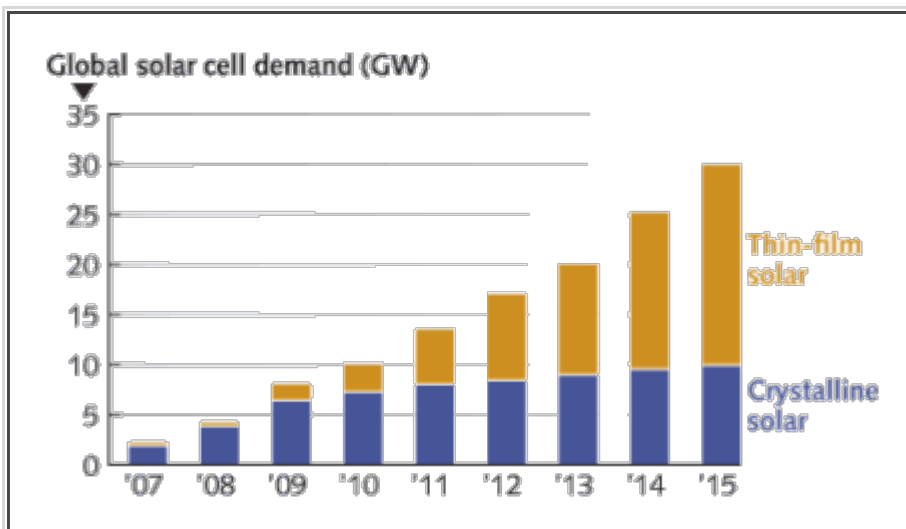


Fig. 2: Crystalline silicon has led the way for solar PV, but future solar growth will mostly come from thin-film. (Source: Mizuho Securities, Nikkei Microdevices)

Also planning to ramp to 1GW capacity by 2011 is Showa Shell Solar, which currently makes only 20MW a year of its CIS thin-film cells. A second planned plant will bring total capacity to 60MW by next year, and another much bigger plant will reach 1GW by 2011, targeting as well a jump to 10%-12% CIS efficiency. The economies-of-scale of high-volume production will mean lower materials and facilities costs, argues director of planning Yuichi Kuroda. "Overseas rivals are moving towards gigawatt scale plants," he notes. "If we

don't outpace them, we'll lose out." Showa Shell has so far relied on equipment it designed in-house, but to speed up development of better deposition technology for higher-efficiency film it is developing a next-generation high-volume tool set jointly with Ulvac.

Contributing to the rapid industry ramp-up of capacity are new players buying turnkey thin-film deposition lines from Applied Materials, Oerlikon Balzers, or Ulvac. Applied says it had contracted for sales totaling 1.7GW of capacity across 10 customers as of June. Ulvac's Yoshio Sunaga, senior managing director and chief director of the FPD business, says it has orders for 217.5MW worth, from NexPower Technology, Sunner Solar, China Solar Power, and another Chinese and another Korean customer, who altogether plan future expansions of 650MW more. Ulvac is just starting to expand its marketing to Europe, India, and the Middle East. Sunaga reports Ulvac has installed capacity to produce 600MW/year worth of tools at its Tohoku facility.

The initial turnkey lines have gotten up and running in a quick 16-19 months. Taiwan's NexPower ordered 37.5MW capacity from Ulvac in March 2007 and started shipping 6.5% efficient cells in June 2008. Moser Baer Photovoltaic ordered 40MW capacity from Applied in March 2007, started initial production in July 2008, and plans to start shipping product in September.

Company	Planned capacity	Production year	Technology
Sharp	2GW	2010	x-Si, thin film
Showa Shell Solar	1GW	2011	CIS thin film
Sanyo	0.6GW	2010	x-Si (HIT), Si thin film
Kyocera ¹	0.5GW	2010	x-Si, back contact
Mitsubishi Electric ²	0.5GW	2012	x-Si, honeycomb cells
Kaneka ³	0.13GW	2010	Si thin film, tandem
Mitsubishi Heavy Industries	0.13GW	2010	Si thin film, tandem

¹ Will start production of back contact cells 4/09, showing 18.5% efficiency in R&D.
² Plans production of honeycomb cells in 2010, showing 18.6% efficiency in R&D, says lower cost. Also supplies power conditioners and other parts of total system.
³ Started production of tandem cells in 4/08, now 10% efficiency, expects 11%.

Fig. 3: Big Japanese solar suppliers add thin film, high-efficiency x-Si capacity. (Source: Nikkei Microdevices)

Some question, however, how a company can distinguish itself in the long term if it makes the same product with the same turnkey production line as its competitors. NexPower president Semi Wang told *Nikkei Microdevices* his company planned to find its own ways to improve its future production lines itself to reduce costs, with its own developments and with equipment from other companies. Kaneka's Mikio Hatta, managing executive officer of the solar energy division, questions how producers making 6%-7% efficient cells on turnkey lines can compete with the 10%-11% efficient cells his company makes with equipment it developed itself.

Other major players Sanyo Electric, Kyocera, Mitsubishi Electric, Kaneka, and Mitsubishi Heavy Industries plan more modest capacity expansions over the next few years, concentrating instead primarily on developing their proprietary new technologies to make higher-efficiency cells at lower cost, often relying initially on specialty equipment developed in-house.

Kyocera and Mitsubishi Electric each plan to expand to 500MW annual capacity for crystalline solar cells by 2010-2012, noting their growth plans are limited primarily by the amount of silicon they expect to be able to obtain. Both companies say they have no plans to start thin-film production in the foreseeable future, though both are continuing research efforts. Instead, they count on significantly improved efficiencies from new x-Si technologies. Kyocera solar energy marketing manager Ichiro Ikeda says his company plans to start production in April 2009 of its back-contact cells, which are now getting 18.5% efficiency in the lab. Solar systems manager Satoshi Ikeda reports Mitsubishi Electric plans volume production in 2010 of its honeycomb cells, currently with R&D efficiency of 18.6%.

"With a plentiful supply of silicon available again, and revolutionary new technologies ready for market, 2010-2011 will be a crucial turning point," says Showa Shell Solar's Kuroda. "Companies who miss this window of opportunity will lose out to the competition."

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