First Solar Fast Facts

Quick Facts

- Founded in 1999
- First Solar is a Tier 1 solar panel manufacturer
- The only US-headquartered company among the top 10 global solar manufacturers and the only one not manufacturing in China
- Headquarters in Tempe, AZ, with US manufacturing plants in Ohio and Alabama (anticipated opening in 2025)
- Manufactures its modules in the United States, Vietnam, India (anticipated in late 2023), and Malaysia
- The company is listed on NASDAQ under the FSLR stock symbol

A Brief History

First Solar is exclusively a solar module manufacturer. At one time, it provided development, engineering procurement & construction (EPC), and operations & maintenance (O&M) services but has since sold these business units to focus solely on module manufacturing.

Thin Film Solar PV Modules

First Solar manufactures thin film modules. These modules are different from typical crystalline silicon modules in their material composition, manufacturing process, sustainability advantages, and more.

Worldwide Systems

First Solar sells its modules for use in ground-mount systems, carport/canopy systems, and floating solar systems across commercial & industrial (C&I) markets, distributed generation (DG), and both large and small utility-scale projects around the world.

Vertically Integrated Manufacturing Process

First Solar produces modules from a sheet of glass to a finished module, all under one roof, in about 4.5 hours.

In-House Recycling

First Solar is the world's largest PV recycler and the only solar manufacturer with global high-value PV recycling services.

Distribution Network

First Solar sells modules directly to customers and has US distribution partnerships with Greentech Renewables, Graybar Electric, Kinect Solar, and WESCO, who sell First Solar modules to their customers.

Made in the USA

First Solar is one of the largest employers in the American solar manufacturing sector.

10 Reasons to Choose First Solar

1 Established the solar industry's first global solar panel recycling program in 2005 and is currently the only solar panel manufacturer with global high-value recycling services.

- Customers can opt in to recycle modules with First Solar at any point in the module's life cycle.
- First Solar modules are designed for high-value recycling to maximize material recovery at end-of-life and recover more than 90% of module materials for reuse in new solar panels, glass, rubber, and aluminum products.
- One kilogram of First Solar's semiconductor material can be recycled up to 41 times.

2 Received Silver-rated EPEAT Ecolabel for Series 6 and Series 6 *Plus* Modules.

- First Solar Series 6 modules are the world's first PV product included in the Electronic Products Environmental Assessment Tool (EPEAT) registry for sustainable electronics.
- EPEAT is a globally recognized and independently validated ecolabel that establishes corporate and product sustainability criteria.

3 Awarded a Platinum rating from one of the most robust social audits in the industry.

- First Solar is a member of the Responsible Business Alliance (RBA), the world's largest industry coalition dedicated to supporting the rights and well-being of workers and communities in the global supply chain.
- First Solar received a Platinum rating with a perfect score from the RBA's third-party Validated Assessment Program (VAP) audit of its Ohio manufacturing facilities.

4 Invested over $1.5 billion in research & development (R&D) efforts since 2010.

- First Solar is an innovative company focused on continuous improvement of its pioneering thin film technology.
- First Solar is investing in a dedicated R&D facility in Ohio to further enable its product roadmap innovation.

5 Trusted industry leader with a 20+ year track record and reputation for good business practices.

- Its US-based management and support teams ensure ease of business from origination to operation.
- First Solar has one of the strongest balance sheets in the industry with $2.4 billion in net cash at the end of 2022 and is an A-Rated module manufacturer in bankability from PV ModuleTech.
- First Solar produces US-made modules, using American technology developed in California and Ohio, and manufactured in Ohio and Alabama (expected opening in 2025). First Solar also produces modules in Malaysia, Vietnam and India using the same American technology.
- First Solar is focused on expanding its domestic manufacturing, creating US jobs, and bringing improved energy security to the country.

6 The best environmental profile of any photovoltaic (PV) module on the market.

- First Solar's Series 6 modules have a 2.5x smaller carbon footprint, 2x faster energy payback, and a 3x lower water usage footprint than typical crystalline silicon modules.
- First Solar modules are manufactured in a fully integrated manufacturing process using less energy, water and semiconductor material than conventional crystalline silicon PV manufacturing.

7 One of the lowest warranted annual degradation rates on the market at 0.3% per year.

- The rate ensures the modules will retain at least 91% of their original performance over a 30-year warranty period, contributing a to higher lifetime energy per nameplate watt when compared to typical crystalline silicon modules.
- The 0.3% rate is provided for all Series 6 *Plus* modules as long as the project utilizes central inverters or string inverters with potential induced degradation (PID) mitigation, otherwise a warranted annual degradation rate of 0.6% is provided.

8 Offers the industry's only warranty against power loss from cell cracking.

- Cell cracking is a phenomenon that occurs only in crystalline silicon photovoltaic modules, and often cannot be seen by the unaided eye.
- These hidden cracks can occur from hail, wind, and snow loads, as well as during transportation and installation.
- With each new crack, this hidden damage gets progressively worse, leading to permanent power loss in affected c-Si modules.
- First Solar's modules are immune to cell cracking due to a thin film Cadmium Telluride (CadTel) semiconductor—just a few microns thick—that conforms to substrate surfaces and cannot fracture under stress or impact.
- This important difference gives First Solar customers added peace of mind, lower financial risk exposure and enhanced insurance risk profiles - especially for projects in regions prone to extreme weather.

9 Has a transparent and sustainable supply chain.

- First Solar does not source any module components from Xinjiang, China, a region of the solar supply chain that has been associated with human rights risks related to polysilicon.
- Our manufacturing architecture is controlled by a single set of global specifications for Bill of Materials components resulting in a tightly controlled supply chain and quality product.

10 Can accommodate short lead times for module procurement in US projects.

- Inventory modules are ready to be shipped upon contract execution.
- US-made inventory can be delivered to customer sites as soon as four weeks after purchase order execution and receipt of a down payment.
- By 2025, First Solar's US manufacturing facilities are anticipated to produce 10+ GW DC of modules annually, supporting 15,000 indirect American jobs and adding an estimated $3.2 billion in value to the US economy[1].

Top 5 Questions from Customers

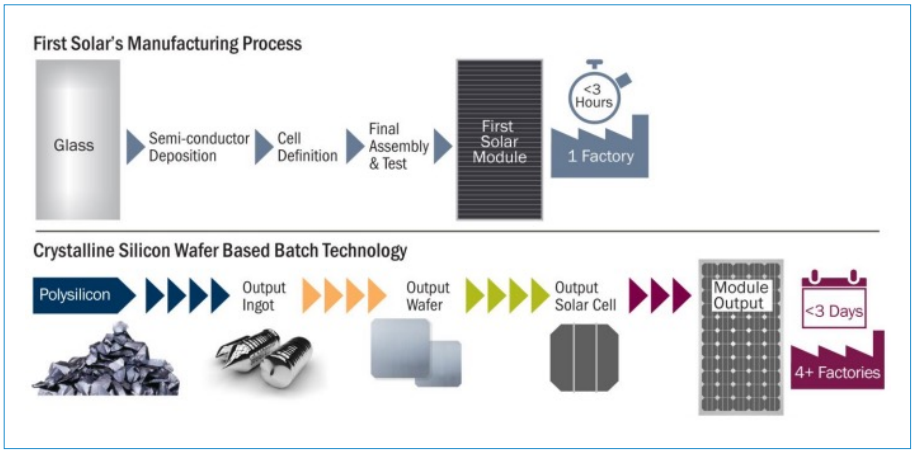
1 What are the main differences between thin film and crystalline silicon modules?

Composition:

- First Solar Series 6 and Series 6 *Plus* modules do not contain polysilicon. The semiconductor material in First Solar modules is Cadmium Telluride (CadTel).
- **First Solar modules start from a single piece of front glass** onto which is applied a transparent conducting oxide layer, a CadTel semiconductor layer, and a back contact layer through vapor deposition. Lasers then create cell interconnect pathways by etching cells in the material. A rear conductor layer is next added to the top. Module interconnection bussing is added on, followed by an encapsulate laminate material, back glass, an anti-reflective coating, dual junction boxes, and the module frame.
- Typical crystalline silicon modules are composed of polysilicon, where pure silicon is processed into a high-purity single crystal ingot, which is then sliced into wafers, processed into a silicon cell, then soldered together and laminated under glass to create a working module.

Manufacturing Advantages:

- **First Solar's manufacturing process is fully vertically integrated, highly automated, and continuous. Modules are manufactured from sheets of glass to a finished module, under one roof, in about 4.5 hours.**
- **Typical crystalline silicon modules are manufactured using the batch processing technique. One module can take up to three days for production, in pieces, across up to four factories (sometimes in different countries and/or continents) with less stringent oversight of the manufacturing process.**

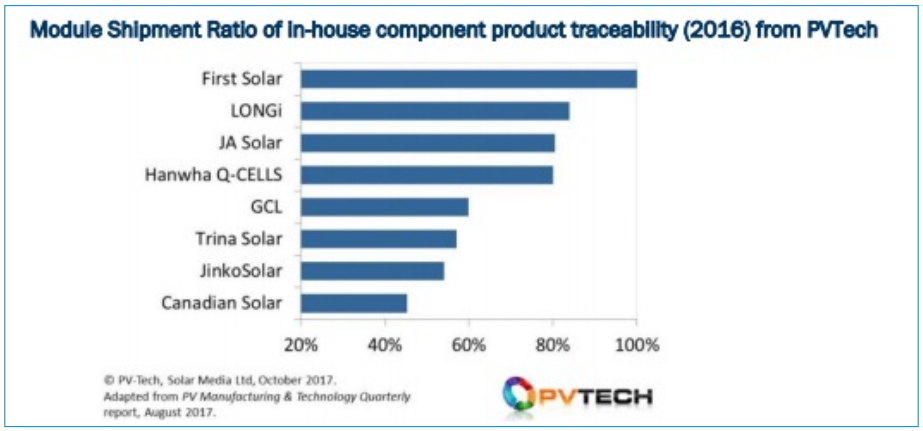


Environmental Impacts:

- First Solar modules have a 2.5x lower carbon footprint, 2x faster energy payback time, and a 3x lower water footprint on a lifecycle basis than typical crystalline silicon modules.
- First Solar is the first PV manufacturer to have its product included in the EPEAT global registry for sustainable electronics, which recognizes the most eco-efficient PV solutions available today.

Traceability:

- First Solar's manufacturing architecture is controlled by a single set of global specifications for Bill of Materials components resulting in a tightly controlled supply chain and quality product.
- In contrast, many traditional Tier 1 crystalline silicon manufacturers have multiple products, processes, and Bills of Materials with sprawling supply chains that result in increased variability, quality, and reliability risks.
- First Solar modules are in a completely controlled manufacturing process from start to finish, which is unique among solar manufacturers. Every module is traceable through the First Solar manufacturing process by way of an inscribed serial number that is etched on the front glass of every module once it enters the manufacturing line. This serial number endures the life of the module and can be used to trace the module after it is deployed in the field.



Visual Appearance:

- With an advanced and optimized design, First Solar modules have a sleek, black glass appearance with an undermounted frame.
- This visually stunning design is also practical, providing the cleaning benefits of a frameless module while protecting the edges against breakage.
- Typical crystalline silicon modules often appear blue in color with easily visible cell structure and frame surrounding the outside of the module.

2 Are First Solar thin film modules safe for the environment?

Yes. First Solar uses CadTel as the semiconductor material in its thin film modules. CadTel is ideal for absorbing and converting sunlight into electricity, so First Solar modules require 98% to 99% less semiconductor material than typical crystalline silicon modules. This semiconductor layer in First Solar modules is only a few microns thick, equivalent to a fraction of the thickness of a human hair. Unlike elemental Cadmium (Cd), CadTel is a stable compound with extremely high chemical and thermal stability that is insoluble in water. It has high melting and boiling points and a low evaporation rate.

First Solar's thin film semiconductor is encapsulated between two sheets of glass and is sealed with an industrial laminate which limits the potential release into the environment. More than 50 researchers from leading international institutions have confirmed the environmental benefits and safety of First Solar's thin film technology over its entire life cycle, during normal operation, during exceptional accidents like fire or module breakage, and through end-of-life recycling and disposal. First Solar thin film modules have been tested for safety during breakage, fire, flooding and hailstorms, and they have met rigorous performance testing standards to demonstrate durability and reliability in real-world environments. CadTel PV is a mature technology and First Solar panels have been in the field for more than two decades. With more than 50 gigawatts deployed worldwide, First Solar modules have a proven record of safe and reliable performance.

3 Can First Solar provide my project with US-made modules that meet the domestic content requirements for the Buy American Act?

Yes, any of First Solar's modules manufactured in its US manufacturing facilities meet the Buy America requirements established under the Inflation Reduction Act of 2022 (IRA), the American Recovery and Reinvestment Act of 2009 (Recovery Act), the Buy American Act (BAA), the North American Free Trade Agreement (NAFTA), the Federal Acquisition Requirements (FARs), and the World Trade Organization Government Procurement Agreement (WTO GPA).

For specific project requests, please check with your distribution partner and/or the First Solar business development team on volume availability for US-made modules.

4 What is First Solar's manufacturing capacity and does it manufacture all of its modules in the US?

Currently, First Solar has two vertically integrated manufacturing facilities in Northwest Ohio that manufacture its Series 6 *Plus* modules, with a total annual production capacity of 3 GW DC. Its third manufacturing facility in Ohio began producing Series 7 modules in early 2023, with a planned annual capacity of 3.5 GW DC. First Solar also announced in August 2022 that it is scaling up its US manufacturing capacity with a new 3.5 GW manufacturing facility and $1 billion investment in Alabama. This fourth US factory is expected to be operational in 2025.

By 2025, First Solar's US manufacturing facilities are anticipated to output over 10+ GW DC, support 15,000 indirect American jobs, and add an estimated $3.2 billion in value to the US economy[1].

In addition to its US manufacturing facilities, First Solar also operates factories in Vietnam and Malaysia, and is building its first manufacturing facility in India which is scheduled to begin operations in the second half of 2023. Upon completion of its expansion plans in the US and India, First Solar expects to have over 21 GW DC of annual global manufacturing capacity by 2025.

5 Where can I buy First Solar modules for my project?

First Solar works with four national distribution partners in the US to supply First Solar modules to the US C&I and DG markets: Greentech Renewables, Graybar Electric, Kinect Solar, and WESCO. All First Solar products that are currently available can be procured through any of these partners for projects under ~20 MW DC, with delivery to any continental US state.

[1] Assuming five workers added in the overall US economy for every one manufacturing job (Source: National Association of Manufacturers (NAM), using 2020 IMPLAN data) Assuming economic impact multiplier of $2.68 per $1.00 spent on manufacturing (Source: NAM, using 2020 IMPLAN data)

First Solar

LEADING THE WORLD'S SUSTAINABLE ENERGY FUTURE

Learn more about First Solar at firstsolar.com