Oerlikon Solar at a glance

<table>
<thead>
<tr>
<th>Headquarters Location:</th>
<th>Trübbach, Switzerland</th>
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<tbody>
<tr>
<td>Year Established:</td>
<td>2003</td>
</tr>
<tr>
<td>Number of Employees:</td>
<td>over 750 worldwide</td>
</tr>
<tr>
<td>locations</td>
<td>13</td>
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<tr>
<td>Global Reach:</td>
<td>Sales and service centers in the USA, Europe and China, Taiwan, Korea, Singapore and Japan</td>
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<tr>
<td>Technology Expertise:</td>
<td>Manufacturing equipment and end-to-end production solutions for thin film silicon PV modules</td>
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<tr>
<td>VLSI ranking</td>
<td>Global number one solar turnkey line supplier</td>
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What does Oerlikon Solar do?

Oerlikon Solar is the world's leading manufacturer of proven end-to-end thin film silicon PV solutions. The company provides solar panel manufacturers a quick path from concept to revenue with its “end-to-end” solutions. Oerlikon Solar thin film PV equipment and factories provide customers with the lowest cost of ownership, fastest time to deployment, highest reliability and superior technology advantages with full service end-to-end solutions that are predictable and reliable. Furthermore, Oerlikon provides customers with the capability to scale up rapidly to meet fast-growing demand for solar PV, demand that will accelerate as the cost of PV energy approaches grid parity. Oerlikon Solar’s progress towards reaching grid parity by end of 2010 is driving market expansion for its customers’ end products. Oerlikon customers have the dual advantage of the industry’s most advanced thin film PV technology that is also the most tested, proven and reliable. Because of this, customers have the fastest time to market with Oerlikon Solar.

Oerlikon Solar manufactures stand alone equipment and end-to-end manufacturing lines include full ramp up support and maintenance support. Oerlikon Solar has developed and proven advanced thin film processes including amorph® HIGH PERFORMANCE and Micromorph® technology for the mass production of thin film solar modules. These technological breakthroughs from Oerlikon Solar provide significant power and efficiency gains, which drive up efficiency and drive down cost moving solar closer to grid parity.

Operational Structure

Oerlikon Solar is one of six business segments of OC Oerlikon Corporation AG, a leading global manufacturer of production systems, components and services for thin film, vacuum, propulsion, textile-manufacturing and precision-technology products.

Oerlikon Solar was established as a new product line in 2003 and became an independent business unit in 2005 within the Oerlikon Balzers Coating segment. Due to market growth and potential, Oerlikon Solar was established as OC Oerlikon’s sixth business segment in the fall of

Oerlikon Solar is headquartered in Trubbach, Switzerland, with an R&D lab in Neuchâtel, Switzerland and a pilot line in Trübbach that provides a key strategic asset for the company’s R&D capabilities. Oerlikon Solar has grown to more than 750 employees worldwide. Global customer support and training are provided through sales and service centers in the United States, Europe and Asia-Pacific. Revenues for 2008 were reported at 628 million CHF. Oerlikon Solar customers have manufactured more than 960,000 panels to date. The company has more than 200 global customer support personnel at 13 locations in nine countries.

What is driving growth in the solar industry?

As the world grapples with soaring energy prices, increasing demand for power and the rising threat of global climate change, solar energy stands out as one of the most attractive sustainable energy options. More than 34 million mega-watt hours hit our planet every day from the sun. This is 10,000 times more than what we use globally. Solar energy is inherently clean, creates no negative side effects and in most parts of the world is readily available in virtually unlimited quantities. With dwindling fossil fuel resources and increased environmental regulation, most experts predict a substantial transition toward solar power as a primary energy source in the near future.

Approximately 90 percent of the new electrical capacity that will be brought on line in the U.S. in 2012 will come from renewables like solar, wind, geothermal, biomass and hydroelectric power, according to a new study from the Prometheus Institute. The European Photovoltaic (PV) Industry Association (EPIA) expects photovoltaic solar electricity generation to grow in the range of 17 to 32 percent over the period 2008 – 2013 according to its Global Market Outlook for Photovoltaic until 2013, April, 2009.

Low-cost thin film solar modules present significant growth opportunities in this market. According to the Prometheus Institute in its September 2008 report, “Thin film PV 2.0: Market Outlook Through 2012,” thin film could make up over 40 percent of worldwide PV production approaching 10 GW of capacity. These developments mark a major step toward achieving “grid parity” with conventional electricity supplies.

Faced with the urgency to increase renewable energy sources, governments around the globe (e.g. China, Japan, USA, Switzerland, France, Italy, Greece…) are supporting solar-energy production in various ways, including incentives, subsidies, feed-in tariffs and tax-reductions.

What are photovoltaics?

Photovoltaic (PV) technology converts light energy directly into electrical energy through photovoltaic cells. Also known as solar cells, individual PV cells are electricity-producing devices made of semiconductor materials. PV modules consist of an assembly of PV cells, and can be combined to form PV arrays of varying sizes and power output.
Solar PV is an increasingly important energy technology because it contributes to global energy supplies with virtually no negative environmental impact, such as air pollution or hazardous wastes. PV systems utilize an inexhaustible, free, and versatile source of energy. Solar PV energy can supplement existing power-grid systems and can also bring electric power to remote areas that are far from conventional power lines.

There are two different processes for producing PV cells: wafer-based silicon technologies and thin film PV technologies. Wafer technology requires a significant silicon supply. Thin film PV cells, a newer, innovative technology, employs silicon and other thin films on supporting substrates such as glass, polymer, aluminum, stainless steel, or metallurgical-grade silicon. They typically use amorphous, nanocrystalline, fine-grained polycrystalline, or epitaxial silicon layers that are only a fraction to a few micrometers thick.

What makes Oerlikon Solar different from others in the solar energy business?

Like the semiconductor industry, the rapidly growing solar-energy industry is comprised of several key sectors that make up a well-developed supply chain: from materials makers to equipment suppliers to OEMs and device makers. Serving a rapidly growing global base of customers, Oerlikon Solar is a leading supplier of equipment and technology for large-scale production of solar modules.

By offering an end-to-end solution to multiple manufacturing partners, Oerlikon’s business strategy allows large-scale energy producers and project managers to diversify their sourcing without sacrificing quality and consistency. Oerlikon Solar’s business model ensures replicability and scalability across its growing customer base around the world so utilities can lock into a standard design. For large-scale projects Oerlikon Solar’s flexible end-to-end business model also provides new business options for utilities or utility-scale developers who choose to vertically integrate into module manufacturing to deliver least cost solar energy.

Oerlikon Solar has the strongest track record in solar equipment and factories in terms of the speed with which customers ramp up and start production. It also has the most customers in production to date. The company has delivered on or before schedule and has met guaranteed performance levels for every project. Customers can go from move in to production in eight months or less with Oerlikon Solar so they can quickly ramp up and start selling products to meet the demand for thin film solar panels.

The company provides the industry’s most complete line of equipment, technology and services enabling automated mass production of large-area, thin film silicon solar modules. Its high-performance production lines for manufacturing cost-effective solar modules feature an innovative Micromorph® tandem technology, invented by Oerlikon Solar’s Dr. Johannes Meier, that combines two different silicon materials — amorph and microcrystalline. This proprietary combination boosts energy conversion efficiency levels up to 50 percent higher than traditional amorphous single junction cells.

Oerlikon Solar is the world’s leading supplier of proven, fully automated end-to-end solutions encompassing metrology and the entire production process — from glass cleaning to testing of the finished modules. This technology is backed by an industry-leading, full-service package for commissioning the equipment, integration of the company’s proprietary process technology and assuring an efficient and timely production ramp-up. The environmentally friendly and highly effective Micromorph® tandem modules offer customers many advantages, including the potential to achieve efficiencies of 10 percent and more in the near future.
What is Oerlikon Solar’s core technology?

As the world’s first manufacturer of automated production lines for thin film solar modules, Oerlikon Solar has extensive experience in integrating production technologies and processes to create end-to-end solar factories. The fully automated FAB 1200 is the latest generation in solar module manufacturing lines.

Oerlikon Solar’s FAB 1200 applied proprietary technologies for the mass production of thin film silicon solar modules include three key components:

1. TCO 1200 for depositing transparent conductive oxide (TCO) layers in a low pressure chemical vapor deposition (LPCVD) process for front and back contacts with haze on demand
2. KAI 1200 for plasma enhanced chemical vapor deposition (PECVD) to build the amorphous and microcrystalline photosensitive layers and
3. LSS 1200 for laser patterning to produce serially connected cells.

What is Micromorph® module technology?

Invented by OerlikonSolar’s Dr. Johannes Meier, the company’s proprietary Micromorph® module technology, which was introduced in the fall of 2007, combines two different silicon materials — amorphous silicon and microcrystalline silicon - in a top and a bottom cell. The amorphous top cell converts the visible part of the sun’s spectrum, while the microcrystalline bottom cell absorbs the sun’s power in the near infrared spectrum. Consequently, the new Micromorph® technology boosts the efficiency level up to 50 percent higher than traditional amorphous single cells. This process not only reduces energy production costs, it also has the potential for reaching conversion efficiencies of more than 10 percent. In addition, Oerlikon Solar is committed to using materials that are non-toxic, low cost and readily available.

Why is Oerlikon’s module size the industry standard?

Oerlikon Solar’s 1.4 m² substrates are the leading format currently available for equipping silicon thin film solar module production facilities, and have become the industry standard through numerous installations in overall PV. In addition to the fact that they are the only substrates available for wide-scale implementation today, this format has other advantages over larger substrates including higher efficiency, lower cost of ownership per watt, lower shipment costs and ease of transport and installation.

How can we offer globally valid IEC (TÜV) certification?

In 2008 TÜV Rhineland approved that Oerlikon Solar passed all tests required for the certification of its Amorph Basic, amorphHIGH PERFORMANCE and Micromorph® thin film silicon PV modules. All Module Performance (IEC 61646:2008) and Module Safety (IEC 61730-1:2004/61730-2:2004) criteria were satisfied.

Issued as a master certificate, it allows Oerlikon Solar to offer all end-to-end production line customers a dramatically reduced time-to-market (from 6 months to six weeks) for certified
modules. These certifications confirm both the technological lead and the viability of Oerlikon Solar's end-to-end production technology.

The certification is valid across the entire globe and forms just one part of the stable platform upon which Oerlikon Solar is scaling-up its production and services.

What is grid parity?

“Grid parity” will occur when solar-powered electricity reaches cost parity with conventional fossil-fuel based electricity. This will first occur in most regions of the world during periods of peak demand, when conventional electricity generation is most costly, and when solar PV electricity generation is at its maximum level. Solar installations in the world’s sun belts will play a major role in achieving grid parity, and in “shaving” peak demand for electricity in these regions. In some regions around the globe (e.g. Southern California, Southern Europe) grid parity is already reality at noontime today.

Oerlikon Solar and other solar industry participants are committed to continually improve solar PV technology and reduce the cost of solar PV energy to reach grid parity, without government subsidies, within the next several years. Grid parity depends on a variety of factors, including lower cost of ownership for solar module production and increased module efficiencies. Benefiting from economies of scale in building large scale and highly efficient solar module factories – in the Gigawatt peak (GWp) range – is a critical evolutionary step on the path to grid parity.

The cost of other elements of the supply chain, ranging from acquiring land and constructing solar farms to purchasing equipment like supporting structures for modules and inverters will also decline as the industry matures.

Oerlikon Solar is on track to reach 70 cents per Watt by 2010, which will move the company to grid parity with traditional fossil fuel energy resources. With the government support already in place, this will spur a major solar build out as the economics will, for the first time, favor solar power. The ability for a company to quickly scale while not sacrificing quality will be critical in addressing the demand and build out of solar power worldwide.

Who are Oerlikon Solar’s customers and partners?

Oerlikon Solar is the world leader in silicon-based thin film solar technology and end-to-end manufacturing solutions with 10 established customers in operation or ramp up worldwide representing 600 MWp of yearly production capacity, enough to power 480,000 households.

The company has a rapidly expanding global customer base. Recent sales to customers include Sun Well Solar and Auria Solar Co. Ltd. (Taiwan), Tianwei and Chint Solar (Mainland China), Inventux, ersol Thin Film GmbH, SCHOTT Solar AG (Germany), and Pramac SpA (Italy), Gadir Solar (Spain) and HelioSphera (Greece).

Besides a well established global footprint, Oerlikon Solar has significant partnerships with leading industrial companies such as Tokyo Electron (sales and customer service) and Flextronics (equipment manufacturing) to guarantee comprehensive customer service and support and rapid scalability throughout different geographies.
What awards has Oerlikon Solar won recently?

Oerlikon Solar has been named winner of the 2009 CELL AWARD, presented at the worlds biggest solar trade show, the Intersolar 2009 Conference in Munich. The jury selected Oerlikon Solar’s KAI 1200 PECVD system as “the best technical product for thin film manufacturing”.

Oerlikon Solar toppes the VSLI list as the “global number one solar turnkey line supplier”. Oerlikon Solar maintained a comfortable lead in 2008 among solar turnkey manufacturing line providers in rankings released by VLSI Research. VLSI Research Inc. is the leading provider of market research and economic analysis on the technical, business, and economic aspects within nanotechnology and related industries.