What's behind solar's polysilicon shortage – and why it's not getting better anytime soon

One of the main ingredients in PV cells has been getting more costly all year, putting developers in a tight spot.

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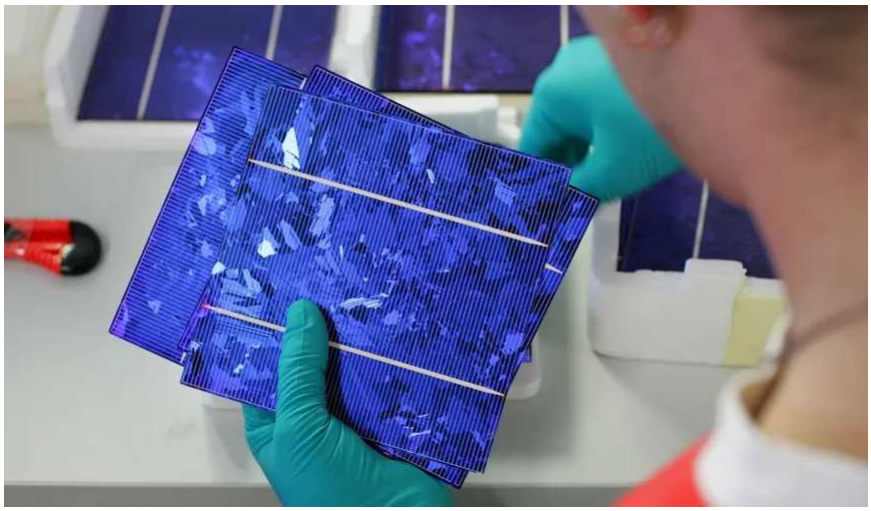

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Jason Deign

Continued high prices for polysilicon, a key ingredient of crystalline-silicon PV cells, are starting to put some solar projects in jeopardy, analysts have warned.

Solar developers that have won projects with ultra-low bids are trying to delay construction "as much as possible," said Josefin Berg, solar PV market analysis manager at IHS Markit, in an interview. "People are talking about projects being 10 to 20 percent more expensive."

Jenny Chase, head of solar analysis at BloombergNEF, said high polysilicon pricing means that "if you can push delivery dates back, you will. But a lot of projects have to be connected by a certain schedule or they will lose their [power-purchase agreements]."

According to the PV market tracker EnergyTrend, the price of polysilicon at the end of September was nudging $30 per kilogram. This is up from an all-time low of $6.80 per kilogram in June 2020, a jump of more than 338percent in just 16 months.

Much of this increase has been absorbed by manufacturers of solar wafers, cells and modules, Johannes Bernreuter of Bernreuter Research said in an email.

Nevertheless, the price of mono passivated emitter and rear cell (PERC) modules in the most frequently used wafer format, M6, went up 14 percent, rising from $0.21 per watt in January 2021 to $0.24 in September, he said.

Unfortunately, the reasons behind the recent polysilicon price hikes – which come on top of other solar supply-chain problems – do not bode well for a rapid resolution to the problem.

Surprisingly, overcapacity is at the root of the current shortages

Somewhat ironically, it turns out that current high prices are a result of production capacity increases that initially brought the price of polysilicon down.

"The top four Chinese polysilicon manufacturers – Tongwei, Daqo, GCL-Poly and Xinte Energy – significantly expanded their production capacities in 2018 and 2019," Bernreuter explained.

"With their low costs, mainly based on low electricity rates from coal-fired plants, these new facilities pushed a dozen smaller, higher-cost manufacturers in China and the South Korean

manufacturers OCI, Hanwha and Hankook out of the solar-grade polysilicon market."

On top of this market cannibalization, a decrease in the growth of the global solar market, mainly due to a PV installation cap and subsidy cut in China, meant that no new polysilicon production capacity came online in 2020, Bernreuter said.

At the same time, the PV market bounced back from the Covid-19 pandemic more quickly than expected. Several new players entered the solar wafer market in 2020 and 2021, spurring demand for polysilicon and triggering a price rally in February 2021.

By April, Bernreuter reported the spot price for polysilicon was "going through the roof" as a result of panic-buying and speculative traders hoarding supplies.

The hoarding may have had a short-term impact on polysilicon pricing but is unlikely to be a major factor now, said Bernreuter. "There were reports in early August that [speculative traders] were selling off their polysilicon stocks," he said.

And while polysilicon and wafer manufacturers might have been tempted to stockpile inventory earlier in the year, "if inventories get too high, they weigh on the manufacturers' costs," he said.

So it appears current polysilicon pricing levels are simply a result of demand outpacing supply. Bernreuter said the situation would likely continue through the end of the year before new polysilicon manufacturing capacity is able to come online.

This is not a problem that will go away

Supply is expected to increase next year, potentially easing the situation in the second quarter, Bernreuter said. But if demand continues to increase at the same pace it has so far this year, "the supply-demand balance could remain tight in 2022."

As a result, it may not be until 2023 that polysilicon shortages finally ease up. Bernreuter said "huge" amounts of new polysilicon manufacturing capacity have already been announced, which could lead to a return to oversupply in 2023 or 2024 – and the risk of more shortages after that, if low prices again push some manufacturers out of the market.

Worryingly, according to Bernreuter, "basically nothing" can be done to prevent supply shortages in the future. "Polysilicon supply will always lag behind demand signals," he said.

Ever since a polysilicon shortage that hit in 2004 and ended in 2009, there has been "a sustained tendency [toward] overcapacity," he noted.

"However, the rapid transition from a somewhat stalling, subsidized PV market in 2018–2019 to an enormously dynamic, more and more unsubsidized market now was too fast to anticipate, and I expect similar phenomena in the future as well."

The Xinjiang challenges for polysilicon

Believe it or not, that's not the only potential problem facing polysilicon. According to Bloomberg, about one-third of the new polysilicon production capacity will be coming online in Xinjiang, the region of China linked to human rights abuses against minority ethnic and religious groups including the Uyghurs.

One manufacturer of solar materials in the region, Hoshine Silicon, is already the subject of a U.S. import ban related to the use of forced labor. Others could face similar export complications as nations such as the U.S. take a harder line on China's human rights record.

So far, the biggest beneficiary of these moves, in the U.S. at least, is the American manufacturing company First Solar, which makes cadmium telluride thin-film modules and thus is not reliant on the polysilicon supply chain.

First Solar is in the process of increasing its global manufacturing capacity up to 17 gigawatts a year by 2024, with new factories planned for India and the U.S.

But that probably won't do much to help the solar developers that were counting on bargain-priced Chinese crystalline-silicon panels to make their project bids viable.

And on top of the module price increases, "we have the shipping costs," said Berg of IHS Markit. The currently ongoing global shipping crisis doesn't seem to be easing up soon either, she said.

IHS Markit is likely to cut its global solar installation forecasts for this year as a result of the situation.