

SPEED SOLAR

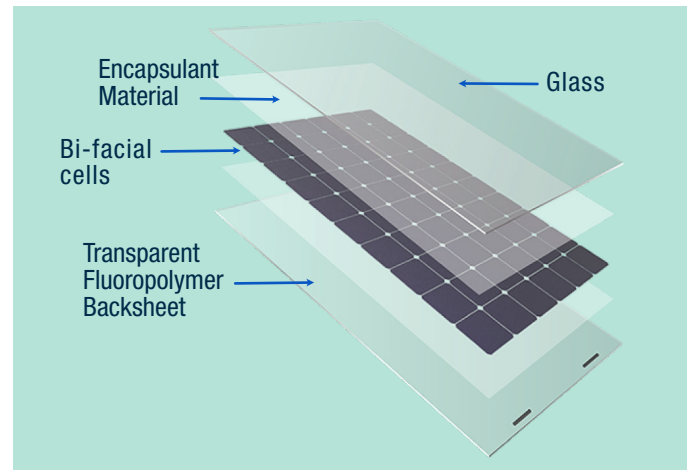
Introducing the Bi-facial Solar Module from Philadelphia Solar.

What is a bi-facial solar module?

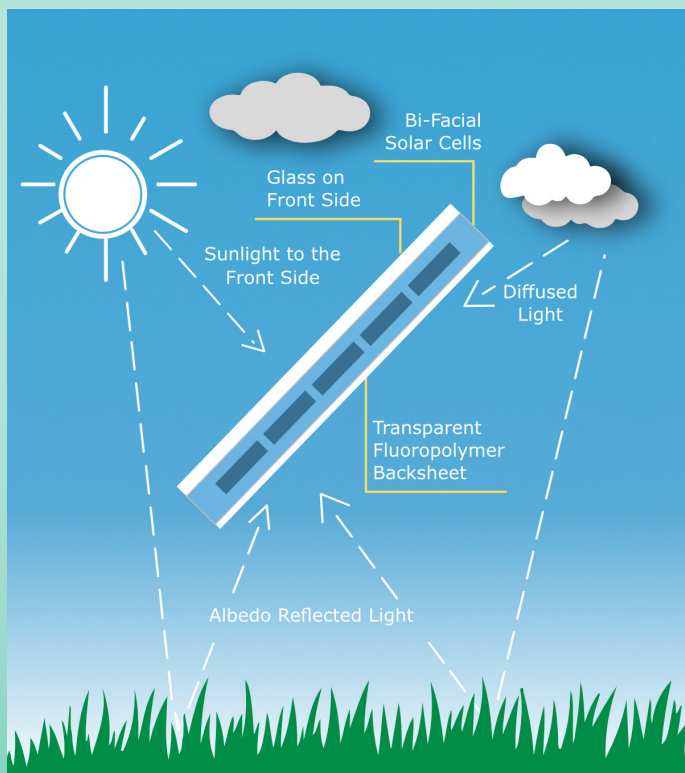
Bi-facial solar modules have solar cells facing both sides of the module, with glass on the front and a clear fluoropolymer sheet on the back, allowing them to produce up to 25% more energy than the typical mono-facial solar module widely used today.

Bi-facial modules can be used with standard racking and inverters for any type of solar array. They perform excellently in low light situations, are PID resistant, and come with a 25 year warranty.

Best of all, bi-facial modules are comparably priced to mono-facial modules. Speed Solar bi-facial modules are sold by the pallet: 27 modules per pallet, with discounts available for volume orders.



Why Bi-facial Solar Modules Are Better



Soil / Green Grass

- Albedo 10-20%
- Expected yield/gain 6-7%

Sand / Gravel

- Albedo 22-25%
- Expected yield/gain 10-12%

Snow / White Paint / Aluminum

- Albedo 80-95%
- Expected yield/gain 15-25%

Up to 25% More Power

Bi-facial solar modules take advantage of **albedo light**, or light reflected from a surface. The solar cells on the back of the module produce energy from that reflected light, even if the cells on the front of the module are obscured by snow.

Compared to mono-facial modules, bi-facial modules produce more energy per square foot, with the back side capable of producing 75% (+ or - 5%) of the front.

Excellent Low Light Performance

Speed Solar's tests show that even on heavily overcast days, our bi-facial modules produce significantly more energy than similarly situated mono-facial modules.

Sheds Snow Faster

When mounted at an angle that allows albedo light access to the back of the module, bi-facial modules shed snow faster than mono-facial modules in the same setting.

In the photo below, taken at 10 am on a January morning at our Deerfield test site, the bi-facial panels (right) have shed most of their snow while the mono-facial panels are still snow-covered.



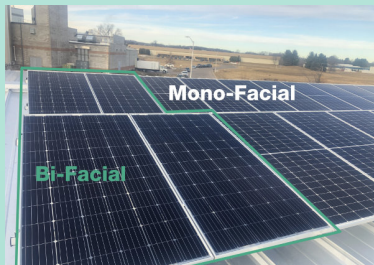
We get it. Industry claims about the significant output increases for bi-facial solar modules can seem too good to be true.

That's why we decided to test it.

Whenever we talk to installers about increases of up to 25% in energy output from bi-facial modules, they're skeptical. It's also hard to find industry test results to prove our claims. So Cal Couillard, one of Speed Solar's owners and bi-facial solar module advocate, decided that we needed unequivocal proof.

Cal devised a series of three tests that would show, once and for all, that bi-facial solar modules actually do produce up to 25% more energy than mono-facial modules. Each site compared the same number of bi-facial modules to mono-facial modules, with everything else the same. Percentage increases, as shown in the chart below, were calculated as an average over a two month period.

Speed Solar Bi-Facial Module Test Results



Test Site 1

Reedsburg, WI

- Roof mounted
- 4 bi-facial modules compared to average of 3 sets of 4 mono-facial
- Same degree of tilt



Test Site 2

Helenville, WI

- Ground mounted
- 8 modules of each type
- Same degree of tilt

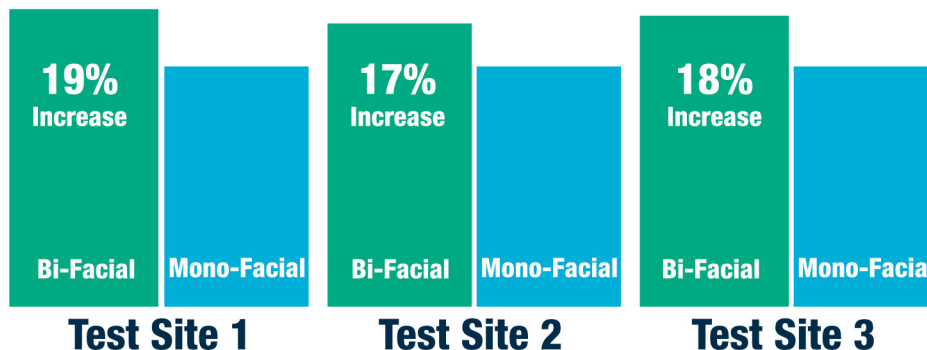


Test Site 3

Deerfield, WI

- Pole mounted
- 10 modules of each type
- Same degree of tilt

Test Results January - February 2020 Bi-Facial Output Compared to Mono-Facial Output (all modules 370 watts each)



"Regardless of how much sun we have, the bi-facials outperform the mono-facials by between 15 to 20%."

"In fact, on some of the days when we had a lot of snow-cover the bi-facials outperformed the mono-facials by 200-300% or more because the mono-facials produced very little and the bi-facials were much more productive."

Neil Matthes, P.E.
Duck Creek Engineering Inc.

Test data is available upon request.