

\$77m research lab launched to improve efficiency of solar panels

This can help boost the adoption of solar energy, which is key for S'pore's green push

Cheryl Tan

A \$77 million solar research lab was launched on Friday, aimed at boosting innovation and research for more efficient, cost-effective solar cell technologies for commercialisation.

The lab, jointly set up by the Solar Energy Research Institute of Singapore (Seris) and solar manufacturer REC Solar at the National University of Singapore (NUS), is looking to produce low-cost solar cells that have an efficiency of at least 30 per cent.

Deputy Prime Minister and Coordinating Minister for Economic Policies Heng Swee Keat, who was at the launch of REC@NUS Corporate Lab, noted that the current energy conversion efficiency of solar cells, which entails converting sunlight to electricity, is at most 25 per cent.

A solar panel is usually made of silicon and comprises solar or photovoltaic cells, with each panel containing 36 to 144 cells.

Raising the efficiency of solar panels will strengthen the business case for solar photovoltaics, and can help propel the broader adoption of solar energy, which is crucial for Singapore's renewable energy push, said Mr Heng.

Under the Singapore Green Plan, the Republic is looking to deploy at

least 2 gigawatt-peak of solar energy by 2030, which is equivalent to the annual electricity needs of around 350,000 households.

One viable way of achieving this target would be to raise the efficiency of solar panels through the use of tandem solar cells, which means stacking two solar cells one on top of the other, he noted.

The uppermost layer will be made of perovskite, a family of crystalline compounds known for its low production cost and high energy conversion efficiency, with silicon as the bottom cell.

Professor Armin Aberle, chief executive of Seris, who will be the co-director of the REC@NUS Corporate Lab, said: "Having a tandem solar cell is much like tandem bicycles, where there are two riders instead of one.

"When both riders are in sync, the bicycle can go a lot faster than a single bicycle.

"Similarly, when we put two solar cells on top of each other, the top cell, which faces the sun, converts the visible colours of the rainbow into electricity, and the bottom cell converts infrared light, which is invisible to us, into electricity.

"So that's how the efficiency is a lot higher than a single silicon solar cell."

He noted that the best silicon solar panels in the market today have



Deputy Prime Minister Heng Swee Keat (third from left) being briefed by Professor Armin Aberle (right), chief executive of the Solar Energy Research Institute of Singapore, at the launch event. With him are REC Solar chief technology officer Shankar G. Sridhara (left) and National University of Singapore president Tan Eng Chye. ST PHOTO: KUA CHEE SIONG

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a 24 to 25 per cent efficiency rate. Technological advancements, at best, can bring this up to only 27 to 28 per cent.

Therefore, tandem solar panels would show the way forward, he said.

Researchers around the world have demonstrated that small tan-

dem solar cells, measuring 1cm by 1cm, have been able to reach 30 per cent efficiency.

Tandem cells have been used in space satellites, but these are still far too costly for commercial use.

One of the challenges the lab is looking to tackle is to scale up tandem cells in a cost-effective way, with a goal of producing the world's first large-scale solar cell – 21cm by 21cm in size – with a 30 per cent efficiency rate by 2026.

Another area the lab seeks to address is to enhance the durability of perovskite, as it is sensitive to moisture and humidity, which could affect its performance.

Therefore, ensuring the solar panel's lifespan of 25 years will also be a crucial issue to address, said Prof Aberle.

The lab will bring together research expertise and talent from NUS and REC, in partnership with Nanyang Technological University (NTU), to facilitate Singapore's manufacturing of cost-effective, high-performance tandem solar cell technologies.

Prof Aberle added that the lab hopes to leverage NTU's expertise with perovskite, which has "hundreds of different flavours", to identify which performs best when placed together with a silicon cell.

The project will involve about 40 researchers and aims to train up to 20 PhD students over the next five years.

REC chief technology officer Shankar G. Sridhara, who will also be a co-director of the lab, said his company is committed to continually improve efficiencies and costs of solar panel technology, by creating new products and driving global transitions.

"By continuously increasing the power density of solar panels and their longevity, more clean energy can be generated at lower costs, more emissions can be offset, and more resources can be saved," he added.

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