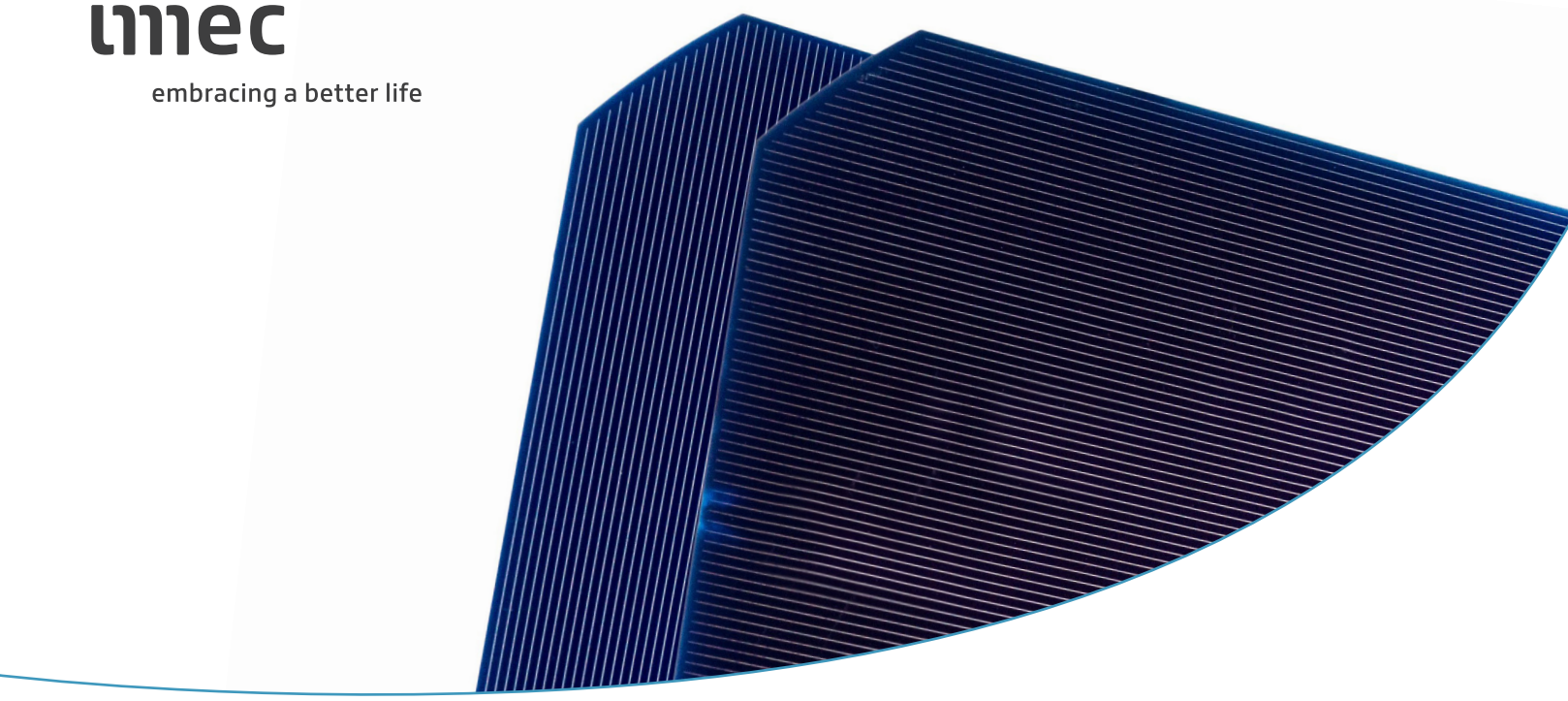
imec

embracing a better life



BIFACIAL PV MODULES HARVEST LIGHT ON FRONT AND BACKSIDE

Photovoltaic modules are prone to become one of the major sources of electrical energy in the next decades. They will be used on our homes, cars and in large-scale solar parks. Imec develops the technology blocks for a solar future, combining visionary solutions with industry-relevant technologies. The research focuses on both silicon and thin-film (perovskite) solar cells. The new star on the horizon is the bifacial solar cell, that harvests light on both the front and backside.

Bifacial PV modules are rapidly becoming the industry standard because they require less material and system compounds to produce the same amount of energy. Hence they inherently reduce the kwh/cost of PV generated electricity. They promise a boost in performance up to 20-30% as compared to monofacial modules. Predicting their performance is however very complex since light at the backside is strongly dependent on ground reflection, self-shading, mounting structures etc. To fully exploit the potential of this technology, accurate prediction tools are needed.

Imec develops both the technology for bifacial solar cells and modules as well as an energy yield simulation tool that is indispensable for module manufacturers and power plant designers and operators.

UNIQUE INTERCONNECT TECHNOLOGY

Recently, imec has developed bifacial screen-printed and plated cells with conversion efficiencies of respectively 22.1 and 22.8%. Bifaciality values have reached circa 90% for the printed and close to 100% for the plated cells. Material and process selection have been carefully done to offer a cost-competitive solution. Plated cell metallization for instance requires less than 8 mg/cell Ag usage which is orders of magnitude lower than current schemes. Combined with the multi-wire interconnection technology of our industrial partners and imec's own patented approach, PV modules can generate 3-5% more power compared to traditional interconnection schemes. Moreover, the multi-wire interconnection becomes nearly invisible to the eye, an important argument as we integrate PV in our buildings.

IN THE FIELD

An equally important challenge is the efficient field operation of bifacial modules. The physics-based energy yield simulation tool developed by imec enables the selection of materials, module and system layout adapted to specific sites and climates. This patented approach is unique in coupling the thermal and electrical effects, strongly impacting the module power outdoors. Intra- and inter-module non uniformities and diffuse radiation are also considered which is critical to reach a good prediction. The more precise the prediction, the more useful the information is for the exploitation of PV plants.

IMEC'S BIFACIAL CELL, MODULE AND SYSTEM RESEARCH EXPERTISE

- Screen printed or plated cell metallization: lowest metal consumption and finest cell finger width
- Record cell performance and high bifaciality factor
- Multi-wire interconnection technology following industry standard and also based on imec's own patents
- Mass customization in PV module assembly for specialty PV
- Highest precision energy yield simulation tools for plant design and O&M activities
- Simulation capabilities for non-uniform operating conditions, such as partial shading and thermal inhomogeneities
- Next generation PV module electronic components

LOOKING FOR: RESEARCH AND INDUSTRY PARTNERS

Imec strongly believes in the power of multidisciplinary research. In the case of bifacial solar cells and PV modules, imec builds both the technology blocks and the software simulation tools to understand what will be the gain when transitioning from mono-- to bifacial solar cells and modules. Although we have built a strong network of tool suppliers, material suppliers, module manufacturers etc., we are always looking for research and industry partners, active in domains ranging from cell and module manufacturing to power plant exploitation.

partner in Energy Ville

ENERGYVILLE, A JOINT SMART ENERGY INITIATIVE

Since its foundation, imec is developing the key building blocks for a sustainable future with solar energy. Recently, a new era in its solar research has commenced with the transfer of imec's solar cell research to EnergyVille, a collaboration between the Flemish research partners KU Leuven, VITO, imec and UHasselt in the field of sustainable energy and intelligent energy systems. Also the research on bifacial photovoltaic modules and energy yield simulation is done in the framework of EnergyVille.

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SOLAR RESEARCH SOLLIANCE

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