Corporate News

centrotherm photovoltaics succeeds ISE-certified solar cell with sensational 20 percent efficiency

- **Company presents product innovations and updates along the solar value chain at leading EU PVSEC photovoltaic trade fair**
- **All technological developments focus on higher efficiencies and lower operating costs**
- **Major order for multi-crystalline ingot furnaces from Taiwan for centrotherm SiTec**

Blaubeuren, August 30, 2011 – At this year's 26th European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC: September 5 to 8, 2011, in Hamburg) centrotherm photovoltaics AG is presenting technology and systems boosting efficiency along the photovoltaic value chain. There is great demand for efficiency enhancements and lower operating costs in view of the intensely competitive market environment among solar cell and module manufacturers. The globally leading technology and equipment provider is responding to these demand from its customers with state-of-the-art production systems and corresponding upgrade and retrofit packages.

Solar Cell & Module product update

"We are on the way to 20 percent cell efficiencies in industrial production. We have already reached this magic threshold in the laboratory, and we have current ISE certification for a sensational 20.00 percent efficiency level," was how Dr. Peter Fath, CTO at centrotherm photovoltaics AG, expressed his delight at this development. This peak value was achieved on the basis of centaurus rear side technology developed by centrotherm photovoltaics. The reference surface area is the industry standard wafer size of 156 mm x 156 mm on mono-crystalline silicon. "We will be working flat out on transferring these excellent figures to mass production," commented Dr. Fath. The Fraunhofer Institute for Solar Energy Systems ISE is Europe's largest solar research institution, and is regarded as the leading inspection and certification institution for the photovoltaic sector.

centrotherm photovoltaics identifies enormous potential in the Solar Cell & Module area for both its selective emitter and centaurus rear side upgrade technologies. Up to 800 of a global total of around 1,000 solar cell production lines can be retrofitted to improve their

costs and boost their efficiency. The centaurus rear side technology is currently being installed at a major Chinese state company with the aim of achieving more than 19 percent cell efficiency in mass production.

Silicon & Wafer product innovations

centrotherm SiTec, a company in which the centrotherm photovoltaics Group bundles its silicon expertise, is presenting a newly developed Medium Voltage Ignition System (MVI) in the polysilicon power supply area. This MVI was specially developed to optimize CVD reactors' production start for polysilicon manufacturing. By contrast with conventional CVD reactor pre-heating technology, the MVI ignites the slim rods within a significantly shorter process time, thereby enabling higher production capacities and lower operating costs. The fully automated process and a contamination-free environment compared to predecessor technology comprise further advantages. All CVD reactors that are currently in operation can be retrofitted with the MVI technology.

With its ingot squaring and brick cropping systems, centrotherm SiTec GmbH is presenting two key equipment items for integrated ingot and wafer production. The automated ingot squaring system saws the multi-crystalline ingots into bricks. The brick cropping system cuts these bricks to the precise corresponding length. Wafers are later produced from these bricks. Both systems deploy state-of-the-art diamond wire saw technology that enables the highest-precision incisions accompanied by maximum productivity and optimized manufacturing costs, and both the squaring and cropping systems can also be configured to saw mono-crystalline ingots and bricks.

Ahead of the EU PVSEC, centrotherm SiTec received a major order from Taiwan to supply multi-crystalline ingot furnaces to produce ingots with an annual capacity of around 140 MW peak. The order volume lies in the single-digit range in millions of euros. The first multi-crystalline ingot furnaces will be shipped in October, with the last delivery occurring in the first quarter of 2012.

Thin Film Module product update

In the Thin Film area, two news items are set to form the focus of positive discussion: centrotherm photovoltaics has successfully concluded the development of its new second-generation selenium (Se) systems to manufacture CIGS thin film modules. The systems have reached and exceeded the planned performance improvements in terms of homogeneity and uptime in acceptance tests at Blaubeuren, Germany. These systems will also be offered in the future as single equipment items to produce thin film modules.

centrotherm photovoltaics' selenium and sputtering systems comprise key equipment items to manufacture thin film modules that can be adapted in line with customer wishes.

The second news item comes from the Far East: the efficiency of the CIGS thin film module from centrotherm photovoltaics' production line at Sunshine in Taiwan has been continuously enhanced in the direction of 11 percent. The modules (1,400 x 1,100 mm²) can achieve output of more than 150 W peak. The developers have also paid particular attention to the environmental aspect of the centrotherm CIGS technology: the process management utilizes nonhazardous and recyclable elementary selenium instead of highly toxic hydrogen selenide (H_2Se).

Inspection systems product innovation

GP Solar GmbH, a wholly-owned centrotherm photovoltaics subsidiary, is taking the opportunities offered by the EU PVSEC to showcase three innovations for the quality assurance of solar cells and modules. With the GP Solar Inspect CHROME, a completely revised product line for in-line measuring technology is being launched on the market that is distinguished by numerous improvements in terms of hardware and software. An in-house development in the camera optics area enables the spectral analysis of wafers, cells and modules, and thereby the highest level of measuring precision for innovative processes such as selective emitters or rear side contacts. The new software enables the live defect analysis of up to 600 samples, and renders the smallest process problems visible. The software will also be fitted with a Chinese-language user interface in the future.

The GP TOPO-D .Scan represents a global product innovation: this is an in-line inspection system that measures the entire topography of wafers and solar cells on a 3-D basis. Measurement occurs within one second without interrupting the production process.
The GP TF-SENSE .Scan is a high-quality inspection system that offers 100 percent inspection of thin film modules. A particular attraction of this technology is that each individual substrate can be measured without a detrimental effect on the production cycle. All of these developments share the ability to immediately identify the smallest defects. This reduces rejections, resulting in verifiably lower production costs. These inspection systems can be integrated flexibly, very rapidly and easily within production processes.

Roll-to-roll product update

FHR Anlagenbau, a wholly-owned centrotherm photovoltaics subsidiary, is demonstrating its expertise in the flexible photovoltaic area with corresponding foil coating solutions. The roll-to-roll system concepts that deploy PVD or PECVD technology, and which have been developed on a customer-specific basis, are appropriate for various substrate materials and diverse solar cell concepts. FHR boasts major know-how particularly in the area of foil of solar cells that are based on CIGS and a-Si, and regards itself as in a leading position globally in this context. FHR is reporting great success in accompanying several international customers in taking the step from pilot production to mass production, including some very successful partnerships in China. The flexible, light and unbreakable cells are also particularly suited to large industrial roofs, and applications such as the textile, automotive and aerospace industries. Thin film solar cells generated using this roll-to-roll procedure are unrivalled when it comes to uneven surfaces.

"As a solar pioneer and technology leader, we are pleased to set benchmarks at the EU PVSEC in Hamburg with efficiency-enhancing developments in all business areas," was how Dr. Fath explained his company's involvement. "It is our constant aim to further expand our customers' advantage with respect to cost-leadership and efficiency in this context. New customers benefit in terms of the latest production systems, and our existing customers benefit from our upgrade packages."

centrotherm photovoltaics at the 26th European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC: September 5-8, 2011, in Hamburg):

CCH Congress Center & Trade Fair, Hamburg, Hall A1, Stand A1/B2

About centrotherm photovoltaics AG

centrotherm photovoltaics AG, which is based at Blaubeuren, Germany, is the world's leading technology and equipment provider for the photovoltaics sector. The company equips well-known solar companies and new sector entrants with turnkey production lines and single equipment to manufacture silicon, ingots and bricks, crystalline solar cells and modules, and thin film modules. As a consequence, the Group possesses a broad and well-founded technological basis, as well as key equipment at practically all steps of the photovoltaics value chain. centrotherm photovoltaics guarantees its customers important performance parameters such as production capacity, efficiencies, and completion deadlines. The Group employs around 1,900 staff members, and operates in Europe, Asia and the USA. centrotherm photovoltaics achieved revenue in the 2010 financial year of EUR 624,2 million, EBIT of EUR 75.4 million. The company is listed in the TecDAX index on the Frankfurt Stock Exchange.

centrotherm photovoltaics AG
Johannes-Schmid-Strasse 8
89143 Blaubeuren
Internet: www.centrotherm.de
ISIN: DE000A0JMMN2
WKN: A0JMMN
Admitted to the Regulated Market/Prime Standard, Frankfurt Securities Exchange
Corporate domicile: Germany

Contact:
Saskia Feil
Senior Manager Investor & Public Relations
Tel: +49 7344 918-8890
E-mail: saskia.feil@centrotherm.de

Dr. Torsten Knödler
Manager Public Relations
Tel: +49 7344 918-8898
E-mail: torsten.knoedler@centrotherm.de