

Polysilicon & wafer rankings 2016

Photo: Jinko Solar



Crystalline silicon manufacturing: Demand is looking strong for both polysilicon and crystalline silicon wafers, as analysts expect that another rush for installations is imminent, ahead of China's latest feed-in tariff cut in July. Demand for monocrystalline wafers has increased, but manufacturing trends still leave space for high performance multi-wafers.

Vertically integrated manufacturer Jinko Solar increased its wafer capacity to 4.5 GW in 2016.

The latest polysilicon and wafer manufacturers ranking from IHS Markit shows that 2016 was very much a year of two halves. While full year figures show an overall rise in demand, the drop off in the third quarter was enough to send spot prices plummeting and put serious pressure on some manufacturers.

“The polysilicon spot price plummeted to \$12.65/kg in late September,” Johannes Bernreuter, head of Bernreuter Research told **pv magazine**. “That prompted eight or more Chinese manufacturers to shut down their plants temporarily and wait for prices to recover. It was caused by low demand, I don’t know of any internal reason why supply was reduced.”

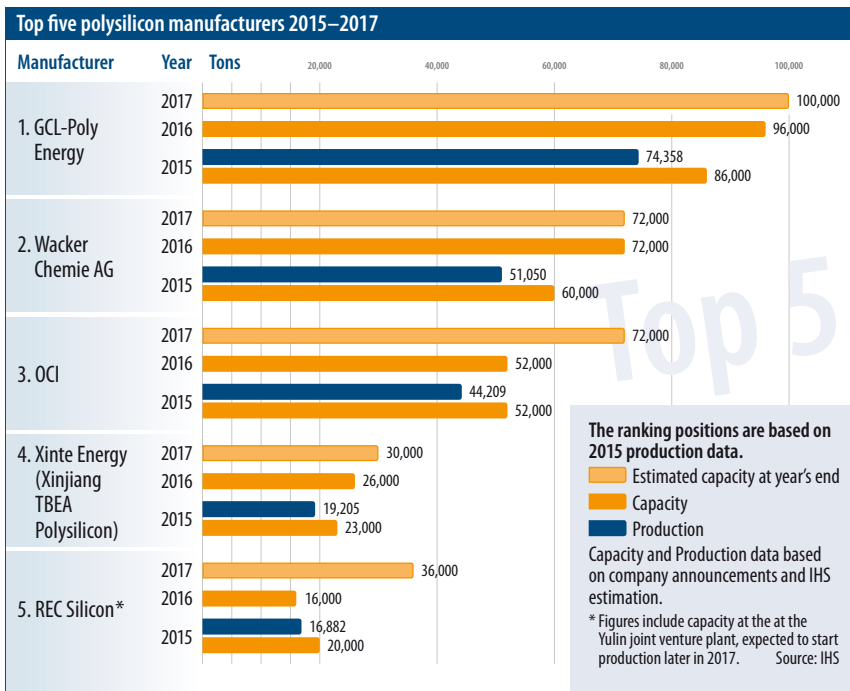
The tariffs on imports into China continue to have a crippling effect on western manufacturers, particularly those in the U.S., although for some strategies are in place to navigate this tricky terrain.

Polysilicon top five

According to IHS Markit estimates, the top five polysilicon producers were responsible for 55 – 60% of market share in 2016. Based on these figures, GCL-Poly and Wacker carried on business as usual in the top two spots. The largest manufacturer, GCL Poly’s capacity grew by 10,000 metric tons (MT) in 2016, and is expected to hit 100,000 MT by the end of 2017, based on IHS estimates. Wacker, which has benefited from a special minimum import price agreement with the Chinese Government, was also able to add to its capacity in 2016.

Hemlock was a notable absence from the IHS Markit top five in 2016, though this may change once production figures are available. The company has continued to struggle after retreating from the Chinese market, and still appears to be hanging on by demanding strict compliance of customers with existing contracts, which leaves them paying well above the current market rate.

Through this and increasing their share in the smaller market for electronic grade polysilicon, Hemlock may be able to survive. “It still has long-term customers in other Asian countries,” states Karl Melkonyan, Senior Analyst for Solar Demand at IHS Markit. “It depends how long the trade duties from China last, and in which direction the solar market moves next.” Bernreuter, meanwhile, expects Hemlock to reduce its capacity in the mid-term, stating: “I cannot imagine



Graphics: pv magazine/Harald Schütt

a scenario where it could get back to utilization of 90% or higher.”

Norwegian/U.S. group REC Silicon moved into the IHS Markit top five at Hemlock’s expense. Its capacity utilization dropped in 2016, as it was forced to close down fluidized bed reactor (FBR) production at the Moses Lake, Washington facility from February to May, blaming “current market conditions and the ongoing solar war” in a company press release. Currently, the plant has resumed operation at 50% capacity.

REC, however, may have found a way around the tariffs, with a joint venture with Shaanxi Non-Ferrous Tian Hong New Energy Co., Ltd. Although it is not entirely clear how the joint venture shares will be divided between the two companies, capacity from its new production facility in Yulin, Shaanxi Province is included in REC figures. The facility is expected to come online in the second half of the year and more than doubles REC’s capacity year on year.

U.S. manufacturers are also seeing success, albeit on a smaller scale, in markets outside of China. REC has gained several new customers in Taiwan, some of which resell excess silicon into mainland China.

The other two non-Chinese manufacturers retaining their position in 2016, Wacker and OCI, can also attribute their success to avoiding the Chinese tariffs. OCI benefits from far lower tariffs on South Korean imports, while Wacker has negotiated directly with the Chinese

government to secure a minimum import price for its products, allowing it to avoid paying duties.

Record imports to China

In this case, however, it seems more a sign of the strength of China’s demand for the material. “The question of imports is one of demand – China is the main market for polysilicon – they need the imports,” says Melkonyan.

Figures provided by Bernreuter Research also show that imports into China jumped by 56% between October and November 2016. So China’s H2 drop in supply can once again be cited as partly responsible. “Part of this rapid increase can be explained as a reaction to the low domestic production volumes in September and October, when many Chinese manufacturers shut down their plants for maintenance in view of the collapsed spot price,” states Bernreuter.

Of all these imports, 80% come from South Korea, Germany, and the U.S, with South Korea by itself responsible for 50% – a share that has increased as that of U.S. manufacturers decreased. The share of all three has declined slightly over the past few years (2015: 82%, 2014: 85%).

The bulk of the remaining polysilicon imports to China came from Malaysia – where Japanese producer Tokuyama is in the process of selling the country’s only production facility to OCI, and Taiwan, which was responsible for 16% of imports in April 2016 and finished the year with

around 10%, less than a 1% increase on the previous year. “I thought Taiwan would have risen more,” says Bernreuter. “That was just a short-term reaction to the declining share of the U.S.”

Although increased imports are primarily driven by demand, quality is certainly still an issue for suppliers. “Of course, rising imports signify demand for higher quality, if you talk about Wacker or OCI, the purity of that material is definitely better than what Chinese producers can deliver,” comments Bernreuter.

Analysts estimate though that this quality gap is closing: “Chinese tier-1 and tier-2 manufacturers produce good quality solar grade,” says Melonyan. “They have made progress compared to a few years ago,” adds Bernreuter, “though they

cannot compete with Wacker or OCI in terms of quality.”

Chinese capacities rise

“We expect China to progress in terms of capacity,” says Melkonyan. “Almost all of the extensions from the last two years have been located in China.”

By the time REC’s and Shaanxi’s Yulin facility reaches its full production in 2019 or 2020, it will be a top 10 poly producer by itself. Daqo New Energy in Xinjiang also brought a new facility of 6,000 MT capacity online in February 2017.

Several other factories are expected to begin production in 2017 – Bernreuter estimates that there could be as much as 50,000 MT of new capacity online in China by the end of the year.

With high import levels and the growth of Chinese manufacturers, there is a chance that the overcapacity issue could rear its ugly head again in 2017.

In response to this, Chinese manufacturers have requested a mid-term review of current duty rates for South Korean imports, accusing South Korean companies of operating with a dumping margin of 34% to 36%. “Chinese manufacturers are definitely speculating on lower imports from South Korea to allow them to expand their own capacity,” Bernreuter told **pv magazine**.

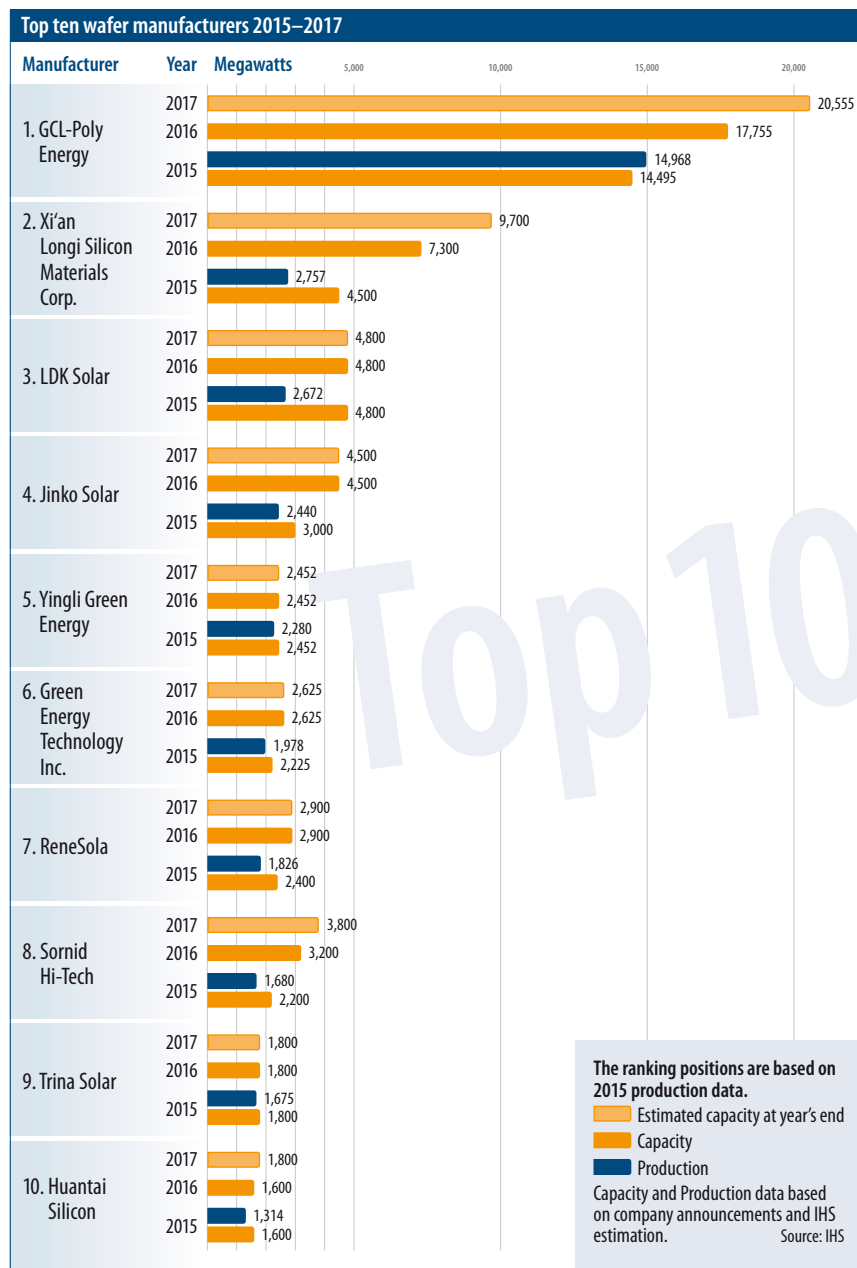
The raising of tariffs on South Korean imports would cause significant upset among the country’s manufacturers. The country’s largest manufacturer OCI has an insurance policy with its imminent purchase of the 20,000 MT Tokuyama facility in Malaysia – from where it would in any case be able to import duty-free into China. This would not cover the entirety of OCI’s current imports though.

“The best solution for Korean polysilicon manufacturers,” says Bernreuter, “would be if they – like Wacker – could achieve a minimum price agreement with the Chinese Ministry of Commerce to avoid any import duties.”

Wafer

A shift from multi to monocrystalline silicon has been evident in the wafer market throughout 2016, as new manufacturing technologies and market developments have brought down the cost of mono, allowing its efficiency advantage to come into play. “During the past couple of years growth in wafer capacity has largely been supported by the increase of monocrystalline wafer, which has grown at twice the rate of multi in terms of relative growth,” Melkonyan told **pv magazine**. “The main factors for this are technology improvements and the price decline, which has narrowed the gap in average selling price between mono and multi.”

Total wafer capacities grew by 16% in both 2015 and 2016, largely driven by strong end market demand. While monocrystalline wafer has undoubtedly increased its overall market share, falling prices for multi mean that efficiency is now the name of the game: “After sharp declines for standard multicrystalline technology in the second half of 2016, the industry has increased focus on high efficiency technology,” says Melkonyan. “This includes both n-type mono



wafers, used in HJT, IBC and PERT, technologies, and high performance p-type-multi PERC.”

As the biggest supplier of mono-wafer, Longi has led this transition. The company has undergone aggressive expansion over the past few years, to become the second largest supplier. “Xi’an Longi Silicon Materials is a market leader in production of monocrystalline wafer. It has successfully increased capacity at its two facilities in Xi’an and Wuxi in China, as well as acquiring SunEdison’s Malaysia facility in early 2016,” says Melkonyan. IHS Markit expects Longi to further increase its capacity in 2017, with the acquisition of further production lines in Malaysia from Comtec.

IHS estimates mono’s market share at 31% for 2016, and expects it grow to 34% by the end of 2017. This shift toward mono is evident when we look at GCL, by far the largest wafer producer, and traditionally a supplier of multicrystalline. “GCL has announced plans to increase capacity for n-type mono wafer by 1 GW at its plant in Ningxia, China,” says Melkonyan. “The company’s wafer processing production



Photo: Solar Silicon

China imported record amounts of solar grade polysilicon in 2016. These imports could be upset in 2017, as several major new facilities are expected to begin production within China.

costs have declined consistently since 2014, as it increases use of diamond wire sawing and automated production.”

Aside from the two largest producers, there have been few increases in the past two years. Third largest manufacturer LDK Solar officially entered liquidation in mid-2016, having been in financial difficulty since early 2014.

“The wafer business structure is quite complex in several aspects, it requires high investment and a long-term outlook on technology, price, and demand,” says Melkonyan. “The segment is also at a high risk position in the supply chain, in terms of price fluctuations in polysilicon on one side, and cells and modules on the other.” ♦

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