

# Year of transition



Muted mood: at the 10<sup>th</sup> Solar Silicon Conference in Berlin, the industry found itself confronted with massive overcapacities, plummeting prices and a wave of consolidation.

Photos (2): Johannes Bernreuter

A drop in demand on the part of the photovoltaics industry and the massive expansion of production capacities have resulted in an oversupply of polysilicon. This has caused the spot price to plummet and many factories are standing idle. The 10<sup>th</sup> Solar Silicon Conference, which was held in Berlin at the end of March, sought ways out of the doldrums.

One year ago the situation still looked quite acceptable: after a decline to 55 US\$/kg, the spot market price for polysilicon had climbed back to almost 80 US\$/kg. But at the 9<sup>th</sup> Solar Silicon Conference in April 2011, analysts were already predicting a massive oversupply. The force with which this development finally hit had been underestimated, chiefly by the many small polysilicon manufacturers in China with production capacities of less than 3,000 metric tons (MT). From October onwards, the spot price accelerated its decline until it finally reached a level of about 25 US\$/kg towards the end of the year.

Despite a short-lived price recovery in January and February, Henning Wicht, the Principal Analyst Photovoltaics at the market research company IHS iSuppli, does not hold out any hope of a trend re-

versal. At the 10<sup>th</sup> Solar Silicon Conference, held by Photon Europe GmbH in Berlin on March 26<sup>th</sup>, he predicted a spot price of 22 US\$/kg by the end of 2012, and only a marginally higher price of 23 US\$/kg by the end of 2013. The low price on the spot market affects the price level of long-term contracts: "The days of 45-dollar contracts are gone," said Gøran Bye, the Chief Executive Officer of China's second-largest polysilicon manufacturer LDK Silicon & Chemical Technology Co, Ltd., in Berlin.

For many producers this means that they have to sell at cash costs (manufacturing costs without depreciation) if they want to survive on the market. Some of them will not succeed. Martin Meyers, an analyst at Photon Consulting, believes there will be only eleven manufacturers left in 2013. "Companies that

have not been producing for longer than twelve months will exit the market,” predicted Meyers. The participants in the panel discussion at the conference were not as pessimistic: they saw a chance for 15 to 25 companies to still be in the market in 2013.

## The photovoltaics engine is spluttering

The bleak outlook is caused by the weakening growth of the photovoltaics industry, which meanwhile consumes far more polysilicon than the semiconductor industry. For 2012, Meyers even expects a decline in the photovoltaic capacity that is added worldwide or possibly just a minor increase to a capacity range from 26 to 28 GW. This estimate is much more down-to-earth than the bold predictions with which Photon Consulting attracted attention just a few years ago: in 2008, for example, when crowds of Chinese newcomers built polysilicon factories overnight, Photon Consulting still predicted that in 2012 new photovoltaic capacity of around 50 GW would be installed.

In addition to the bleak growth prospects, the situation is worsened by the large stocks that the photovoltaics industry built up between 2009 and 2011 along the entire value creation chain. As these will be used up in 2012, polysilicon production will plunge by 20 % this year, the analyst predicted. Meyers also considers it quite likely that the large manufacturers will delay their planned projects: OCI Company Ltd’s fifth factory at its new site in Saemangeum/South Korea (24,000 MT), Wacker Chemie AG’s new US production site in the state of Tennessee (18,000 MT), Tokuyama Corporation’s new location in Malaysia (6,200 + 13,800 MT) and MEMC Electronic Materials’ joint venture with Samsung

Fine Chemicals Co., Ltd. (10,000 MT) in South Korea. The Hemlock Semiconductor Group has already officially put off the first expansion stage (11,000 MT) of its new 10,000 MT plant in Tennessee.

This was unwelcome news for the conference participants, whose numbers have declined almost in step with the silicon spot price in recent years (see table). Already at the opening, the Conference Chairwoman, Photon Editor-in-Chief Anne Kreutzmann, had noted quite a muted mood in comparison with the previous years. It was probably spoiled even further by the fact that a full ten of the lectures that had been announced in the programme only one week earlier were cancelled. The speakers from the large manufacturers Hemlock, OCI, GCL-Poly Energy Holdings Ltd., REC, MEMC and Tokuyama were all absent.

## The next shortage in 2016?

The conference did not sink into complete desperation, though. Analyst Henning Wicht already has a small glimmer of hope for 2012. Although the basic scenario from IHS iSuppli predicts that the newly installed photovoltaic capacity will stagnate at 27.6 GW, Wicht sees some upside potential in countries such as China, Japan, Germany and Italy, so that in the best-case scenario 35 GW of new capacity could be installed worldwide this year.

From 2013 onwards, Photon Consulting also expects annual growth rates of 20 to 25 % to return to the global photovoltaics market. Therefore, analyst Meyers called 2012 a “year of transition.” But both he and Wicht assume that the reduction of polysilicon overcapacities will continue in 2013.

By 2016, Wicht said, the spot price could climb back to 35 US\$/kg and a new shortage might develop: “The

## Downward trend

Date of conference	Number of participants	Spot price of polysilicon
March 2009	729	125 US\$/kg
April 2010	381	55 US\$/kg
April 2011	233	78 US\$/kg
March 2012	127	28 US\$/kg

**Reflection of the market situation: in recent years, the number of participants at solar silicon conferences has declined almost in parallel with the polysilicon spot price.**

Sources: Photon Europe, DigiTimes, PVinsights



The specialist panel discussing ways out of the doldrums included (from left): Gøran Bye (LDK Silicon), Peter Fath (centrotherm photovoltaics), Anne Kreutzmann (moderator, Photon) and Heinz Graeber (GEC Graeber Engineering Consultants); not shown in the photo: Martin Meyers (Photon Consulting).

situation of 2008 to 2010 will repeat in 2017/2018.” According to Dave Keck, the General Manager of the Silicon Division at the US equipment supplier GT Advanced Technologies, Inc. (GTAT), this is nothing new at all. In a cyclical business such as the polysilicon industry, the fluctuation between shortage and oversupply remains the same, only the length of time between the peaks and troughs has shortened to about four years, Keck explained. Accordingly, the next peak could already be reached in 2016.

### Strategies for survival

The polysilicon specialist recommended that manufacturers implement several measures in order to lower their costs: optimize their Siemens reactors in order to reduce their electricity consumption; recover the waste heat from the reactor’s cooling water in order to generate steam for the distillation of the precursor trichlorosilane; switch from the use of converters to the cheaper hydrochlorination using hydrogen and silicon particles for the conversion of the by-product silicon tetrachloride into trichlorosilane.

Smaller manufacturers in particular currently lack the funds to take such steps. The company Activ Solar GmbH, for example, intends to operate its 2,500 MT plant in Ukraine at less than full capacity in order to save cash. In addition, the company has opted for the construction of large-scale solar power stations as a second source of income in order to create demand for its own products.

The fully integrated Chinese module producer LDK Solar Co. Ltd. is also going to expand its solar power station business. But Gøran Bye, the Chief Executive Officer of LDK’s silicon subsidiary, admitted that the integration of the entire value creation chain ties up a lot of capital, and that LDK has therefore divided the company into business units with the intention of attracting external investors. He believes that the geographic shift of locations will continue: “China will become dominant in polysilicon production over the next few years.” In China, a plant on a greenfield site can be erected with an investment of less than 50 US\$/kg of capacity today – elsewhere, up to US\$ 100 are needed. This advantage, however, is largely offset by the higher electricity costs in China, explained GTAT manager Keck.

## In-house metallurgical-grade silicon

Another approach to lowering costs was presented by Lou Parous, the Director of Advanced Silicon Materials at centrotherm photovoltaics AG. For polysilicon producers, this equipment manufacturer develops solutions for the integrated production of the precursor, metallurgical-grade silicon. The polysilicon industry is reaching a size where integration makes sense, said Parous. The four large manufacturers Hemlock (via the majority shareholder Dow Corning Corp.), Wacker, OCI and GCL have already purchased or founded suppliers of metallurgical-grade silicon. If the metallurgical-grade silicon is produced directly next to one's own polysilicon factory, the transport costs can also be saved. Integration could help avoid fluctuations in the quality of the metallurgical-grade silicon and save costs of more than 1 US\$/kg, Parous argued.

This is exactly the strategy that Silicor Materials Inc. has opted for. Until February, the company was still known as Calisolar Inc., an integrated manufacturer of solar cells made from upgraded metallurgical-grade (UMG) silicon. Now the company wants to focus on the production of UMG silicon and produce its metallurgical-grade silicon itself. The equipment needed for this purpose will be purchased from the German supplier SMS Siemag AG. In July Silicor intends to break the ground for a 16,000 MT plant in the state of Mississippi and start the production of UMG silicon there after a two-year construction period. The Chief Executive Officer Theresa Jester expects production costs to range from 15 to 20 US\$/kg. The funding of the US\$ 600 million project had not, however, been completed at the time of the conference.

In view of the severe price pressure, Peter Fath, the Chief Technology Officer of centrotherm photovoltaics, warned against reducing the discussion to just a single topic: "Cost, cost, cost." Highly efficient solar cells with efficiency levels exceeding 20 % require high-quality polysilicon, he said. But opinions on this point differ in the photovoltaics industry. As the concluding panel discussion revealed, there is disagreement regarding the question as to how pure polysilicon for solar cells needs to be.

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Further information:

Activ Solar: [www.activsolar.at](http://www.activsolar.at)

Bernreuter Research: [www.bernreuter.com](http://www.bernreuter.com)

centrotherm photovoltaics: [www.centrotherm-pv.com](http://www.centrotherm-pv.com)

GCL-Poly: [www.gcl-poly.com.hk](http://www.gcl-poly.com.hk)

GEC Graeber Engineering Consultants: [www.graeberconsult.de](http://www.graeberconsult.de)

GT Advanced Technologies: [www.gtat.com](http://www.gtat.com)

Hemlock Semiconductor: [www.hscpoly.com](http://www.hscpoly.com)

IHS iSuppli: [www.isuppli.com](http://www.isuppli.com)

LDK Solar: [www.ldksolar.com](http://www.ldksolar.com)

MEMC: [www.memc.com](http://www.memc.com)

OCI Company: [www.oci.co.kr/eng](http://www.oci.co.kr/eng)

Photon Consulting: [www.photonconsulting.com](http://www.photonconsulting.com)

REC: [www.recgroup.com](http://www.recgroup.com)

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Tokuyama: [www.tokuyama.co.jp/eng](http://www.tokuyama.co.jp/eng)

Wacker Chemie: [www.wacker.com](http://www.wacker.com)