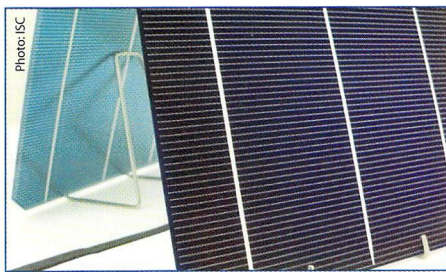


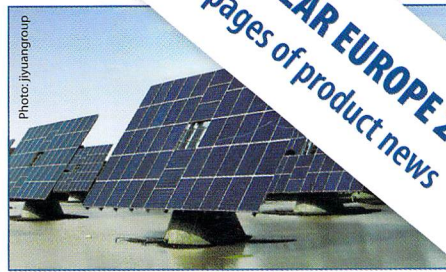
Markets & Trends

Africa: The continent holds ample possibilities. Charting the changes.
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Industry & Suppliers

Cell manufacturing: Reaping fruits.
N-type cell research is proving to be an efficiency booster. *Page 86*



Applications & Installations

Trackers: A niche market but one with resilience and global presence.
Follow the trends. *Pages 126 & 130*

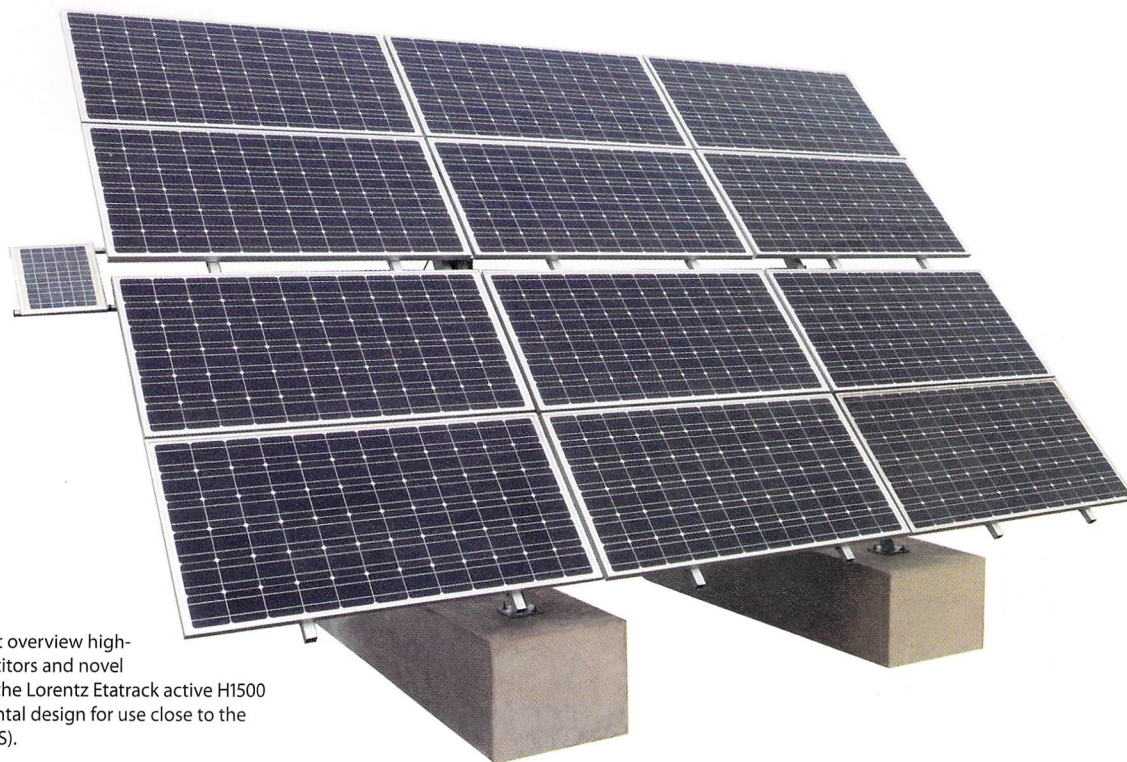
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PHOTOVOLTAIC MARKETS & TECHNOLOGY



Setting the solar story straight. *Page 26*



Our tracker market overview highlights new competitors and novel products, such as the Lorentz Etatrack active H1500 with a new horizontal design for use close to the equator (35N to 35S).

Finely-tuned for performance

Tracker Market Overview: For a segment of the solar photovoltaic systems market whose future is constantly being called into question, the tracker segment remains surprisingly resilient. It might be a niche market, but it is now a global one. This year's annual tracker market overview highlights new competitors, new products, as well as the re-emergence of dual-axis tracking, and some new performance data.

There is a common saying that states you are more credible when you put your money where your mouth is. And so it is that Artur Deger, founder and CEO of Degerenergie, one of the top three tracker manufacturers globally, did something along those lines this year. He spent €25,000 to install a 22 square meter solar photovoltaic tracking system to meet the electricity requirement for his home and office located in Horb am Neckar in the southwest of Germany, which includes two electric vehicles. It generates some 6,000 kilowatt hours annually. All the details about cost and winter performance of the system are described in a statement to the press. It is welcome information because it is not easy for journalists

to validate figures on the costs and benefits of tracking.

Validating tracker performance

This year the technology got another unexpected validation from an unlikely source, the U.S. Department of Defense (DoD). In a study published in January on the military organization's ability to generate income from solar power on its real estate holdings in the Mojave Desert and in Colorado, the DoD said that crystalline silicon PV on single-axis tracking had the highest overall internal rate of return (IRR) of the six solar technologies evaluated on large ground sites. It said that crystalline silicon outperformed IRR-wise in all but one site where thin

film tracking had a slightly higher IRR than crystalline tracking. It also found that fixed-axis crystalline silicon PV had the higher IRR of the two solar technologies evaluated on building roofs.

Typically, tracker manufacturers claim anywhere between 25 and 45 percent performance gains compared to fixed mounting systems. Some confirming data became available to **pV magazine** from AllEarth Renewables which sent information about two PV plants located at the same site, one fixed and one using its dual-axis trackers. The fixed panels had a higher capacity module, that is 280 watts peak versus the 210 watt peak module on the tracker system. The data showed that over a fourteen month period, the

AllEarth dual-axis trackers delivered 29.5 percent more electricity. Both plants are owned and operated by Green Mountain Power, an electricity utility located in Colchester, Vermont.

Germany-based a+f GmbH also published some performance data on its new space-saving SunCarrier22 tracking system in one of its marketing documents. It compared SunCarrier22 to one of its classic SunCarrier fixed systems (fixed at a 30 degree angle) in several regions around the world. It found outperformance with tracking ranging from 24.3 percent in southern Italy to 35.7 percent in the Sahara region. It also pointed out that the design of the new system does not necessitate the need for a larger inverter, nor does it need special cables or connectors.

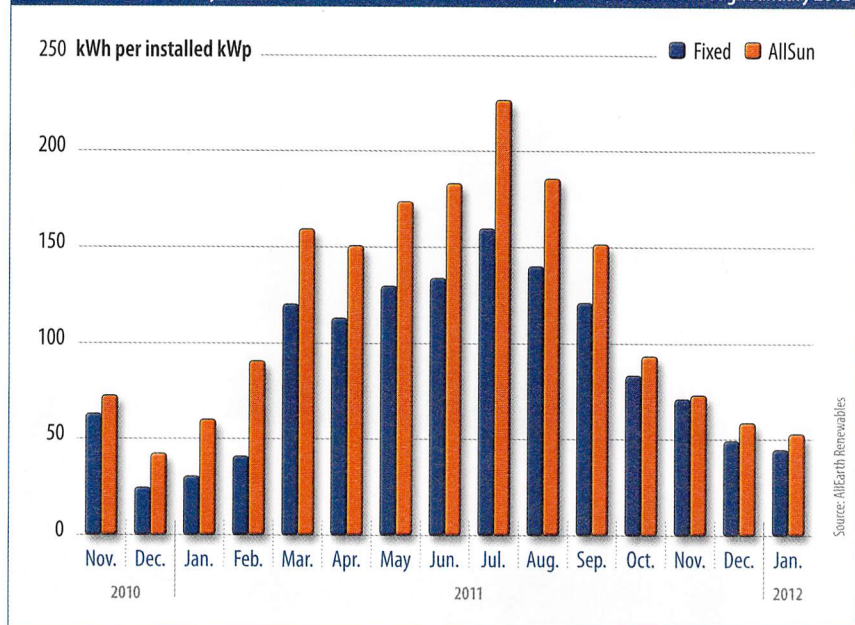
Expanding into concentrating PV

As has been highlighted by **pv magazine** in the past, single-axis tracking has emerged as the most popular type of system over the past two years, but dual-axis is making a comeback. Originally dual-axis emerged for the Spanish market, but it lost ground due to the price/performance not comparing well to single-axis tracking. The trackers used in Spain were mainly for crystalline silicon modules.

This comeback is due to concentrating PV (CPV), which has always been a dual-axis tracker market because of its high-precision tracking requirement. The CPV niche could see installation of 300 MW this year, according to Ash Sharma, senior analyst at IMS Research. But the CPV market is highly competitive. Opel Solar, based in Connecticut, said in a recent financial statement that it would shift resources from CPV modules to the utility-scale tracker business. The company's sales pipeline is currently dominated by solar tracking quotations. The demand was confirmed by rival Exosun, which has developed CPV trackers with design features to fit the requirements dictated by feed-in tariff regulations in key markets. "We see better acceptance of CPV and we think that this year or next year there will be some big projects in the Mediterranean region," commented Frédéric Conchy, Exosun CEO.

There are several other CPV-related tracker developments to report. Kirchner added a CPV tracker to its product line this year, Mecasolar announced trackers for CPV earlier this year. And finally, Solar Trak upgraded its astronomically-

Shelburne Farms: Fixed system vs. AllEarth Renewables' AllSun tracker, November 2010 through January 2012



This graph compiled by AllEarth Renewables shows the kilowatt hours generated per installed kilowatt for a full year period. The fixed mount system is equipped with SunTech STP-280S, 280 watt peak modules, and the trackers are equipped with Evergreen ES-A-210-fa2, 210 watt peak modules. The AER tracker system generated 29.5 percent more power over this period.

controlled systems for CPV targeted at medium accuracy CPV systems, to withstand strong wind and lightning storms.

One of the companies poised to tap the CPV market is GreenVolts, a complete CPV systems manufacturer based in Fremont, California. Its spokesperson told **pv magazine** that it expects the CPV utility-scale segment to grow faster than the mainstream market. A sign that its view has some weight behind it is that GreenVolts signed up global energy project giant ABB as an investor and strategic partner last December. "As the exclusive CPV provider to ABB, our market reach has been greatly extended, and we are now engaging with customers in Europe, Africa, Central and South America, and Australia," Lin Chen of GreenVolts told **pv magazine**.

CPV may well emerge as an opportunity for tracker manufacturers. But not all the market leaders are convinced of this opportunity, at least in the short term. Indeed, in March of this year, Degerenergie announced that it was discontinuing two tracking system products for CPV and putting its R&D budget of €750,000 into mainstream PV systems.

Entering low concentrating CPV

It is not only high CPV that is making life more interesting for tracker vendors, but

also low concentrating PV. Established players, Exosun, Sunpower and Mecasolar, have developed such PV trackers. Sunpower says its low CPV C7 Tracker is performing better than planned at Sandia National Laboratories, one of its beta sites. It will begin commercial production this year at Arizona State University, according to Julie Blunden, Sunpower's Executive Vice President for Public Policy and Corporate Communication.

Mecasolar describes its new trackers for crystalline modules, stating that its concentrating trackers are expected to deliver precision within 0.5 degrees, which is a much higher accuracy rating than the 2.88 to 1.44 degrees of its mainstream trackers. Mecasolar says the new system is built on a modular basis to enable scalability. It can also be assembled on site, which enables cost reducing transport and installations.

IdeemaTec is also active in this niche, last year announcing a low CPV tracking system in partnership with Solaria, a manufacturer of high efficiency cells. The partnership kicked off with an order for 400 MW worth of tracking equipment.

Newcomers innovating dual-axis

Dual-axis trackers might even make a comeback in the crystalline silicon market if two newcomers, AllEarth Renew-

ables, a six year old manufacturer of renewable energy systems, and Eternegy, a startup tracker company, are successful. Both claim their dual-axis solutions compete with single-axis on cost, but deliver better performance. AllEarth's tracker is a GPS driven system that it sells in a package with Evergreen panels, a remote monitoring system, and a Motech inverter. It comes in two sizes, a 20 module (4,200 watt) or 24 module (5,520 watt) configuration, shipped to the site on a pallet. "The pallet format is a cost-saving feature," pointed out AllEarth Renewables spokesperson, Andrew Savage.

The Eternegy tracker is a novel design that its developer said was inspired by kites used in kite surfing. The dual-axis tracker uses steel cables to orient the PV panel platform and strengthen the structure. Mechanisms and electronics are at ground level for easy access. **pV magazine** suggested in an interview with Simon Fried, Eternegy's Vice President of marketing, that an airborne kite is not an ideal image for a tracking system, especially since some of the regions where trackers are used are subject to tornados

and hurricanes. "Yes, perhaps a more fitting image is that of a suspension bridge. What you cannot see in the photos are the steel cables attached at the extremities. Winches are sensor-controlled, ensuring constant tension, which creates structural rigidity. This makes for an extremely rigid structure, more rigid than a post and panel design," said Fried, who added that the use of cables allowed the designers to get rid of about half the steel used in more traditional tracker designs.

Eternegy's tracker is targeted at utility-scale PV projects. "Its modular and standardized parts, particularly the steel beam format, enable local manufacturing, as well as lower costs and easier installation," Fried told **pV magazine**. Just how low the cost is Fried did not say, but he did state that the company aims to sell at a price that competes with single-axis systems, not other dual-axis systems. Eternegy's trackers are still in the pilot and trial phase. The company has a grid-connected system on demonstration near Tel Aviv and a 150 kilowatt site in the Negev desert. Further pilots are being set up in Suzhou, China, Tucson, Arizona,

and with InSolare, an Indian solar engineering, procurement and construction (EPC) company.

This year the market overview on the following pages has a new addition, AllEarth Renewables. Kemper has several new product descriptions and features after upgrading its trackers based on a new super-sturdy design. It is now implementing the Siemens Simatic S7 control system, the fourth tracker manufacturer to do so since **pV magazine** started covering this segment.

IdeemaTec added a horizontal tracker, as did Lorentz to better serve a wider geographical market and a wider range of business cases. New horizontal designs are for use close to the equator, says Lorentz. The company sees its tracker as a complement to solar water pump solutions in rural off-grid environments. The following companies were removed because they did not reply to requests for updates in time for production deadlines: Adem Energy, GSM Solar, Clenergy, IMO, PV Trackers, PV Strom, Solea, and Titan Tracker. ♦

Valerie Thompson

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