

Quick Facts

A deposition technology developed in collaboration with NREL helped First Solar grow from a small startup company in Toledo, Ohio, to become an international company with manufacturing facilities in Ohio and Malaysia. Its production capacity exceeds 2 gigawatts per year.

First Solar employs roughly 5,000 people throughout the world, including about 1,500 in the United States. In 2010, it was listed in tenth place among Industry Week's list of the 50 best manufacturers.

First Solar has produced more than 7 gigawatts of solar modules, which have displaced roughly 5 million metric tons of carbon dioxide emissions. The modules produce enough electricity each year to power nearly 3.7 million homes.

First Solar is a vertically integrated solar provider, manufacturing modules while also developing new solar projects. Its modules are powering some of the largest solar projects in the world, including a 250-MW project in Arizona, with even larger projects now under construction.

Continuous improvements in First Solar's processes and modules brought production costs below \$1 per watt in 2008; production costs have since been lowered to less than \$0.64 per watt.

First Solar has set world records for the efficiency at which its CdTe modules convert sunlight into electricity. Its solar modules have achieved a 14.4% conversion efficiency.

Rapid Deposition Technology Holds the Key for the World's Largest Manufacturer of Thin-Film Solar Modules

In a long-term collaboration with the National Renewable Energy Laboratory (NREL), an innovator in thin-film solar technology has grown from a startup company to become one of the world's largest manufacturers of solar modules, and the world's largest manufacturer of thin-film solar modules. First Solar, Inc., headquartered in Tempe, Arizona, now manufactures its cadmium telluride (CdTe) solar modules throughout the world.

In 1991, NREL started working with First Solar's predecessor, Solar Cells, Inc., with funding from the Office of Energy Efficiency and Renewable Energy within the U.S. Department of Energy. Solar Cells was focused on depositing CdTe on glass, forming rigid solar modules similar in appearance to traditional solar modules made from crystalline silicon solar cells. In 1999, private investors formed First Solar, Inc. as a joint venture with Solar Cells, and later bought out Solar Cells' stake in the company. In its early years, First Solar developed a range of novel technologies to make it easier to manufacture its thin-film-on-glass solar modules. Along the way, the company continued to collaborate with NREL.

A key innovation developed through this collaboration is a technology known as High-Rate Vapor Transport Deposition (HRVTD), in which the material to be deposited is carried on a gas stream in powder form, then heated and vaporized as it passes through a membrane before depositing on the glass substrate. This deceptively simple technology can deposit a thin, uniform layer of CdTe or cadmium sulfide (CdS) on 8 square feet of glass in less than 40 seconds—a deposition rate 3–4 orders of magnitude greater than rival thin-film solar technologies. The technology was the key to success for First Solar's first production line, which was able to crank out one solar module per minute.

First Solar's production lines feed soda lime glass with a very thin layer of transparent conducting oxide into vacuum deposition chambers, where the HRVTD process is used to deposit first a layer of CdS, then a layer of CdTe. Today, the company has the capacity to manufacture nearly 70 megawatts (MW) of solar modules per year in each of its four U.S. production lines, for a total U.S. production capacity of nearly 280 MW.



First Solar, Inc. is NREL's biggest success to date for the manufacture of thin-film solar modules. The company's manufacturing facility in Perrysburg, Ohio, has an annual production capacity of nearly 280 MW.
Photo from First Solar

National Renewable Energy Laboratory
15013 Denver West Parkway, Golden, CO 80401
303-275-3000 • www.nrel.gov

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