

Stacked panels boost solar energy production

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Researchers at Gujarat Energy Research and Management Institute (GERMI) in Gandhinagar have proposed a novel method to enhance electricity generation from a solar power station.¹ They say that stacking up photovoltaic (PV) panels makes for more efficient generation of power without having to use huge plots of land to lay out the panels. Around the world, these stations generate power through PV panels that capture sunlight and convert it into electricity. More power generation requires more PV modules and additional land to place them. The GERMI scientists suggest that instead of using a single layer of PV panel, stacking two layers of PV panels one above the other, separated by a small distance could work wonders. Our results of two-layer solar panels have shown about 75 per cent increase in efficiency as compared to a single layer solar panel," Pragma Sharma and Tirumalachetty Harinarayana of GERMI have reported.



Researchers: Pragma Sharma & T. Harinarayana

Explaining the concept GERMI Director Harinarayana said both panels get equal sunlight in the morning hours. During midday the upper panel gets maximum sunlight but it blocks the sunlight reaching the lower panel. In the evening hours both panels get the same sunlight again and, overall, the net electricity generation is more than that from a single layer of PV panel.

Setting up a commercial solar power station using PV modules requires a lot of land area whose cost, the authors said, has gone up five to ten times in the last 10 years in India. "The rationale behind our present work is to save the land cost and get maximum output from the solar power plant in a limited area," Harinarayana told *Nature India*. According to the researchers, the energy generation from commercially available single layer solar panel system for a typical day in December in Ahmedabad or Gandhinagar is 252 kWh for 756 square metre area of PV panel. "It increases up to 445 kWh — an increase of over 70 per cent — with the two-layer solar panels separated by 10 meters," they report. The output varies depending on the separation between the two layers of photovoltaic panels according to the researchers who conducted the study for separation distances varying from one metre to ten metres.

So far the results obtained for two-layer solar panels were from computer simulations. Encouraged by the findings GERMI has started a field study, where a prototype solar power generating system using stacked PV panels is being built. Results from this field study should be out in two to three months, Harinarayana said. Although computer modelling studies were limited to the two-layer PV system of small dimensions, the concept can easily be extended to multiple layer solar PV panel system of any dimension, the authors said. "We can mount several PV panels one over the other like a rack to generate more power," Harinarayana said. "The only added expenses are the cost of solar panels and accessories as land cost is zero."

Furthermore, the results obtained by the GERMI scientists were for presently available PV modules that are opaque and cannot pass sunlight through. Their report says that one should be able to further enhance the energy generation by stacking transparent solar panels which will become available in the near future. According to the GERMI scientists, the concept of stacked PV panels can open up new avenues towards large scale generation even for the small scale solar power plant. "The two-layer PV system can be implemented in all the roof top installations around the world," Harinarayana said.

References

1. Sharma, P. *et al.* Enhancement of energy generation from the two layer solar panels. *Int. J. Energ. Environ. Eng.* doi: [10.1186/2251-6832-3-12](https://doi.org/10.1186/2251-6832-3-12) (2012)