

More information about the PV manufacturers worldwide

Antec Solar Energy AG, Arnstadt (Germany): www.antec-solar.de

Arcticsolar, Gällivare (Sweden): www.alfasolar.de

ASS Automotive Systems, Erfurt (Germany): www.ass-gmbh.net

Atersa, Valencia (Spain): www.atersa.com

Azur Solar, Memmingen (Germany): www.azur-solar.de

Bangkok Solar Co., Ltd., Bangkok (Thailand): www.bangkok-solar.com

Baoding Tianwei Yingli New Energy Resources Co., Baoding (China): www.yingligroup.com

Beijing Hope Industrial & Trading Co. LTD, Tong Zhou (China), phone: 00 86/10/69 50 00 86

Blues Solar, Velenje (Slovenia): www.blues.si/solar

BP Solar, London (United Kingdoms): www.bp.com

CSG Solar AG, Thalheim (Germany): www.csgsolar.com.au/

CSI Solartronics Co Ltd, Changshu (China): www.csisolar.com

Delsolar, Hsin-Chu Science Based Industrial Park (Taiwan): www.delsolarpv.com

Deutsche Cell, Freiberg (Germany): www.deutschezell.de

Dopt BV, Joure (Netherlands): www.dopt.com

Energy Solutions, Pernik (Bulgaria): www.energysolutions.gr

Eni Technologie, Nettuno (Italy): www.enitecologie.it

Ersol Solar Energy, Erfurt (Germany): www.ersol.de

E-Ton Dynamics, Taiwan (Taiwan): www.e-ton.com.tw

Evergreen Solar, Marlborough (USA): www.evergreensolar.com

First Solar LLC, Perrysburg Ohio, (USA): www.firstsolar.com

GE Energy, Newark, Delaware (USA): www.gepower.com

GPV, Gällivare (Sweden): www.gpv-solar.com/

GSS Gebäude-Solarsysteme GmbH, Löbichau (Germany), phone: 036602/509676

Heckert BXT Solar, Chemnitz (Germany): www.heckert-solar.de

Isofoton, Malaga (Spain): www.isofoton.com

Kaneka Corporation, Toyooka, Hyogo (Japan): www.pvkaneka.co.jp

KD Solar, Choong-Chung (Korea): www.kdgas.co.kr

Kyocera, Kyoto (Japan): www.kyocerasolar.com

Maharishi Solar Technology Pvt. Ltd., Andra Pradesh (India): www.maharishisolar.com

Microsol International Fze, Fujairah (United Arab Emirates):

www.microsolinternational.com

Microsol Power Ltd., Hyderabad (India): www.microsolpower.com

Mitsubishi Electric, Tokyo (Japan): <http://global.mitsubishielectric.com>

Mitsubishi Heavy Industries Ltd. (MHI), Nagasaki (Japan): www.mhi.co.jp/power/e_a-si

Motech, Tainan (Taiwan): www.motechind.com

MSK Corporation, Tokyo (Japan): www.msk.ne.jp/

Nanjing PV Tech Co. Ltd (NJPV), Nanjing (China): www.NJPV-tech.com

Ningbo Solar Cell Factory, Ningbo (China): www.nbsolar.com

Origin Energy, Adelaide (Australia): www.originenergy.com.au

Photon Semiconductor, Korea: www.psec.co.kr

Photovoltech, Bienen (Belgium): www.photovoltech.com

Photowatt, Bourgoin-Jallien (France): www.photowatt.com

Q-Cells, Thalheim (Germany): www.q-cells.com

RWE Schott Solar, Alzenau (Germany): www.rveschottsolar.com

S.E. Project, Padova (Italy): www.se-project.it

Sanyo Electric, Osaka (Japan): www.sanyo-component.com

Scancell, Narvik (Norway): www.scancell.no

Scanmodule, Glava (Sweden): www.rec-pv.no/text/view/3518.html

Scheuten Solar, Gelsenkirchen (Germany): www.scheutensolarsystems.nl

S-Energy, Chung Nam (Korea): www.s-energy.co.kr

Shanghai Chaori Solar Energy, Shanghai (China): phone: 00 86/21/57 55 05 48

Sharp Corporation, Osaka (Japan): sharp-world.com/solar

Shell Solar, Amsterdam (Netherlands): www.shell.com

Shenzhen Topray Solar Co. Ltd., Shenzhen, Guangdong (China): www.topraysolar.com

Siliken S.L., Valencia (Spain): www.siliken.com

Sinonar, Hsin-Chu (Taiwan): www.sinonar.com.tw

SMD Solar-Manufaktur Deutschland GmbH, Prenzlau (Germany): www.aleo-solar.de

Solar Factory, Freiberg (Germany): www.deutschesolar.de

Solar Power Industries Inc, Belle Vernon (USA): www.solarpowerindustries.com

Solar Wind Europe, Soria (Spain): www.solar-windeurope.com

Solara, Hamburg (Germany): www.solara.de

Solar-Fabrik, Freiburg (Germany): www.solar-fabrik.de

Solaria Energia, Puertollano (Spain): www.solariaenergia.com

Solarion GmbH, Leipzig (Germany): www.solarion.de

Solaris, Spezzano Albanese (Italy): www.solarisrlit

Solartec, Roznov pod Radhostem (Czech Republik): www.solartec.cz

Solartron, Nakorn Rachasama (Thailand): www.solartron.co.th

Solarwatt, Dresden (Germany): www.solarwatt.de

Solon, Berlin (Germany): www.solonag.de

Soltech Corp., Beijing (China): www.soltechpv.com

Spherical Solar Power, Cambridge (Canada): www.sspolar.com

SSEC, Shanghai (China): www.ssec-china.com

Sun Tech Solar Company Limited, Shenzhen (China): www.solarsuntech.com

Sunpower Corporation, Philippines: www.sunpowercorp.com

Suntech Power Co., Wuxi (China): www.suntech-power.com

Sunways, Konstanz (Germany): www.sunways.de

Symphony Energy Co. Ltd., Gwangju (South Korea): www.symphonyenergy.com

Tata BP Solar India Ltd., Bangalore (India): www.tatabpsolar.com

Telecom-STV, Moscow (Russia), phone: 007/095/531 83 51

Tenesol, Toulouse (France): www.total-energie.fr

Titan Energy Systems Ltd., Secunderabad (India): www.titansolar.com

Udhaya Semiconductors Limited (USL), Coimbatore (India): www.usl-solar.com

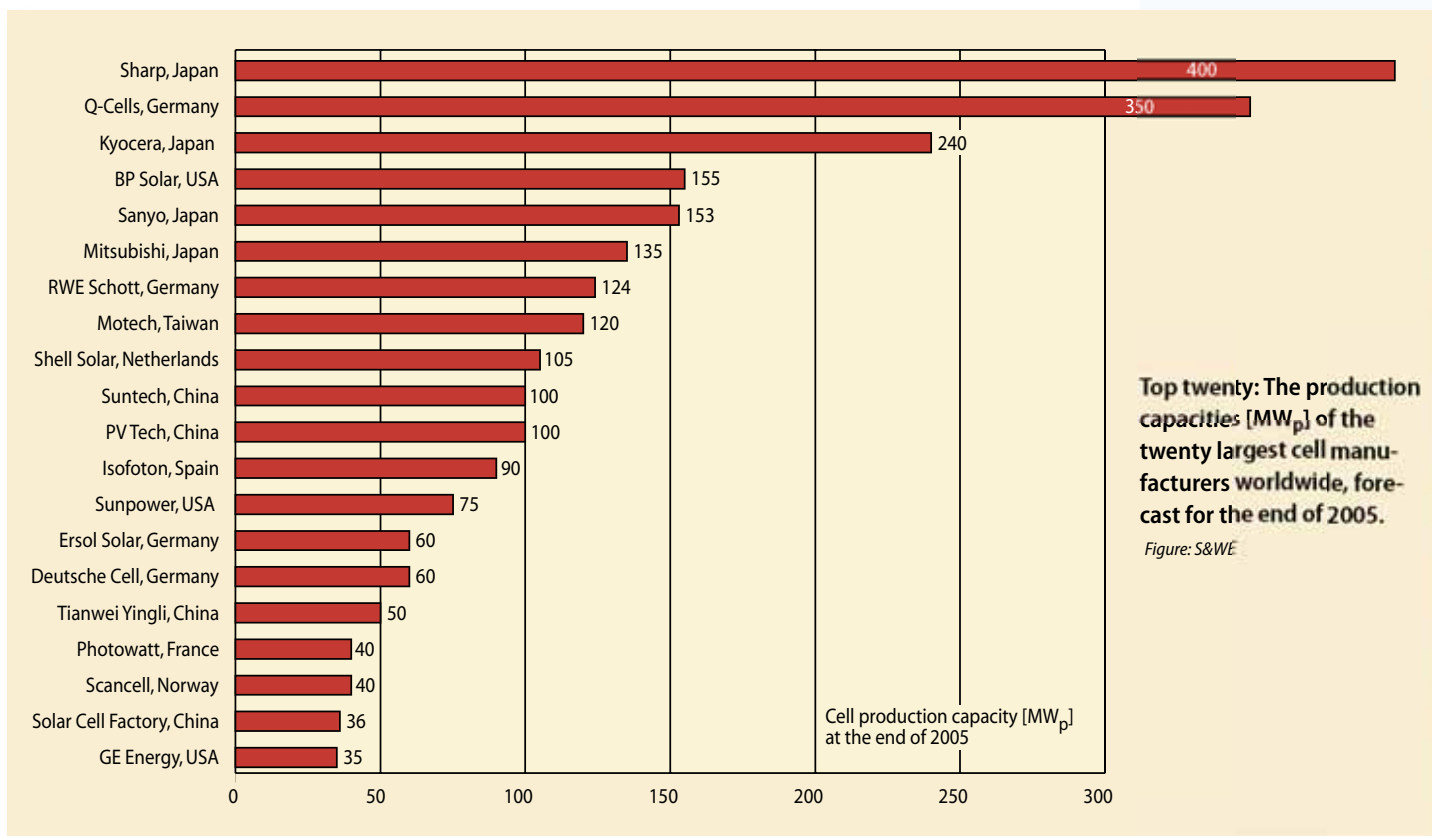
Ulica Solar, Shanghai (China): www.ulsolar.com.cn

United Solar Ovonic LLC, Auburn Hills, Michigan (USA): www.uni-solar.com

USL Photovoltaics Pvt Limited (UPL), Coimbatore (India): www.solarpv.info

Webel SL Energy Systems, Kolkata (India): www.webel-solar.com

Xi'An Rew Co, Ltd, Xi'an (China): www.rew.com.cn



Top twenty: The production capacities [MW_p] of the twenty largest cell manufacturers worldwide, forecast for the end of 2005.

Figure: S&WE

be built in Thalheim, Germany. Before the end of the year, **CSG Solar AG**, a joint venture with Australian Pacific Solar, wants to start producing thin-layer silicon modules. In 2006, **Ever-Q GmbH**, a joint venture with the US Evergreen Solar Inc. and Q-Cells AG, will follow suit. Ever-Q wants to produce wafers, cells and modules using string ribbon technology. The construction of the plant, which will have a capacity of 35 MW_p, has already begun. Therefore, the production capacity of cells at this site will soon amount to 400 MW_p.

SMD Solar-Manufaktur Deutschland GmbH, a production company for **Aleo Solar GmbH**, is planning a new module production in Spain. By the summer of 2006 it will have a capacity of 10 MW_p. By the copy deadline we still had no further information as to where exactly the plant will be located.

Würth Solar, a member of the German Würth-Elektronik-Gruppe, is planning the construction of a plant for CIS modules in Schwäbisch Hall (Germany). Starting in 2007, this plant will produce 15 MW_p. So far, the company only has a pilot production of 1.3 MW_p in Marbach, Germany.

A new module plant is currently being built in Varallo Pombia, Italy. In May 2005, the newly founded **Pa.Sol** bought a production line with a capacity of 12 MW_p for modules from the US manufacturer Spire Solar Inc. This line is to go into operation by January 2006 and will produce 6 to 8 MW_p over the course of a year. By 2007, the production is to be increased to full capacity at 12 MW_p.

Origin Energy, Adelaide (Australia), started pre-production of a new cell type called Sliver Cells in July 2005. Sliver Cells use significantly less silicon than common cells. Commercial production of the first modules

is planned for 2006. Origin's manufacturing plant is expandable to 7 MW_p which in fact is the scheduled production capacity for 2007.

Spheral Solar Power from Ontario, Canada, has come quite a bit closer to series production. The subsidiary of the Canadian company Automation Tooling Systems announced the beginning of series production for the end of this year. According to their marketing coordinator John Finch, a 20 MW_p factory with a staff of 200 people is being planned. Silicon spheres from their own production are being used instead of wafers. Approximately 20,000 spheres make up a wafer (600 x 150 mm²), which is embedded in aluminium foil from above and below and is then further processed into PV cells by means of numerous etching and structuring steps. Spheral Solar Power offers modules from 40 to 200 W_p.

A Slovenian company is now also entering the German market. At the Intersolar in Freiburg (Germany), **Blues Solar** presented solar modules with 180 to 220 W_p based on multicrystalline 6" cells. Production is to start in the third quarter of this year, initially at 15 MW_p per annum. The company is part of the Blues Group that currently employs more than 1,000 people and manufactures industrial cooling machines and household appliances.

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The production capacities of PV plants worldwide are increasing rapidly.

New production sites are springing up like mushrooms. China is shifting into the fast lane.

Several times as of late, the photovoltaics industry has gained recognition from a critical and independent entity, the world of finance. A young and upcoming industry that is increasingly being observed by banks worldwide, it is no longer a »delicate flower« but an industry that has taken root and will continue to bear fruit. The PV industry has become an important industry worldwide with considerable production capacities and turnovers. The world map on page 80/81 contains 111 PV factories from 84 companies in 30 countries. The manufacturers shown will have a cell and/or module production of at least 10 MW_p by the end of this year. The exception: For countries where, if this rule was to be applied, less than two manufacturers would appear on the map, the two largest PV factories are shown, even if they produce less than 10 MW_p.

»The industrial era begins«

Just recently, a German financial institution, the Landesbank Baden-Württemberg (LBBW), in their study called »Das industrielle Zeitalter beginnt« (»The industrial era begins«) estimated the turnover of the PV industry worldwide at 6.3 billion €. The analysts forecast an average worldwide growth of 26% until 2010 (based on the installed PV power annually). That would mean at least a quadruplication of the market from 896 MW_p (2004) to 3,602 MW_p.

It does not seem to be the extension of cell production facilities that restricts the increase of the PV market. The twenty largest cell manufacturers alone (see figure) want to increase their production capacities by approximately 75% by the end of 2005 as compared to the end of 2004 (Isofoton and BP Solar were not included because the data for 2004 was unavailable). If sufficient raw material is available, they could produce cells for a total of 2.5 GW_p. The PV industry has its largest growth in the Chinese sector. Within one year three module plants and two cell plants increased their production capacity up to 100 MW_p. The size of the module plants of the twelve Chinese manufacturers quadrupled within one year from 156 to 547 MW_p (including Soltech's and Topray's thin-film factories). By the end of this year, the six cell plants are supposed to be able to produce fivefold as much (a total of 316 MW_p). And many smaller Chinese manufacturers, who also have high ambitions, do not even appear on the world map, because they failed to provide their data prior to our copy deadline.

Top twenty of cell manufacturers: newcomers are pushing forward

In 2005 the cell manufacturer ranking shifted all around. The market leader **Sharp** is still number one, whose large production facility in Katsuragi, Japan, features an annual solar cell production capacity of 400 MW_p. The technology remains largely within the country. Outside of Japan, Sharp has only established two smaller module productions, one in Wales (United Kingdom) and one in the USA. In Japan the module production capacity of 340 MW_p is divided into three factories in Osaka, Tochigi and Katsuragi.

The German newcomer **Q-Cells** passed numerous competitors and is now in the number two position worldwide. Their location in Thalheim (Germany) has become the second largest production facility for cells world-wide (350 MW_p) within just one year.

With a cell production capacity of 240 MW_p, **Kyocera** will again be therein third place, ahead of **BP Solar** and **Sanyo**. These latter two are neck-and-neck. Including the production in India (Tata BP), the size of the cell production facilities of the British oil corporation adds up to 155 MW_p (2005). Sanyo expanded their 0 locations in Osaka and Shimane, both of which are in Japan, to 153 MW_p and with their module productions in Mexico (10 MW_p) and Hungary (50 MW_p) they are moving in on the important markets in Germany and the USA. In Japan the company operates three module factories: Hyogo (30 MW_p), Osaka (33 MW_p) and Gunma (40 MW_p).

Thereafter the gaps become smaller between competitors. **Mitsubishi Electric** (135 MW_p), **RWE Schott Solar** (124 MW_p), **Mo-tech** (120 MW_p) and **Shell Solar** (105) rank sixth to ninth place worldwide. Among the twenty largest cell manufacturers worldwide are also some Chinese newcomers. **Suntech Power** based in the Wuxi state with their cell production at 100 MW_p, which is the same as their local competitor **PV Tech Co. Ltd.** These two companies thus rank 10th and 11th place. There are four Chinese, four German and four Japanese manufacturers among the top twenty.

India on the other hand is lagging far behind its actual potential. According to their own data, the market leader **Tata BP**, a joint venture of the Tata Power Company and BP Solar, their module capacity of 45 MW_p covers approximately 50% of the Indian market. The other cell and module manufacturers are much smaller and do not even appear on the map, such as **Maharishi Solar Technology** (6 MW_p in 2004) and **Webel S.L.** (5 MW_p). **Udhaya Semiconductors Ltd.** (USL) as well as **Photovoltaics Pvt Ltd.** (UPL) are associated and produce more than 10 MW_p.

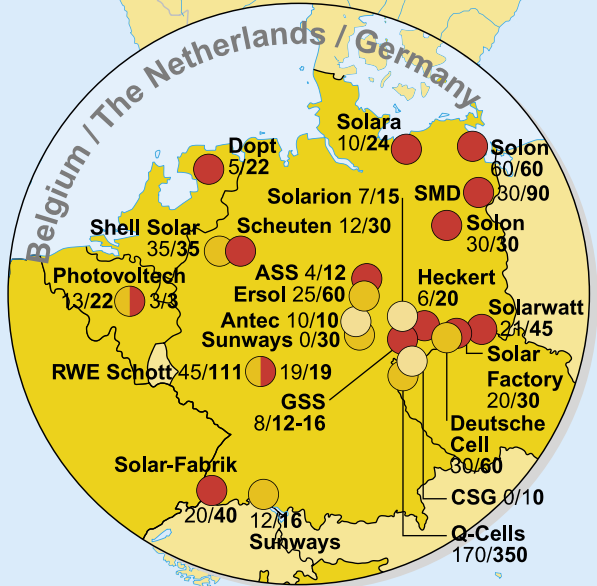
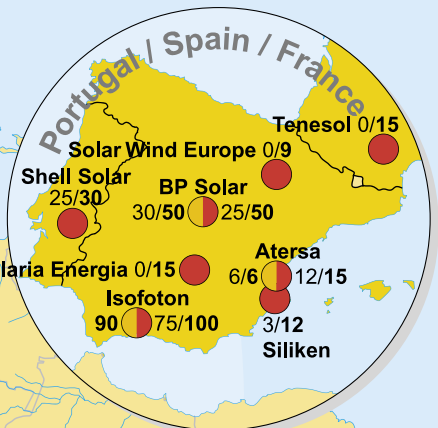
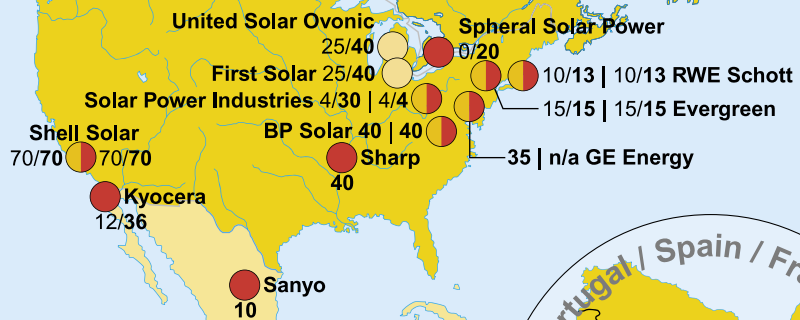
New plants are springing up like mushrooms

The worldwide PV industry continues to grow. New production sites are springing up like mushrooms. The following locations will go into operation next year and therefore do not yet appear on the map.

According to **Q-Cells AG's** plans, one of the »world's largest production facilities of the solar industry« will



The PV industry is gearing up



A powerful industry worldwide

PV factories worldwide: 111 sites in 30 countries

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Capture

- production site for crystalline cells
- production site for crystalline modules
- production site for thin-film modules
- 50 production capacity at the end of 2004 in MW_p
- 50 production capacity at the end of 2005 in MW_p

Example

BP Solar
30/50 ● 25/50

The BP Solar plant featured a cell production capacity of 30 MW_p at the end of 2004, along with a module capacity of 25 MW_p. By the end of 2005, the production capacity for cells and modules is forecasted to reach 50 MW_p.

Selection of locations

The map shows PV manufacturers with a total capacity of 10 MW_p for cells or modules (even if distributed across several locations). For countries where, if this rule was to be applied, less than two manufacturers would appear on the map, the two largest PV factories are shown, even if they produce less than 10 MW_p. In Japan the module production sites of Sharp, Kyocera and Sanyo are combined.