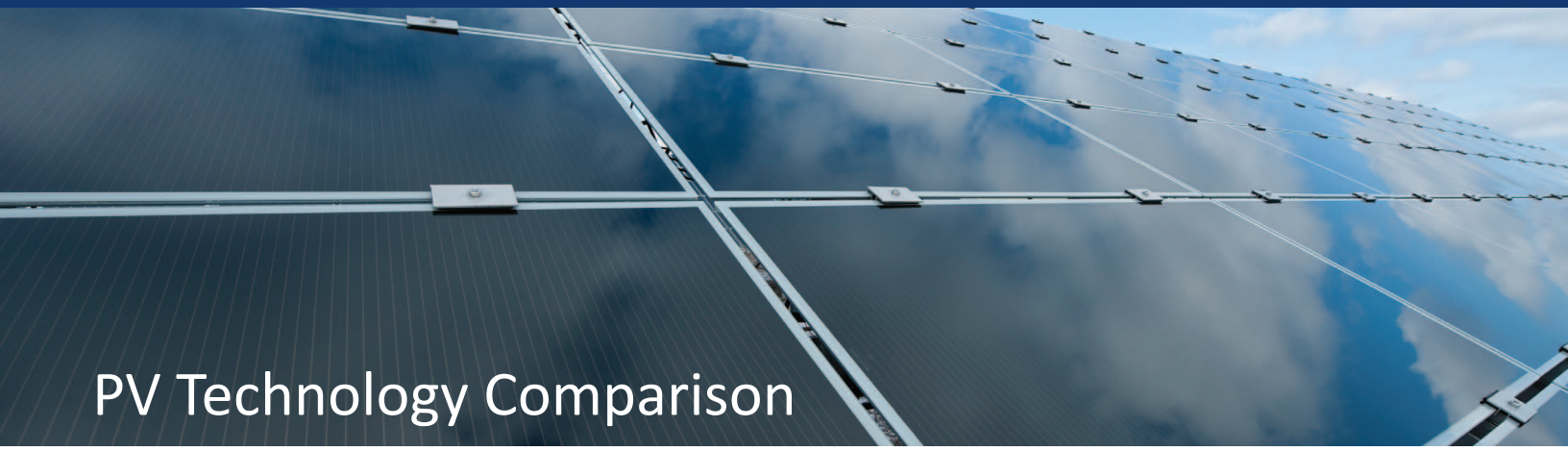


PV Technology Comparison

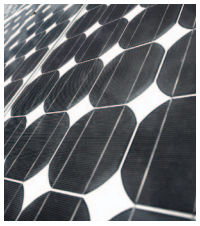
In the world of photovoltaic (PV) solar power, there are several types of semiconductor technologies currently in use for PV solar panels. Two, however, have become the most widely adopted: crystalline silicon and thin film.

Crystalline Silicon

Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled together in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels.

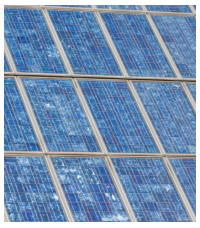
There are two main types of crystalline silicon panels:

– Monocrystalline Silicon



Monocrystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Monocrystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.

– Multicrystalline Silicon



Multicrystalline (also called polycrystalline) panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than monocrystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than monocrystalline silicon. They are also less efficient, though the performance gap has begun to close in recent years.

Thin Film

Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, most thin film panels are not flexible. Overall, thin film solar panels offer the lowest manufacturing costs, and are becoming more prevalent in the industry.

There are three main types of thin film used:

– Cadmium Telluride (CdTe)

CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.

– Amorphous Silicon

Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.

– Copper, Indium, Gallium, Selenide (CIGS)

CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications, and is considered a developing PV technology.

Why First Solar Chose CdTe

First Solar manufactures CdTe solar panels because of its superior energy output characteristics across real-world conditions, its low-cost volume production benefits, and its superior environmental performance.

Energy Performance

CdTe has less temperature-related loss than crystalline silicon due to a lower temperature coefficient. It also provides superior energy output in low, indirect, and diffuse light conditions, producing more electricity on cloudy days. Because of these characteristics, solar systems with First Solar panels produce more energy in real-world conditions when compared to competing systems with the same power rating.

Volume Manufacturing

CdTe enables high-volume, low-cost production. First Solar's manufacturing lines transform a sheet of glass into a complete solar panel in less than 2.5 hours in a continuous, automated process. Only 1-2% of the semiconductor material used in traditional crystalline silicon solar panels is needed, eliminating a major cost component. First Solar has quickly grown to be one of the world's largest solar panel manufacturers. In late 2008, First Solar became the first company to break the $1 per watt manufacturing cost barrier, and continues to drive down costs.

Sustainability

CdTe systems have the smallest carbon footprint of any PV technology. They also have the fastest energy payback time. In less than a year, systems with First Solar panels produce more electricity than was required to create the system. By combining superior environmental performance with low-cost manufacturing, First Solar is able to provide truly sustainable energy solutions.

What is PV?

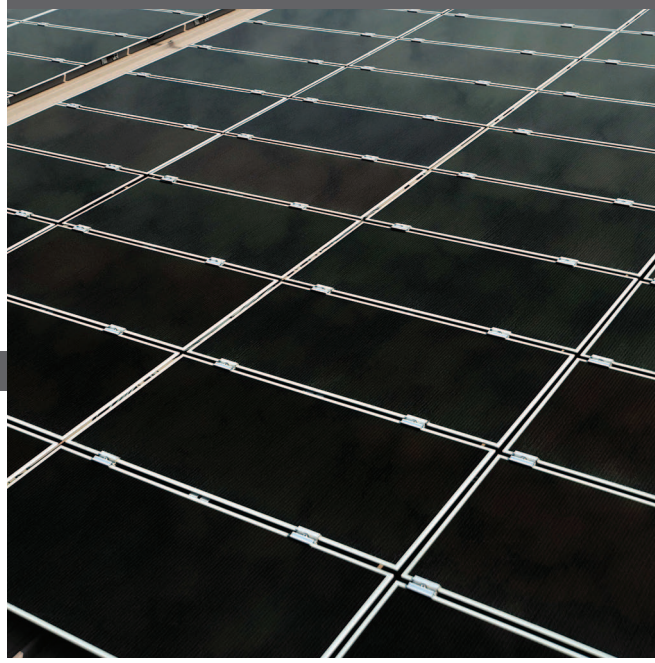
PV stands for photovoltaic which is derived from two words: *photo* meaning light and *voltaic* or *volt* which is the unit used to measure electric potential. PV solar panels create power by converting sunlight, the most abundant renewable energy resource, into electricity — producing clean, affordable energy without consuming any fossil fuels or emitting any green house gases.

PV Cells, Panels, and Systems

A PV cell or solar cell is the semiconductor device that converts sunlight into electricity. These cells are combined to form panels which, in turn, are combined to create what are called arrays — the actual solar generation systems which connect to the energy grid. The efficiency of each solar panel is measured by its ability to absorb light particles called photons. The more photons that are absorbed, the more efficient the panel is at converting light into electricity.

The PV Process — How it Works

When photons strike the solar cells contained in a solar panel, they can be reflected, absorbed, or pass through the panel. When photons are absorbed, they have the energy to knock electrons loose, which flow in one direction within the panel and exit through connecting wires as solar electricity, ultimately providing power for residential and commercial users.



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