***Most energy sources we use have low efficiency and rely on non-renewable resources, which cause severe damage to our planet by contributing to global warming. The sun is the cleanest, most powerful and abundant energy source available in the world. However, current solar photovoltaics produce roughly 4% of the world’s electricity, with limitations due to low efficiency and relatively high cost. Thus, there is a critical need for solar captors with very high efficiency. The EU project GreEnergy tackles this challenge by developing optical nano-antennas as cost-effective solar energy harvester for a greener future.***

**Power from optical nano-antennas harvesting solar energy**

GreEnergy aims to prototype a self-powering system based on optical nano-antennas which can harness solar energy with very high efficiency (20-40% at the system level), at an estimated system cost below €100 per 1m2.

The technology solution will incorporate optical wideband antenna coupled to a nano-rectifier with diodes able to rectify electromagnetic waves at optical frequencies into a direct current, with high conversion efficiency. The optical rectenna, combined with I/O circuitry, will supply a more-steady power to the energy storage unit. This self-powering system will be composed of a micro-supercapacitor (high capacitance and very long cycle life) with optimised electrode and electrolyte materials.

By leveraging recent breakthroughs of the consortium partners, GreEnergy will fabricate demonstrators validated in a laboratory environment, integrating all components on a single microchip.

**The future exploitation and applications**

GreEnergy’s cost-effective solar energy harvesters might change the energy market dramatically. The on-chip self-powering system will allow realizing smart devices that never need to be charged from an external power supply – like wearable outdoor devices, structural-monitoring sensors for vehicles and infrastructures, or environmental sensors.

Furthermore, GreEnergy’s proof-of-concept demonstrators will advance the scientific knowledge in the field of solar energy harvesting at large – with potential implications also for energy providers and solar cells companies – and help reducing the dependency on toxic fossil fuels.

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| The GreEnergy consortium comprises 8 partners including 4 top-level universities, one research centre and 3 specialized SMEs, coming from 6 different countries, namely Sweden (Chalmers), Germany (AMO, IHP), Switzerland (SCIPROM), Israel (NOGAH), Italy (UNIVPM, UNIUD) and Finland (Aalto).  The industry partners are crucial for ensuring the industrial relevance of the technology development and for the commercial exploitation of the project results, while the research and academic partners will target breakthrough innovations and demonstrate the viability of the GreEnergy technology. This well-balanced cluster of enterprises and institutions works together to achieve the project objectives, i.e. to demonstrate a prototype achieving 20-40% efficiency for the integrated components at a system cost below €100 per 1m2. |