Nanoelectronics key to advances in renewable energy

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Nanoscale technology looks promising as a major contributor to advancements needed to fulfill the potential of emerging sources of clean, renewable energy.

Progress in the comparatively new area of nanoelectronics in particular could be the basis for new manufacturing processes and devices to make renewable energy systems and technologies more efficient and cost-effective.

Stephen Goodnick will focus on what nanoelectronics advances could do to help push the performance of solar energy systems to the next level in his talk at the 2014 annual meeting of the American Association for the Advancement of Science (AAAS) Feb. 13-17 in Chicago.

His presentation will lead off a session on Feb. 16, titled "Nanoelectronics for Renewable Energy: How Nanoscale Innovations Address Global Needs."

Goodnick is a professor in the School of Electrical, Computer and Energy Engineering, one of Arizona State University's Ira A. Fulton Schools of Engineering.

Titled "Pathways to Next-Generation Photovoltaics," Goodnick's presentation will look at how innovations driven by nanoelectronics research can enable photovoltaic technology to significantly improve our ability to convert sunlight and heat into electric power.

He'll specifically delve into how new types of nanostructure-based devices can make it possible to produce photovoltaic solar cells that achieve better energy-conversion efficiency.

Goodnick explains that the key is in the different characteristics, properties and behavior of materials at the nanoscale.

A nanometer is one-billionth of a meter (one meter is a little more the 39 inches long). About 100,000 nanometers amount to the same thickness as a typical sheet of paper.

At that tiny scale, silicon and other materials that are used to make solar cells can perform in ways that boost the effectiveness of devices for producing energy, Goodnick says.

"With the use of nanoparticles, made into nanostructures, we could, for instance, improve optical collection, enabling systems to trap more light for conversion into electrical power," he says.

"Using nanomaterials, we could make solar cells even thinner but still more efficient, and we could increase the capacity of energy-storage devices," he says.

Such progress will hinge on the success of science and engineering research in overcoming current high production costs and some technical challenges. But Goodnick says he's confident nanotechnology advances "are going to be big factors in the future of energy."

Goodnick's talk is part of an AAAS conference session that will also feature additional presentations on aspects of nanoelectronics and renewable energy by four other scientists and engineers who will join Goodnick in a research collaboration beginning in July at the Institute for Advanced Study at the Technical University Munich in Germany.

Goodnick has been awarded the German university's Hans Fischer Senior Fellowship, which will enable him to spend six months conducting research at the institute this year. The fellowship award is given to engineers and scientists doing innovative work in areas of interest to the institute.

Provided by Arizona State University