Press Release

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Leibniz Institute for high performance microelectronics

GreEnergy - A new paradigm for solar energy harvesting

Development of optical nano-antennas as cost-effective harvesters for solar energy

Frankfurt (Oder). Most of the energy sources we use today are efficient, but they rely on non-renewable resources and cause serious damage to our planet as they contribute to global warming. GreEnergy, a new EU project funded under Horizon 2020, aims to use the cleanest energy source available: the Sun. The Sun is the strongest and the most abundant energy resource and provides an almost unlimited supply of energy for our planet. According to the Joint Research Center (JRC), current solar photovoltaics (PV) provides around 4% of the world's electricity due to their low efficiency and relatively high cost.

GreEnergy aims to define a new paradigm in the field of solar energy generation by developing a prototype of self-sufficient system based on optical nano-antennas that can harvest solar energy, rectify the AC signal and use it to charge a micro-supercapacitor. The targeted overall efficiency of the demonstrators is around 20-40%, which is competitive in the view of the current state of technology. Furthermore, the maximum theoretical efficiency is well above the theoretical limit of the efficiency of a single PV cell, which leaves ample room for further technological improvements.

GreEnergy's low-cost solar harvesters could change the energy market decisively. The on-chip self-sufficiency mechanism will enable the implementation of intelligent components that never need to be charged by an external power supply - such as portable outdoor devices, structural monitoring sensors for vehicles and infrastructures or environmental sensors. In addition, proof-of-concept demonstrators will advance scientific knowledge in the field of solar energy generation in general and help reduce dependence on harmful fossil fuels.

Led by Chalmers University of Technology, GreEnergy is a four-year interdisciplinary project which draws on the expertise of project partners, including four top universities (Chalmers University of Technology/Sweden, Aalto University/Finland, Università Politecnica delle Marche and Università di Udine/Italy), a non-university research institute (Leibniz Institute for High Performance Microelectronics (IHP/Germany) and three specialized small and medium-sized enterprises (AMO GmbH/Germany, NOGAH PHOTONICS Ltd. /Israel and SCIPROM Sàrl/Switzerland).

"With GreEnergy, we want to show that it is possible to harvest solar energy more efficiently and cost-effectively than is currently possible with photovoltaic cells," says project coordinator Prof. Per Lundgren from Chalmers University of Technology. "It is a real challenge to rectify electromagnetic waves at optical frequencies into a DC current for energy storage and management. We want to achieve this with the coordinated design of the antenna, the power converter and the energy storage device for optimal integration. Such

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integrated technology is unprecedented and will fundamentally change the way solar energy can be harvested."

"Due to the many components such as the antenna, diode, energy storage and circuits that have to be prototyped and developed, the IHP sees the project as a challenging one. Successful project results will contribute significantly to increasing the use of green energy sources," says Dr. Lukosius Mindaugas from IHP.

GreEnergy is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement no. 101006963 (GreEnergy).

Further information: https://www.greenergy-project.eu; https://www.greenergy-project.eu/resources/GreEnergy_Press-Release_v1.0.pdf

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About IHP:
The IHP is an institute of the Leibniz Association and conducts research and development of silicon-based systems and ultrahigh frequency circuits and technologies including new materials. It develops innovative solutions for application areas such as wireless and broadband communication, security, medical technology, industry 4.0, automotive industry, and aerospace. The IHP employs approximately 350 people. It operates a pilot line for technological developments and the preparation of high-speed circuits with 0.13/0.25 µm SiGe BiCMOS technologies, located in a 1500 m² DIN EN ISO 14644-1 3 certified clean room.

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