



Johannes Bernreuter

The Polysilicon Market Outlook **2020**

Technology · Capacities · Supply · Demand · Prices

Your Polysilicon Market Guide

Do you want to be up to date on the polysilicon industry? On the most recent technological developments, the decisive market trends and future price points? *The Polysilicon Market Outlook 2020* provides you with all of that. The 70-page report analyzes hundreds of data and details, presents them in a clear and compact form, and draws insightful conclusions to help you make the best strategic decisions.

- ▶ The **technology chapter** analyzes why fluidized bed reactor (FBR) technology for producing polysilicon granules has recently experienced some setbacks. It explores fundamental technical challenges and an alternative approach.
- ▶ The **capacity chapter** provides a concise overview of plant shutdowns, capacity expansions and greenfield projects. A comprehensive table lists all capacity additions and changes between 2014 and 2019.
- ▶ The **supply chapter** presents four different scenarios of production volumes and end-of-year capacities for 45 polysilicon and UMG silicon plants and projects from 2013 through 2020. It highlights the market shares of the top ten manufacturers, points out China's growing weight among the world's polysilicon production regions, and reveals first signs of industry consolidation. The chapter also details the production volumes of electronic-grade polysilicon for each manufacturer and explains purity specifications for electronic grade.
- ▶ The **demand chapter** quantifies the polysilicon demand of the semiconductor and photovoltaic (PV) industries from 2013 through 2020. It uses an improved bottom-up approach, based on numerous forecasts for 84 countries, in order to arrive at three different scenarios of global PV demand. The 20 most important countries and regions have been surveyed individually.
- ▶ The **balance chapter** compares the various demand scenarios with supply, explains consequences from the supply/demand balance for market participants, and discusses changes in the cyclical pattern of the polysilicon industry. In addition, the chapter gives an outlook on the market development through 2022.
- ▶ The **duty chapter** provides background on the anti-dumping measures of the Chinese Ministry of Commerce and uses data from customs statistics to assess the effect of Chinese anti-dumping duties on polysilicon imports.
- ▶ The **price chapter** examines the factors that have influenced the polysilicon spot price since 2014 and, in particular, dissects the reasons behind the price rally in the spring of 2016. Based on an analysis of industry cost curves, the chapter forecasts the development of the spot price through 2020. It also provides data on cash production costs of 34 polysilicon plants from 2015 through 2020.



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Executive Summary

After the polysilicon industry recovered from oversupply in 2013, its global output sharply increased from 228,000 metric tons (MT) in 2013 by 37% to 313,000 MT in 2014 and by another 16% to 363,000 MT in 2015. However, demand from the photovoltaic (PV) industry, which consumes approx. 90% of polysilicon produced worldwide, did not grow at the same pace. Annual PV system installations only rose by 9% to 42 gigawatts (GW) in 2014 and by 28% to 54 GW in 2015. Consequently, polysilicon inventories swelled again and drove the average polysilicon spot price down to a new record low of 12.93 US\$/kg in January 2016.

An unprecedented Chinese PV installation rally in the first half of 2016, ahead of the feed-in tariff cut on July 1, saved the polysilicon industry from even more serious oversupply. After installations dropped and, as a result, the polysilicon spot price slumped in the third quarter, many Chinese polysilicon manufacturers curtailed production for several weeks, which promoted the recovery of the spot price to a level above 14 \$/kg.

In the next three years, however, the polysilicon industry will face soft demand. The annual growth rate of global PV installations will fall below 10% through 2019; on top of that, decreasing specific silicon consumption in wafer/cell production will dampen polysilicon demand. At the same time, additional polysilicon production capacities from new entrants and existing manufacturers are planned to come on stream. We therefore expect strong cut-throat competition, low utilization rates and the shakeout of several less competitive producers in 2018.

Supported by the depreciation of local currencies against the US dollar, the cash production costs of many manufacturers have fallen considerably since 2013. Technical progress will drive the cost down further. Due to persistent overcapacity, the spot price will follow this development as it will be determined by the cash cost of the last producer that is needed to satisfy demand. Hence, we do not see any indication of a positive change in the low-price market environment through 2020.

In contrast, electronic-grade polysilicon for the semiconductor industry enjoys a higher price. After the depletion of high inventories, demand is gradually picking up again. We forecast a market volume of 38,000 MT in 2020. A couple of Chinese polysilicon producers are trying to establish themselves as suppliers of electronic-grade material as well, but it is still unclear if their product can meet the high purity requirements for semiconductors.

Regarding new production methods for solar-grade polysilicon, fluidized bed reactor (FBR) technology has not yet fulfilled the high hopes that were pinned on it. Since the FBR projects of Sunedison and GCL-Poly have come to a dead end, MEMC Pasadena's plant has been shut down and REC Silicon has reduced the utilization rate of its FBR plant to 50%, the FBR market share will sink below 3% in 2016 and remain in the single-digit range over the coming years.

With individual production data on 45 manufacturers and aspirants, in-depth analysis of demand, diligent supply/demand scenarios and price forecasts through 2020, *The Polysilicon Market Outlook 2020* provides comprehensive, detailed and up-to-date information on the global market for solar-grade and electronic-grade polysilicon.



About the author

Johannes Bernreuter, 51, head of Bernreuter Research and author of the report. Bernreuter has become one of the most reputable photovoltaic journalists in Germany because of his diligent research, clear style and unbiased approach. He has earned several awards, among others the prestigious RWTH Prize for Scientific Journalism from the RWTH Aachen University, one of the eleven elite universities in Germany. Originally an associate editor at the monthly photovoltaic magazine *Photon*, Bernreuter authored his first analysis of the upcoming polysilicon bottleneck and alternative production processes as early as 2001. In 2008 he founded Bernreuter Research to publish polysilicon market reports.

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Companies covered

USA

Hemlock Semiconductor
REC Silicon
MEMC Pasadena
Mitsubishi Polysilicon America
Wacker Polysilicon North America

Germany

Wacker Chemie
Silicon Products Bitterfeld
Sitec

Japan

Tokuyama
Osaka Titanium technologies
Mitsubishi Materials
M.Setek

South Korea

OCI Company
Hankook Silicon
Hanwha Chemical
SMP

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Arabian Peninsula

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Qatar Solar Technologies

China

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Sichuan Renesola
Guodian Jingyang
Kunming Yeyan
Inner Mongolia Fengwei
Qinghai Huanghe Hydropower
Shaanxi Tianhong
Xinjiang Hejing
Hubei Jingxing
Zhejiang Zhongning
Shaanxi Non-ferrous Tianhong REC
Xinjiang Dongming
Erdos Polysilicon
Jiangsu Xinhua Semiconductor (GCL)

Taiwan

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Powertec Energy

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