

First Solar sets record for PV module conversion efficiency

First Solar has set a world record for cadmium-telluride (CdTe) photovoltaic (PV) module conversion efficiency, achieving 18.6% aperture efficiency for an advanced full size module.



FS Phase 1 Mohammed bin Rashid Al Maktoum Solar Park

For the first time ever, First Solar has demonstrated a record module that is more efficient than the best multi-crystalline module recorded.

This achievement reinforces confidence in First Solar's ability to deliver sustained product improvements consistent with its long-term technology roadmap. The record has been measured and certified by the US Department of Energy's National Renewable Energy Laboratory (NREL).

This 18.6% aperture area efficiency corresponds to a full area conversion efficiency of 18.2 percent, which easily beats the best recorded multi-crystalline Si PERC module with an approximate full area efficiency of 17.7% (based on 19.1% aperture efficiency and published module area data).

Eighth update

This achievement is the eighth substantial update to CdTe record efficiency since 2011, continuing a disruptive and sustained trend of rapid performance improvements. In January, First Solar produced a research cell with 21.5% conversion efficiency, certified at the Newport Corporation's Technology and Applications Center (TAC) PV Lab and confirmed by NREL.

"First Solar's CdTe thin film is now rightly categorised as a high performance product," said Raffi Garabedian, First Solar's chief technology officer. "At one time, we might have been characterized as a low cost, low efficiency technology, but consistent with our technology projections we are now proving that CdTe thin film delivers both industry-leading performance and sustainable thin-film cost structures."

Garabedian emphasised that First Solar's significant sustained investment in development of CdTe technology has enabled the company to meet or exceed its aggressive projections for improvements in research cells and modules, as well as commercialized technology.

"While silicon technologies have approached their theoretical efficiency entitlement and levelled out in terms of performance and cost, First Solar continues to harvest the upside available from its superior thin film technology. Our CdTe modules are now more efficient than the best multi-crystalline Si modules, and we still have a great deal of technology head room for further innovation," Garabedian said.

Higher energy density

Nick Strevel, First Solar's senior manager of technology, noted that efficiency combined with other real-world performance attributes result in First Solar technology delivering higher energy density than multi-crystalline silicon (m-Si) solar panels. Given the same installed nameplate module capacity (Watts) with equivalent ground coverage ratio, he said, First Solar's CdTe product will provide up to 8% more useable energy from the same land area than m-Si, which gives First Solar a competitive advantage over other PV technologies.

"A narrow focus on simple metrics such as standard-test-condition (STC) efficiency or cost per STC-watt obscures the actual value of solar generation technologies," said Strevel. "Customers value energy produced by a solar power plant (kWh), not its nominal STC power rating. Metrics with greater relevance to real-world conditions - including specific energy yield, energy density, cost/kWh and long term reliability - ultimately tell a much more comprehensive story of real-world performance and are more influential in reducing levelised cost of solar electricity."

Strevel said that, in addition to the continued trend of efficiency records, First Solar's modules are amongst the highest quality, most reliable modules in the world, having passed the industry's most rigorous multi-stress testing protocols such including Atlas 25+, IEC long-term sequential and thresher tests.

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