Solar Energy System of the Month:

- The world's largest open-space solar power plant with CIS technology
- Thin-film photovoltaic on the way to the world's biggest solar electric power park
- Solar energy for heating and cooling
- The Combined Power Plant: first stage in providing 100 % power from renewable energy
- PV-TEC – Research factory for solar cells
- Solar power system offers protection against blackouts

The superlative of solar parks: the world's largest open-space solar power plant with CIS technology

The photovoltaic system supplier Würth Solergy and the Swiss manufacturer of inverters Sputnik Engineering AG commissioned the largest open-space photovoltaic plant with modules of copper indium diselenide (CIS) in the Spanish city of Albacete which is the capital of the province with the same name. The solar power plant with its 41 600 solar modules and 30 central inverters, each with an output of 100 kW, has an overall output of 3.26 MWp. With this plant in Albacete, CIS technology has now pioneered into solar electricity production on the scale of power plants. The development of this thin-layer technology was achieved in the laboratory of the Centre for Solar Energy and Hydrogen Research of the University of Stuttgart, the industrial large-scale production will be done in the CISfab plant of Würth Solar in Schwäbisch Hall. The Solarserver presents this innovative solar power plant as "Solar plant of the month" October 2008 and provides information on the advantages of these high-performance thin-layer modules in conjunction with Swiss inverter technology.

Solar Energy System of the Month as PDF-Dokument

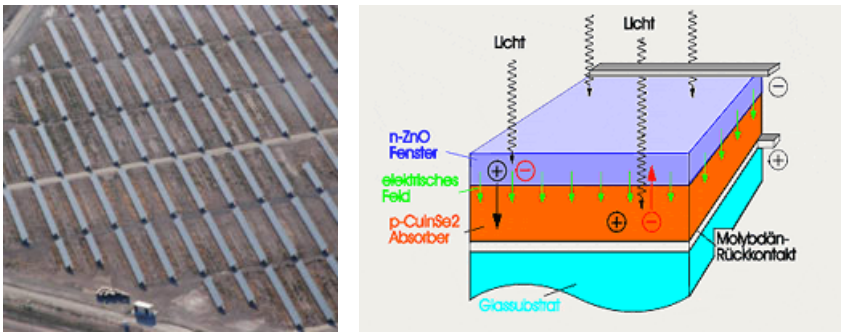
3,26 megawatt solar power plant in Albacete, Spain.

Since the start of thin-layer solar module production on an industrial scale in 2006, Würth Solar has doubled the production capacity of its CISfab plant from 15 MW to 30 MW. This firmly positions Würth Solar as the world's leader in the production of solar modules on the basis of copper indium diselenide. Every year about 350 000 modules are being produced in Schwäbisch Hall. "CISfab is working around the clock:

production lines are running 24 hours, seven days a week, 365 days a year," Bernd Sprecher, CEO of Würth Solar, explains.

CIS technology: the alternative to silicon solar modules

Alternatives to solar cells from crystalline silicon increasingly became the focus of attention during the past years; and these alternatives also included CIS technology. Differently doped copper indium diselenide compounds replaced the semi-conductor function of the raw material silicon. The first letters of the elements used are combined to form the name of this technology - CuInSe2. Other than silicon-based solar cells that require a layer thickness of at least 120 micrometer (µm) because of the indirect semiconductor silicon in order to provide sufficient absorption of light, CIS technology requires a mere 2 micrometers (µm), i.e. the layer thickness is 50 times thinner than a human hair. This is possible because the three-element compound of CIS technology is physically a direct semiconductor compound.



Left: CIS modules in Albacete. Right: Schematic presentation of a CIS solar cell. [Wording of image: Light; n-ZnO window; electrical field; p-CuInSe2 absorber; glass substrate; molybdenum back contact]

Besides CIS there are other technologies, also with very thin semiconductor layers, such as amorphous silicon (aSi) or cadmium telluride (CdTe). CIS modules by Würth Solar have significant advantages regarding their degree of efficiency in comparison to these two thin-layer technologies. In addition, the fact that CIS modules require less surface area in comparison to amorphous silicon and cadmium telluride modules, makes them very attractive if the available roof surface is limited. CIS by Würth Solar also scores through its high performance stability, good properties when integrated into the overall photovoltaic system and an attractive optical appearance.

High energy output and stable performance

A significant advantage of CIS technology is the highly modern manufacturing process. In contrast to the complex production of silicon solar modules, a CIS module is manufactured in a single process at the centre of which stands the vapour deposition on the substrate (glass). Würth Solar can effect all three elements in a single work step. Similar to steaming up a window pane with human breath, the semiconductor layer applied in this manner is negligibly thin. In comparison to the production of crystalline silicon modules, the manufacturing chain requires little energy – a further advantage when considering ecological factors.

Also with respect to their energy output CIS modules are convincing, since they yield good outputs even when ambient temperatures are high – which even in our region can already occur in early summer – or when light is diffuse, for example in poor weather. Even when they are partially covered, for example through snow, CIS modules will still generate power with the open surface area of the module. With an average degree of efficiency of 12 percent, CIS modules of Würth Solar are on a par with modules from crystalline silicon and are clearly better than amorphous silicon modules and cadmium-telluride products. Besides their invisible

technical advantages, the optical appearance of CIS solar modules is also convincing: the uniform black colour of CIS modules with the pinstripe optics opens new creative opportunities. Thus CIS modules are not only classically screwed onto the roof – they can be integrated into the roof surface and can even replace roof tiles or be integrated into the facades of buildings.


CIS modules on stands, CIS photovoltaic plant.

Large-scale production of CIS modules at Würth Solar

Thus far the worldwide share of CIS solar modules is still low. The global market share of thin-layer modules, however, is rapidly increasing and experts expect that thin-layer photovoltaics will have reached a 20 % market share by 2020 and that in the long term every third module will be based on thin-layer technology. Experts in the field thus consider CIS to be the "technology of the future".

At Würth Solar this future has already begun, since this company was the first solar technology company in the world that started the large-scale production of CIS modules in autumn 2006. Currently about 30 000 completed CIS modules leave the production lines. This corresponds to a production capacity of 30 MW. In 2009 the nominal output of the factory is to be increased to 40 MW. It is against this background that Würth Solar anticipates to have secured a market share of about three to five percent by the middle of the next decade. The company continuously strives to improve its degree of efficiency and energy utilisation through further research successes and to continue increasing manufacturing productivity.

With the expansion of the CISfab plant Würth Solar is responding to the large interest in CIS modules. According to the company, demand is currently particularly high in Germany. However, also in countries such as Spain and Italy, the demand of CIS modules is on the increase. In these countries solar energy is also subsidised by legislation similar to the renewable energies act of Germany, which has a positive impact on the markets.


CISfab of Würth Solar; Detailed view of the plant in Albacete.

Stable module efficiency of 12 percent in series production – resource-efficient manufacturing

On the basis of their product properties CIS solar modules also have a high innovation potential in future, Würth Solar emphasises. Thus the

company is convinced that CIS is part of the technologies with excellent future perspectives. GeneCIS modules by Würth Solar have already achieved a stable module efficiency of 12 percent in series production. The innovation potential can be seen in the energy balance: energy payback time, i.e. the time a solar module takes to generate an equal amount of energy as was used for its production, is particularly low in CIS modules. According to the EU-subsidised, independent SENSE project it amounts to 1.3 years in southern Europe and 2.1 years in central Europe. The comparable time for crystalline silicon modules is 50 to 70 percent higher according to the SENSE study.

German CIS modules and Swiss inverters are particularly advantageous when ambient temperatures are high

The advantages of CIS technology become particularly apparent when ambient temperatures are high. In comparison to standard solar modules of crystalline silicon, CIS modules work on a more favourable temperature coefficient. In other words: their module output decreases less when operating temperatures increase. The inverters used in Albacete are also not affected by high ambient temperatures. Thanks to an intelligent cooling concept the products manufactured by Sputnik Engineering AG still feed their full nominal output into the public grid at ambient temperatures of up to 45 degrees Celsius. Sputnik separated the electronics from the heat-generating components of the inverter so that the temperature can be maintained at a low level. The storage throttles are housed in the base of the housing and are cooled by a separate air flow. The temperature of the inner area thus does not increase as much. Lower operating temperatures not only increase reliability of the electronics but also the life expectancy of the inverter.

Over 1 600 kWh of solar power per kW of installed photovoltaic performance

On the basis of high-quality components the operator of the plant expects an annual output of 1 607 kilowatt hours of solar power per kilowatt of installed nominal output, which is significant, even in sun-drenched Spain.

Left: Sputnik inverter; Right: Aerial photograph of solar power plant in Albacete.

Central inverters monitored via internet

In Albacete 30 central inverters of the make SolarMax 100C are used which Würth sells as OEM product under the name of solarStar. One inverter is connected to each solar module with an output of between 114.24 kWp and 108 kWp. In addition, Würth installed 60 generator connection boxes of the make Max Connect 16 Plus and three irradiation sensors called MaxMeteo. The generator connection box Max Connect Plus controls the modules up to string level. Monitoring is done with MaxControl via an internet-based data logger by Sputnik that Würth calls StarCheck and that Sputnik calls MaxWeb.


Left: Central inverter SolarMax 100. Right: Sputnik production in Biel (Switzerland).

At the end of September 2008 the Spanish government passed a new feed-in law with significant reductions. Operators of photovoltaic plants will in future receive about 30 percent less for the electricity they generate. However, Sputnik Manager Christoph von Bergen remains optimistic, "We are convinced that solar power plants with our inverters are still viable, even with the lower feed-in tariffs." The Swiss manufacturer has been manufacturing inverters for the Spanish market since 2004. In 2006 Sputnik established the Spanish subsidiary Sputnik Engineering Ibérica S.r.l. in Madrid. This year alone, the company is planning to sell inverters with a total output of 115 megawatt to Spain.

Return to "healthier" growth in Spain

According to Fernando Sánchez García, Managing Director of Sputnik Engineering Ibérica S.L.U. in Madrid, the new feed-in law will significantly dampen the expectations of the Spanish PV sector. However, it will lead to rationalisation and consolidation of the exorbitant growth that the companies experienced in the past year. "It will lead us back to a more restricted, yet healthier business. I remain convinced that solar energy is the sustainable solution for electricity supply," Sánchez García emphasises.

Text and photos: Würth Solar / Sputnik Engineering AG. Solarserver editor: Rolf Hug.

Further Solar Energy Systems of the Month:

- Power for Africa: solar hybrid systems for rural electrification
- Economic feasibility of PV systems in Germany: more than just a little sunshine
- The world's largest photovoltaic solar power plant is in Pocking
- Electricity and heat from the sun and salad oil
- Sun, Light and Heat: Light Control and Optimizing EnergyBuildings
- Solar Thermal Combination Systems: An Asset for Every New Building
- Fraunhofer Institute for Solar Energy Systems (ISE) in New Quarters
- Building with the Sun: Solar Facades Insulate with Sunlight
- Power Generation with Perspective: Transparent POWER-Cells for Solar Architecture
- Local Solar Heating Systems for the Eco-City
- Solar Boats Turn into Tourist Attractions
- CIS-Solar Cells From the Assembly Line
- Follow the Sun: tracking solar power arrays can increase energy yield by up to 30%
- Summer Sun all Winter: Seasonal Heat reservoir covers heating needs up to 100%

Banner Advertising | Bulletin Board | Events | Solar Magazine | Funding for Solar Energy | Companies | Solarstore (G) | Non-Profit Organizations | Lexicon | Basic Knowledge | Educational Institutions | Imprint | Contact Us | Home

up

Last modified: 11/21/2008 10:44:10
Webdesign Heindl Internet AG