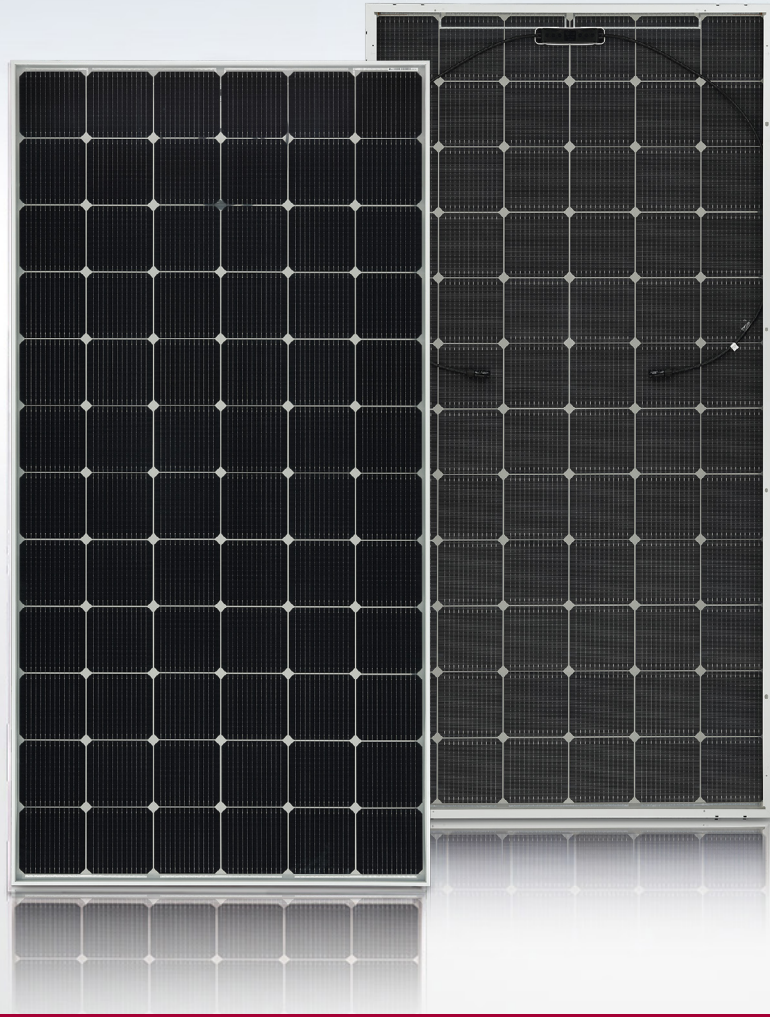


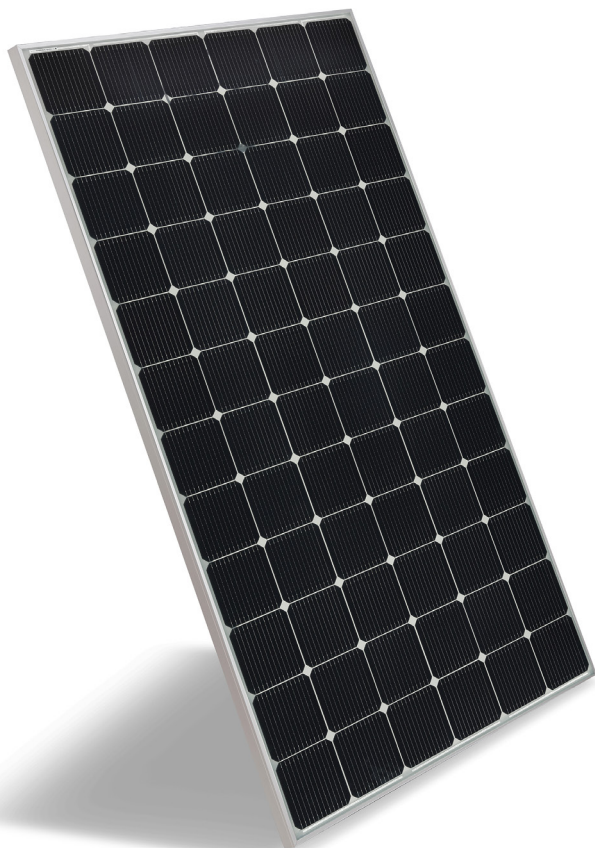
LG Solar



LG Solar BiFacial Modules:

For Commercial and Tilt-Mount Module Projects

Introducing the NeON[®] 2 BiFacial Solar Module



LG NeON[®] 2 BiFacial

NeON[®] 2 BiFacial 72-modules are now available in the United States.

Incorporating the same award-winning Cello Technology™ as our best-selling NeON[®] 2 monofacial modules, LG Solar BiFacials feature the following output and efficiency ratings:

LG 72-Cell NeON[®] 2 BiFacial

400W | 405W

19.3% | 19.5% Module Efficiency



BiFacial Module Features



LG Solar offers a 25-year product, performance and labor* limited warranty.



Better performance on hot days due to a lower temperature coefficient.



BOS (Balance of System) savings



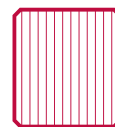
Near Zero LID
(Light Induced Degradation)

**Labor costs in the rare case of a needed module repair or replacement are covered up to \$450.*

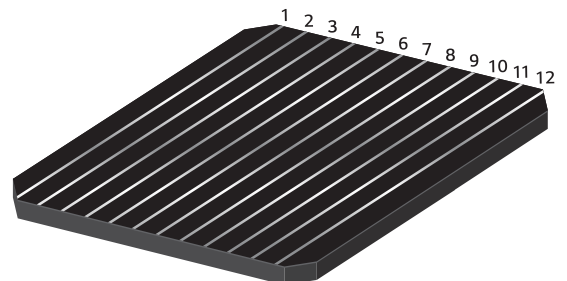
Cello Technology™

All LG Solar NeON® 2 modules, including BiFacial modules, feature Cello (Cell Connection with Electrically Low loss, Low stress, and Optical absorption enhancement) Technology™.

Cello Technology™ features 12 thin, circular-shaped wires instead of the usual 3-5 busbars. Photons absorbed from sunlight have more pathways to enter to produce electrical current in NeON® 2 cells. This also reduces vulnerability to power generation loss due to micro-cracks.



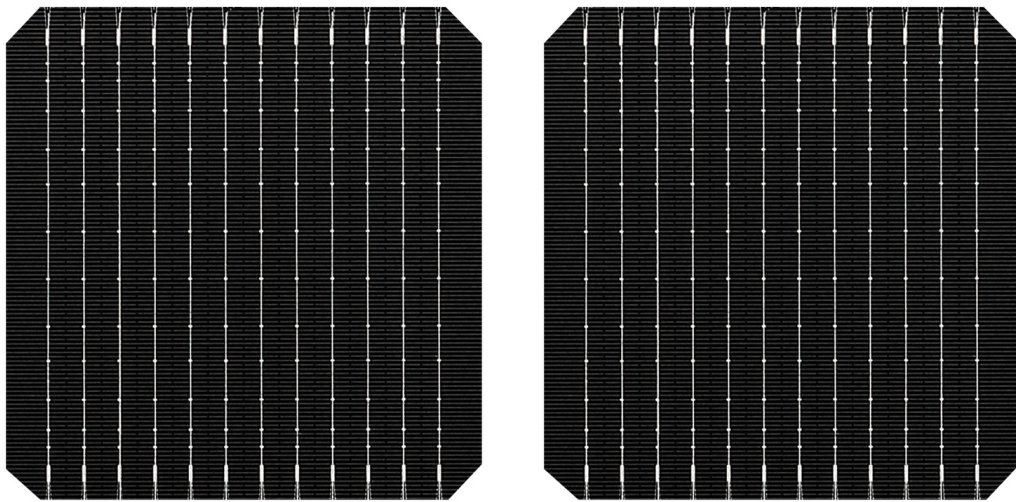
Cello Technology™



12 Thin Round Wires

Cello Technology™ Advantages

- Traditional flat wires reflect out irradiance, while our round wires scatter light more efficiently within the cells
- Light is scattered more effectively within the cells
- Resistance to power loss caused by environmental factors such as micro-cracks
- Improved module appearance



Front and Rear of a NeON® 2 Cell

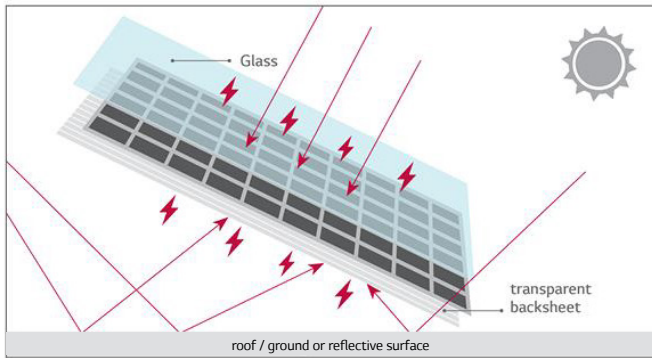
Transparent Backsheet

LG Solar's BiFacial modules have a transparent backsheet that enables reflected light to be absorbed by the cells. In addition, the cells in each module have a symmetrical structure designed to capture both front and rear irradiance.

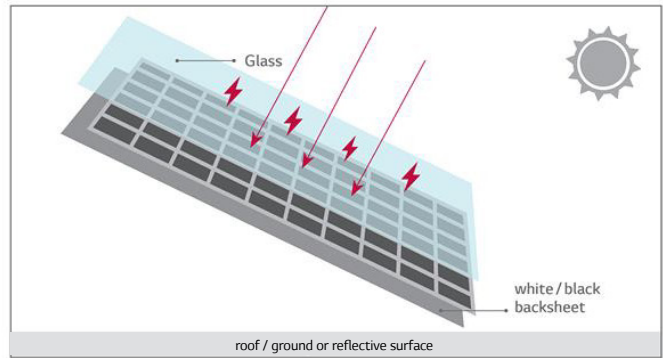
BiFacial Gain

The additional power gained from the back of the double-sided cells in our BiFacial modules changes the electrical values of the module. Current increases proportionally with the power boost.

Bifacial module



Monofacial module



Extremely Low Light Induced Degradation (LID)

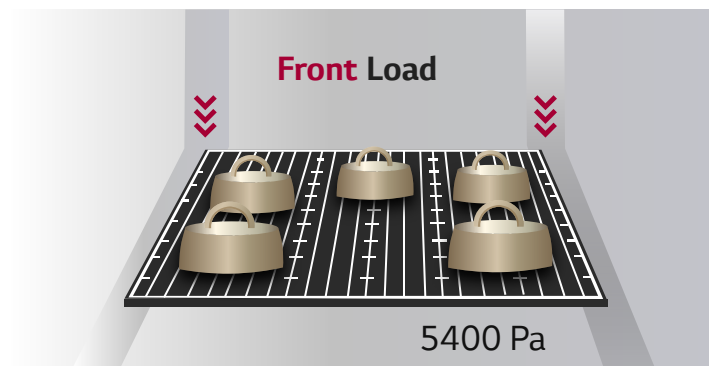
Because our NeON[®] 2 BiFacial modules are manufactured with N-type wafers, they experience extremely low LID rates.



LG NeON[®] 2 BiFacial / Phosphorus in N-Type wafers improves LID rates

Outstanding Durability

All LG Solar modules feature a reinforced frame design that allows for a strong load. Our 72-cell NeON[®] 2 BiFacial modules can handle a 5400 Pa (Pascal) front load and a 3000 Pa rear load.



In-house Testing

LG Solar tests all of our modules in our in-house testing laboratory, which is certified by TÜV Rheinland.

Array Design Considerations

A number of factors should be considered when designing a BiFacial installation for maximum power output. These include:

- Albedo
- Module Elevation
- Module Pitch
- Shading Caused by the Mounting Design and Structure
- Electrical Considerations

Albedo

BiFacial gain increases with the proportion of the incident light or radiation that is reflected by a surface beneath the modules.

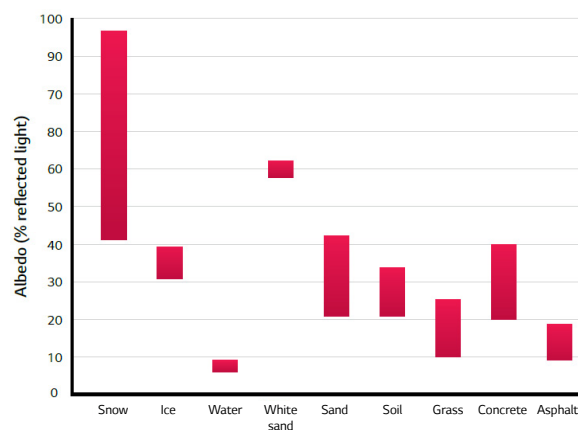
To determine the albedo of a surface you can:

1. Inspect the ground and use the albedo reference table
2. Measure the albedo using a pyranometer
3. Measure the albedo by installing a BiFacial module, measuring the max power output and then comparing to the graph for reverse engineering.

$$\text{Albedo of the surface} = \frac{\text{Reflected light}}{\text{Incident light}}$$

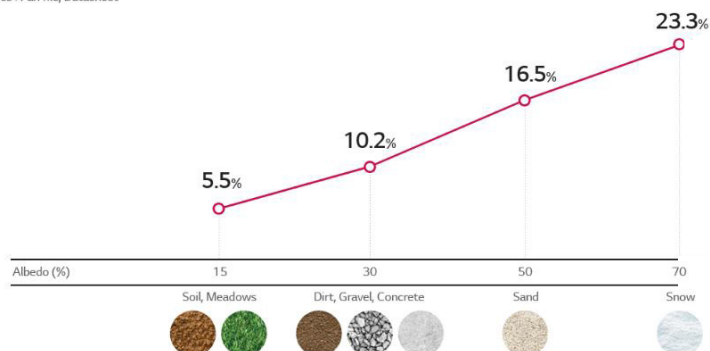


Albedo range for a variety of surfaces



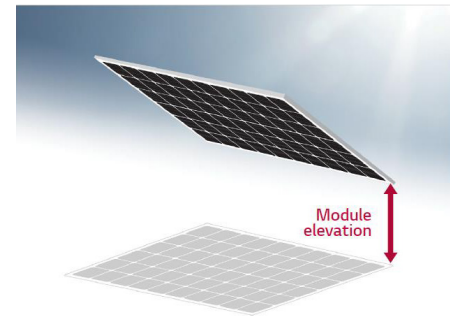
* Source : Helmholtz Alfred-Wegener Institute and the National Renewable Energy Laboratory (NREL)

* PV Syst: simulation result
* Region : Bayern München, Germany
* One day in July (Highest temperature in a day : 32 °C)
* Data source : Pan file, Datasheet

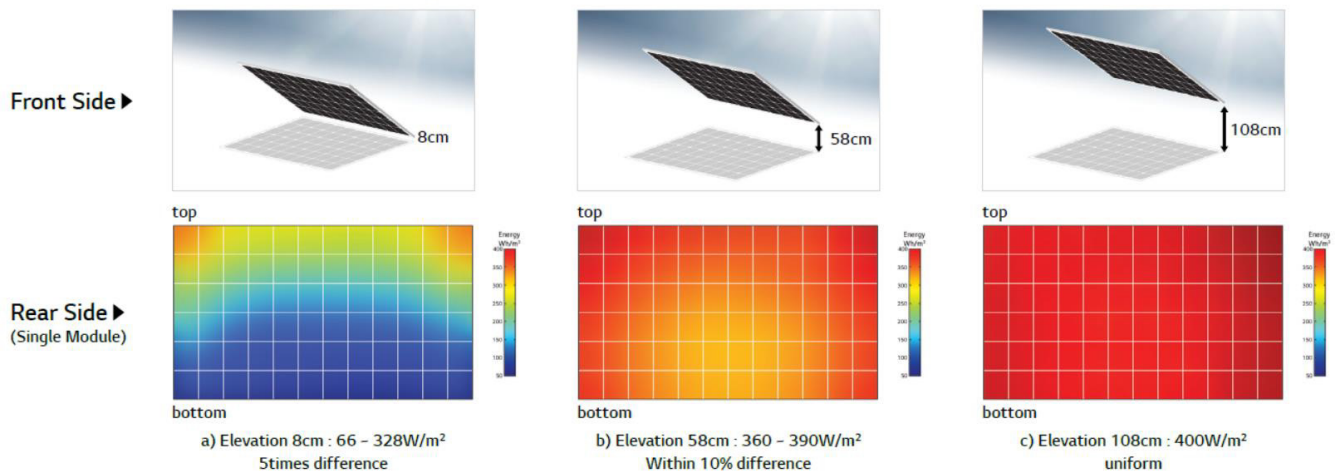


Module Elevation

Higher module elevation provides higher energy yields for BiFacial modules. LG Solar recommends a module elevation of 1 meter, noting that higher installations off the ground or roof also mean higher wind loads. Higher elevation also provides module uniformity.



Irradiance Distribution of Backside in Single Module



* Source : PV MODULE POWER GAIN DUE TO BIFACIAL DESIGN: PRELIMINARY EXPERIMENTAL AND SIMULATION DATA, (2010 IEEE)
* Test condition : horizontal irradiation 1006W/m², Albedo 50%, Tilt angle 30deg

Module Pitch

The ideal pitch (tilt angle of each module) is about 30°. Pitch is directly correlated with the Ground Coverage Ratio (GCR). The GCR is the ratio of the modules area and the total ground area:

$$\text{GCR} = \frac{\text{Module Area}}{\text{Ground Area}}$$

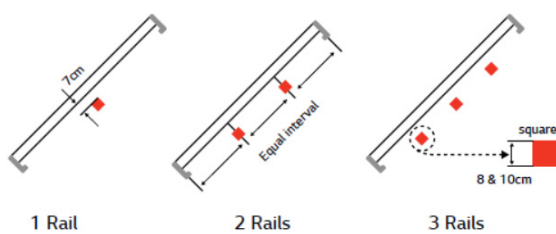
When modules are elevated and at the proper angle, more reflected light reaches the bottom of the panel without sacrificing any sunlight that hits the top. A higher pitch provides greater energy production.

Shading

Decisions about mounting structure and array configuration will affect the amount of shading affecting the modules. The following elements of the mounting structure will affect shading:

- Rail thickness and width
- Number of rails below the modules
- Design of the rails
- Distance between rails

Mounting conditions



To minimize shading, you can:

- Install the mounting structure on the frame of the modules
- Design smaller array configurations
- Minimize the number of rows in the array
- Optimize irradiance uniformity



Mounting structure for BiFacial (Rail on the edge of module)

**Source: OPSUN bifacial Racking System*

Electrical Design

For more information on electrical design using BiFacial modules, including inverter sizing, clipping and MLPE considerations, [contact an LG Solar Engineer](#).



When you go solar,
ask for the brand you can trust: LG Solar
