

## Utility-scale solar aaron

Cadmium telluride (CdTe) solar panels, famously made by First Solar, are an essential part of the US solar module ecosystem. Aaron Bates, founder of Toledo Solar, an Ohio-based manufacturer of CdTe modules, told pv magazine usa that the technology has grown from a small fraction of solar projects to the dominant source of modules in utility-scale projects.

Bates came from an institutional finance background, and when he first got involved in solar, he was intrigued by this level of growth and began investigating. He said he was trying to find reasons not to enter the space, and the more he looked, the more CdTe became appealing. Eventually, he purchased an existing CdTe facility in Ohio, which today operates as the module supplier Toledo Solar.

Bates said that 90% of US utility-scale projects last year were CdTe, and the utility-scale sector makes up about 55% of all solar capacity added. About 20 years ago, it represented less than 1% of solar installations. So why all the growth, and why did Bates enter the market?

There are quite a few reasons to support CdTe and US-made solar, said Bates, including technological advantages, bankability, recyclability, supply chain stability, improved labor practices, and more.

First, Bates said CdTe has a wider range of spectral response than polysilicon cells, the main source of US solar panels. Unlike polysilicon, CdTe is photoactive to the entire visible light spectrum. This factor is not measured in efficiency ratings, but it is measured in the final kWh output of the panel, said Bates.

Because CdTe is largely used at the utility-scale, projects are quite large, making investment and liability high. Due to this, stability and bankability, and decreased risk are important, both in the supply and delivery of planned projects, and the performance in the field.

Bates said the degradation level of CdTe is much lower than polysilicon modules, and they perform better in high temperatures, meaning the technology is a safer bet for investors who sign 20 to 30 year power purchase agreements with large utility offtakers. This is important to utilities, too, which are mandated to supply a reliable, stable source of electricity.

"First Solar has been doing this for 25+ years. They lead the world of PV in recycling. There's a higher percentage, no matter if you want to measure it by weight or components or the cost of said components, there's a higher percentage of recycled everything in a CadTel module. More recycled material than even what's in automobiles, which are made of highly recycled materials, whether it's steel, aluminum, plastics, polymers," said Bates.

First Solar has already set up recycling centers globally for CdTe modules and has sharpened best practices for

using the most material possible from retired panels. Bates said PV is notoriously bad at recyclability, with CdTe being an exception.

Normally, in any manufacturing process there is some scrap or excess material thrown away, but this is not the case for Toledo Solar. "We don't throw anything away. Everything gets recycled. And it goes back into the supply chain, which not only benefits the industry to keep the costs down, but also helps the planet," said Bates. "It's ironic when solar panels are not recycled, or made of recycled material, or are just thrown away."

Supply shortages have been the dominant problem for the buildout of solar in 2022. For many in the industry, the Department of Commerce's investigation into Malaysia, Vietnam, Cambodia, and Thailand for alleged harboring of tariff-circumventing Chinese goods came under the crosshairs as a major reason for the shortage. The potential of large tariffs being retroactively applied to goods shipped from the four nations, which supply about 80% of US polysilicon solar panels, caused many developers to cancel or delay projects due to the uncertainty it caused.

Bates questioned whether these were genuine concerns, or if they were instead talking points to continue to support these international supply chains. He pointed to the fact that the Biden Administration did not increase tariff levels and that Commerce was following laws that had already existed for years.

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