CTF SOLAR
CNBM

Factories from CTF SOLAR – Putting Thin Film Solar Energy to Work

High-end German engineering coupled with Chinese production methods backed by collaborations with leading European and Chinese machine construction companies has enabled CTF SOLAR to offer state-of-the-art CdTe solar module factories and approved production technology – now available to customers worldwide.

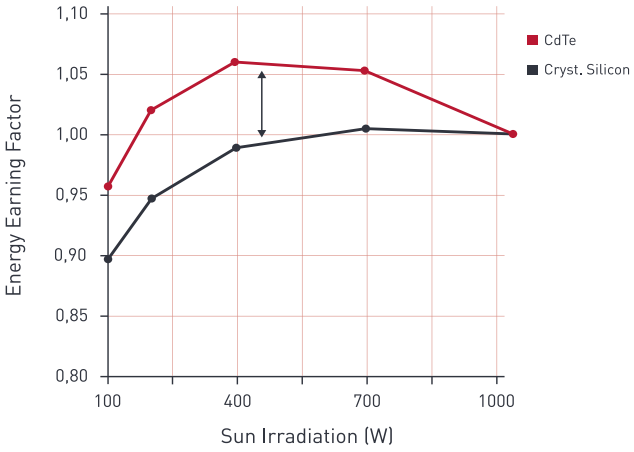
Innovation. Empowering Excellence.

The Technology

CdTe technology has excellent physical features which include effective diffuse light performance as well as resistance to temperature fluctuations – which is an important factor when used in areas with varying, rapidly and frequently changing weather conditions.

Excellent Low Light Performance

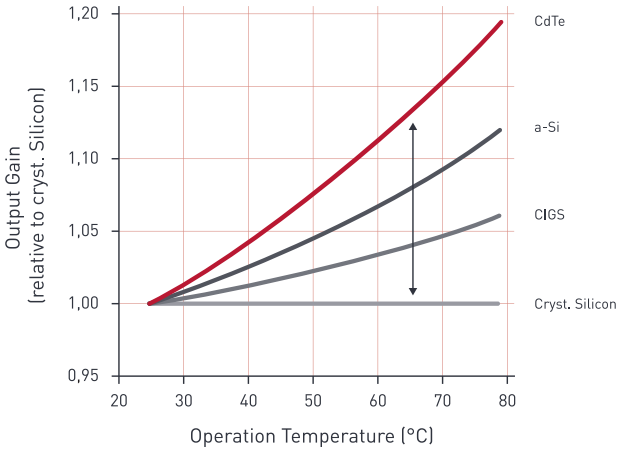
CdTe panels become more efficient as solar radiation decreases, which means that they produce high yields even in cloudy and foggy conditions.



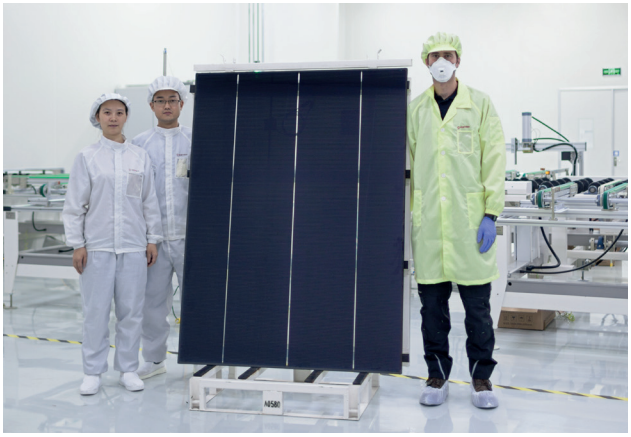
Additional energy provided by a CdTe solar module at real irradiation conditions.

Excellent High Temperature Performance

Although solar modules' energy conversion efficiency decreases with increasing temperatures, CdTe modules are least affected by this effect and yield higher energy harvests compared to other systems of the same nominal efficiency.



Up to 15% additional energy output by a CdTe solar module at real operation temperature relative to crystaline silicon.



Environmental friendly

With a payback time of less than a year, CdTe modules have the **lowest energy payback time** of all PV modules. On a life cycle basis, CdTe PV furthermore has the **smallest carbon footprint** of all other solar technologies. CTF SOLAR factories are **emission-free**. This is thanks to the fact that all exhaust air is cleaned at machine level, central process heat is collected using a closed loop water cooling system, a line-integrated waste water treatment and recycling system, and very low processing water needs in general.

The Factories

The first CdTe factory with a standard capacity of 100 MW came into existence in Chengdu, in the Chinese province Sichuan.

This factory is the prototype for the kind of solar module factories that the CNBM Group is now offering to design and implement for customers worldwide through CTF SOLAR.

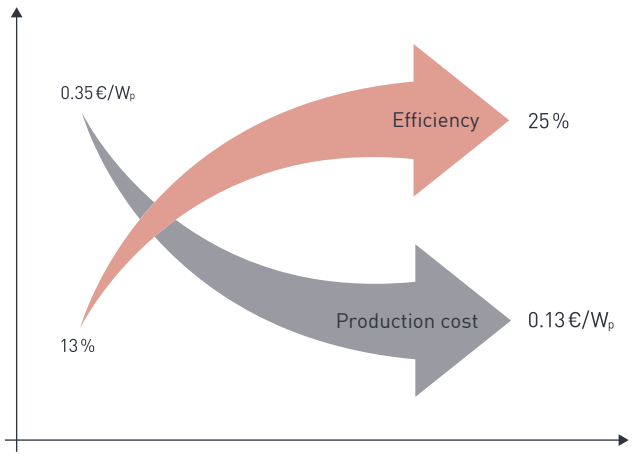
The **fully-automated factory** in Chengdu has a production line with a length of 750 m, a cycle time of less than 1 minute and a **24/7/52 operating schedule**. The factory's equipment is mainly made in Europe and complemented by a number of Chinese components.

From the factory's layout and the selection of the equipment from leading European and Chinese manufacturers, to the precision design and integration of all components and processes – CTF SOLAR delivers high quality and the most advanced technology, putting the results of its extensive research and development work into effective practice.

CTF SOLAR's solutions used in combination with the support it provides concerning **materials sourcing** enables its customers to achieve the **lowest possible module production cost**, thus contributing to the production of highly competitive PV modules.

Thanks to its expertise in the field of CdTe technology development and factory engineering and its proven implementation process, which has been specifically designed with a view to achieving high cost efficiency, CTF SOLAR is able to guarantee **low operating cost structures**, low investment and low risk.
In view of the fact that CdTe technologies are furthermore far from having reached their maximum potential, there is yet further potential for reducing this technology's cost in the future.

This is why CTF SOLAR is continuously working towards further improving the associated production technologies and manufacturing processes.
By cooperating with leading scientific institutes, CTF SOLAR has been able to produce a development and cost reduction roadmap for reaching conversion **efficiencies of 25 %** and production **costs as low as 0.13 €/W_p** within the next 5 years.



Thanks to their uniform appearance and **size of 1.600 × 1.200 mm**, CTF SOLAR's CdTe modules are an attractive choice for architects for use as **building integrated modules**. Due to the modules' technology features, they are also well suited for use as utility scale solar plants, and especially so under the climatic conditions found in both developing and evolving countries.

CTF SOLAR – the Original

CTF SOLAR is the first company worldwide to offer equipment and solutions for producing thin film PV modules using cadmium telluride (CdTe) technology to customers across the globe. CdTe technology was developed by Dr. Dieter Bonnet, who created the world's first functional cadmium telluride (CdTe) solar cell in 1969. In 2001, Dr. Dieter Bonnet, Dr. Michael Harr and others founded the company ANTEC Solar in Germany, which was the first company worldwide to produce CdTe thin film modules on a commercial basis.

Today, the work begun by ANTEC Solar is being continued by CTF SOLAR, which is part of the Shanghai-based company CTIEC (China Triumph International Engineering Corporation), a company of the Beijing-based CNBM Group (China National Building Material Group Corporation).

CTF SOLAR can provide its customers with almost 30 years of expert experience, thanks not only to its outstanding history, but also to its current team of over forty physicists, chemists and engineers from 10 different nations who are pooling their expertise and working together in Dresden.

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