

Researchers convert sunlight to electricity with over 40 percent efficiency

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UNSW Australia's solar researchers have converted over 40% of the sunlight hitting a solar system into electricity, the highest efficiency ever reported.

The record efficiency was achieved in outdoor tests in Sydney, before being independently confirmed by the National Renewable Energy

Laboratory (NREL) at their outdoor test facility in the United States.

The work was funded by the Australian Renewable Energy Agency (ARENA) and supported by the Australia-US Institute for Advanced Photovoltaics (AUSIAPV).

"This is the highest efficiency ever reported for sunlight conversion into electricity," UNSW Scientia Professor and Director of the Advanced Centre for Advanced Photovoltaics (ACAP) Professor Martin Green said.

"We used commercial solar cells, but in a new way, so these efficiency improvements are readily accessible to the solar industry," added Dr Mark Keevers, the UNSW solar scientist who managed the project.

The 40% efficiency milestone is the latest in a long line of achievements by UNSW solar researchers spanning four decades. These include the first photovoltaic system to convert sunlight to electricity with over 20% efficiency in 1989, with the new result doubling this performance.

"The new results are based on the use of focused sunlight, and are particularly relevant to photovoltaic power towers being developed in Australia," Professor Green said.

Power towers are being developed by Australian company, RayGen Resources, which provided design and technical support for the high efficiency prototype. Another partner in the research was Spectrolab, a US-based company that provided some of the cells used in the project.

A key part of the prototype's design is the use of a custom optical bandpass filter to capture sunlight that is normally wasted by commercial solar cells on towers and convert it to electricity at a higher efficiency than the [solar cells](#) themselves ever could.

Such filters reflect particular wavelengths of light while transmitting others.

ARENA CEO Ivor Frischknecht said the achievement is another world first for Australian research and development and further demonstrates the value of investing in Australia's [renewable energy](#) ingenuity.

"We hope to see this home grown innovation take the next steps from prototyping to pilot scale demonstrations. Ultimately, more efficient commercial solar plants will make renewable energy cheaper, increasing its competitiveness."

The 40% efficiency achievement is outlined in a paper expected to be published soon by the *Progress in Photovoltaics* journal. It will also be presented at the Australian PV Institute's Asia-Pacific Solar Research Conference, which begins at UNSW today (Monday 8 December).

Provided by University of New South Wales

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