

SERIS develops world's first full-size IBC bifacial solar module

The Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS) has developed the world's first full-size Interdigitated Back Contact (IBC) bifacial solar module using ZEBRA solar cells from the International Solar Energy Research Center (ISC) Konstanz. With high-efficiency IBC silicon solar cells of 6 inches in width, the 60-cell bifacial module is capable of producing up to 400 Watts of electric power, a much higher power compared to conventional modules with power output in the range of 270 to 290 Watts.

Singapore, 12 April 2017 – The world's first full-size interdigitated back contact (IBC) bifacial solar module has been developed and fabricated in Singapore by the Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS) in collaboration with the International Solar Energy Research Center Konstanz, Germany (ISC Konstanz).

The module technology's first prototype was produced using bifacial ZEBRA IBC solar cells from ISC Konstanz with efficiencies as high as 22%. The cells were fabricated using industrially proven process equipment and standard industrial 6-inch n-type Cz monocrystalline silicon wafers. The module's structural reliability is ensured by using a double-glass insulation technique perfected by SERIS since 2009. Encapsulated using the double-glass structure, IBC bifacial solar modules could offer a longer warranty period of 30 years or more. Furthermore, by utilising the bifacial nature of the solar cells, as much as 30% extra power is generated by the double-glass module due to reflection of sunlight from the ground ('albedo') towards the module's rear surface.

Dr Wang Yan, Director of SERIS' PV Module Cluster, is ecstatic about this new product. "With SERIS' new module design, panels with 350 Watts front-side power can be made with sixty 23% efficient screen-printed IBC cells. Considering an additional 20% of power via the panel's transparent rear surface, each 60-cell IBC bifacial module will produce a stunning 400 Watts of power in the real world."

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The world's first full-size IBC bifacial module has several unique features:

- All back contact: This eliminates metal shading losses from the cells' front surface. As a result, the module can achieve higher current and efficiency outputs.
- Bifacial nature: The module is able to absorb light from both its front and rear surface, with a bifaciality of 75%. This enables the module to convert sunlight that enters via its rear surface, as a result of reflection from the ground and the surroundings.
- Double-glass structure: The cells are encapsulated between two glass panes using polyolefin elastomer (POE), which guarantees a long module lifetime in the field.
- Low-temperature interconnections: This prevents warping of the IBC cells due to heating.
- Specially designed & customized electrical junction box: This prevents shading of the rear surface of the bifacial IBC cells.
- Industrially feasible solar cell and module fabrication process and equipment: This enables the module to achieve high efficiency at lower cost and means that the technology is ready for industrial production.

Dr Radovan Kopecek, founder of ISC Konstanz, Director of Advanced Solar Cells and Lead Scientist for ZEBRA development since 2009, has ambitious future plans for this technology: "Many people now might think that putting highly efficient IBC cells into bifacial modules does not make sense - but our consortium will prove them wrong. The ZEBRA process is extremely simple and cost-effective and so is the module manufacturing process. In large bifacial systems, this technology will lead to the lowest LCOEs ever. Bifaciality is quickly gaining popularity and, since a few weeks ago, one can also simulate the bifacial advantage using PVsyst – such developments will give many bifacial technologies the breakthrough in the PV systems arena".

Prof Armin Aberle, SERIS CEO, is also enthusiastic about the development. "IBC cells are famous for their efficiency, reliability and durability in the field. The newly developed IBC bifacial module is a testimony of SERIS' R&D capabilities in the PV module technology sector. The module technology offers world-class front side power while providing free extra power from the rear side. As a result, it has excellent LCOE potential" he explained. "The prototype module made at SERIS serves as a proof of concept for mass production. The next step will be to transfer the technology to industrial partners." He believes that such a high-power product could be available in the market within two years.

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The world's first full-size IBC bifacial module fabricated by SERIS will be on display at the booths of SERIS' industry collaborators Centrotherm Photovoltaics AG (booth #360, E3) and SPIC Xi'an Solar Power (booth #330, W1) at the SNEC (2017) International Photovoltaic Power Generation Conference & Exhibition (SNEC PV POWER EXPO), Shanghai, China, from 19 to 21 April 2017. Concurrently, Dr. Wang Yan will also report on the IBC bifacial module design at the SNEC conference during his talk on 19th April at the Pudong Ballroom at 1 pm (CST).

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About the Solar Energy Research Institute of Singapore (SERIS)

Founded in 2008 and located at the National University of Singapore (NUS), the Solar Energy Research Institute of Singapore (SERIS) is Singapore's national institute for applied solar energy research. SERIS conducts research, development, testing and consulting on solar energy technologies and their integration into power systems and buildings. The institute's R&D spectrum covers materials, components, processes, systems and services, with an emphasis on solar photovoltaic cells, modules and systems. SERIS is globally active but focuses on technologies and services for tropical regions, in particular for Singapore and South-East Asia.

About SERIS' PV Module Cluster

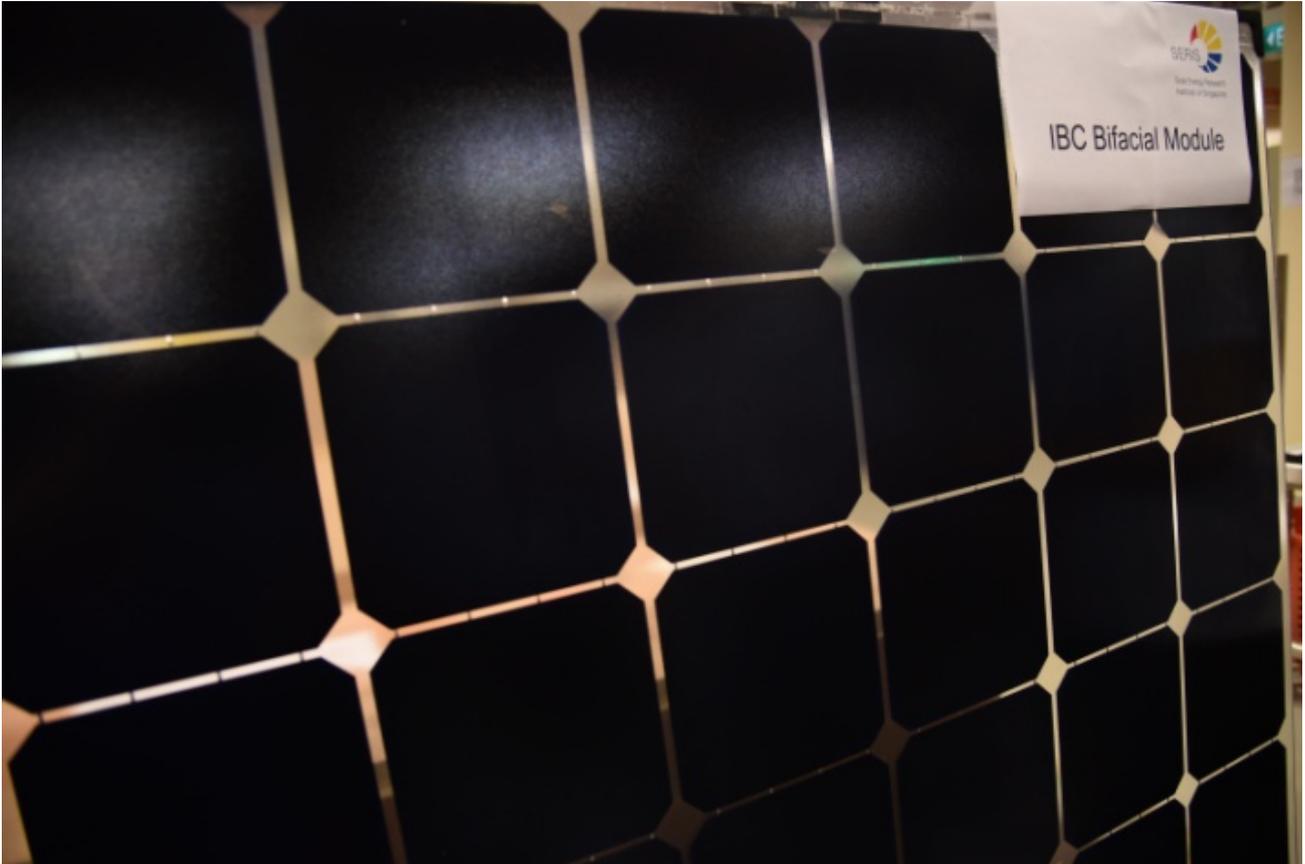
The PV Module Cluster conducts R&D on next-generation PV modules, in close collaboration with partners from industry. The Cluster consists of two groups – the PV Module Development (PVMD) Group and the PV Module Testing (PVMT) Group. The PVMD group operates a PV Module Development Laboratory which houses state-of-the-art PV module manufacturing and characterisation facilities. PV modules of different sizes (up to full industry standard) can be fabricated and characterised in this laboratory. The PVMT group serves partners from the global solar industry with PV module certification testing as well as customised testing of PV modules and module components. The group operates SERIS' ISO-17025 accredited PV Module Testing Laboratory and is capable of performing specialised precision measurements as well as standard performance testing of PV modules.

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ANNEX: Photos accompanying the press release



World's first full-size IBC bifacial module developed at SERIS which has no metal connections on the front side and minimal connections on the rear side – thereby increasing the cell active-area for electricity generation.

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Dr Khoo Yong Sheng (left), Head of the PV Module Development Group and senior scientist Chai Jing presenting the world's first full-size IBC bifacial module.