



ZIM Success Story

Sun Simulator Tests Double-Sided Solar Cells

An LED-based sun simulator is now facilitating ongoing quality checks on bifacial (double-sided) solar cells during in-line manufacturing. The system simulates both direct and indirect sunlight at the same time, which makes it possible to predict how bifacial cells will perform in real-world scenarios.

Bifacial solar cells are on the rise in the photovoltaic industry thanks to the increased yield they promise compared to conventional one-sided cells. Their advantage lies in their main characteristic, namely the ability to capture sunlight on both their front and reverse sides and turn it into energy. The downward-facing side absorbs sunlight reflected off the ground, which can boost energy production by up to 20 per cent.

Achieving an increase of this size does, however, require high-performance solar panels that are optimally positioned, along with an underlying surface capable of reflecting light. The light that finds its way to a panel's reverse side is also diffuse and has a

different spectral distribution, which makes it less effective than direct rays from the sun.

The product and its innovation

Photovoltaic modules undergo a number of complex inspections during production. Illumination systems, for example, simulate sunlight to offer insights into a panel's functional capabilities and corresponding performance.

To ensure that the reverse sides of bifacial modules also meet the necessary quality standards, various designs and concepts for LED lighting were explored in a recent ZIM cooperation project. One of the partners involved, WAVE LABS Solar Metrology Systems GmbH (Saxony, Germany), had already

developed a lighting unit for the industrial manufacturing process. However, it was designed for the front side of solar panels and could not simply be used to illuminate the reverse side, as well.

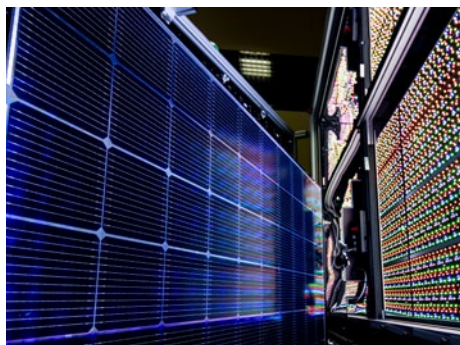
A new LED lighting system was thus needed that could not only generate 1,000 watts of radiated power per square metre as required by PV module manufacturers, but also reproduce the characteristics of reflected light while illuminating cells as evenly as possible. This required a new approach. Furthermore, WAVE LABS needed to design the new lighting unit in a way that would make it possible to illuminate cells on both sides of a panel and measure their energy production at the same time. As part of the



Outdoor test stand for facade integration



Diffuse sunlight on facade



LED solar simulator with bifacial module

Project information

Project duration: 07/2016 to 06/2019

Project form: Cooperation Projects

Technology field: Energy Technologies

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This project between Germany and Korea was carried out as a result of the international research initiative EUREKA.

international research initiative EUREKA, the Department of Electrical Engineering, Mechanical Engineering, and Engineering Management at the Anhalt University of Applied Sciences (HSA, Germany) joined Yeungnam University (South Korea) in examining the energy yield of bifacial modules produced by LG Electronics under specific deployment conditions.

The empirical data these institutions collected then served as a basis for a yield prediction model. Thanks to the insights provided by HSA, the latest sun simulator developed by WAVELABS is now capable of offering exact predictions of how specific tested modules should be deployed for optimal results.

Market and customers

Given the growing prevalence of bifacial solar modules, the market potential of this new solution continues to improve. Its precise measurements enable manufac-

turers to provide classified solar modules for specific deployment situations. WAVELABS is thus in a position to become a technology leader in the production-compatible analysis of bifacial solar cells and sell solar simulators all around the world.

The partners

WAVELABS Solar Metrology Systems GmbH was founded in October 2011. The Leipzig-based company manufactures and sells systems that measure the characteristics of solar cells for production, research, and certification purposes. Its customers mainly include solar panel manufacturers all around the world. The Anhalt University of Applied Sciences (HSA) focuses in particular on connections between science and innovative technologies. Thanks to its three professorships in the field of photovoltaics, it has a broad range of expertise in corresponding materials, technologies, and system research.

ZIM project of the year

On 23 June 2022, the successful implementation of the project results was honoured as „ZIM Cooperation Project of the Year“ with a certificate of the Federal Minister for Economic Affairs and Climate Action at the Innovationstag Mittelstand des BMWK.

Information about the program

The Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Climate Action provides funding to all technologies and sectors:

- Individual projects
- Cooperation projects
- Innovation networks and feasibility studies prior to R&D projects.

Information and advice on cooperation projects

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Imprint

Publisher

Federal Ministry for Economic Affairs and Climate Action (BMWK), Public Relations Department
11019 Berlin, Germany
www.bmwk.de

Last update

June 2022

Design and content

AiF Projekt GmbH, Berlin

Image credits

page 1: WAVELABS
page 2: Hochschule Anhalt