

STERLING & WILSON



DESIGNING BIFACIAL PV IN AUSTRALIA

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APAC



**RANKED WORLD'S LARGEST
SOLAR EPC SOLUTIONS PROVIDER
IN 2018***

by IHS Markit

*Based on Sterling and Wilson Solar Limited's annual installation of utility-scale PV systems of more than 5 MWp



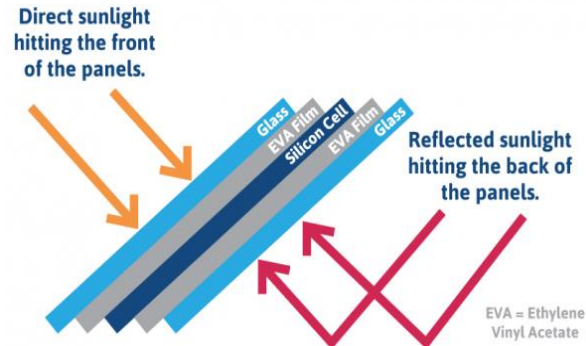
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INTRODUCTION TO BIFACIAL

- Traditional solar panels capture sunlight on one light-absorbing side, and light energy that cannot be captured is simply reflected away
- A bifacial solar panel can absorb light that is reflected off the ground or another material, as these types of panels have solar cells on both sides

Bifacial Solar Panel Cross Section

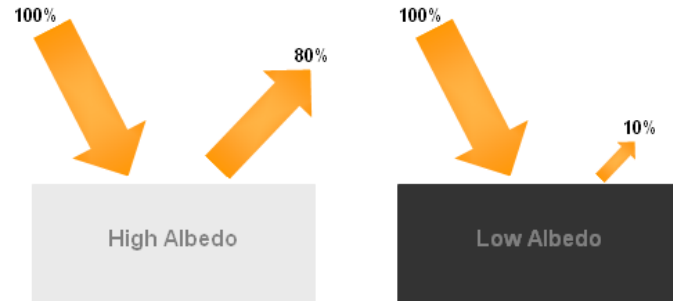


- Bifacial modules come in many designs. Some are framed while others are frameless. Some are dual-glass, and others use clear backsheets
- True bifacial modules have contacts/busbars on both the front and back sides of their cells

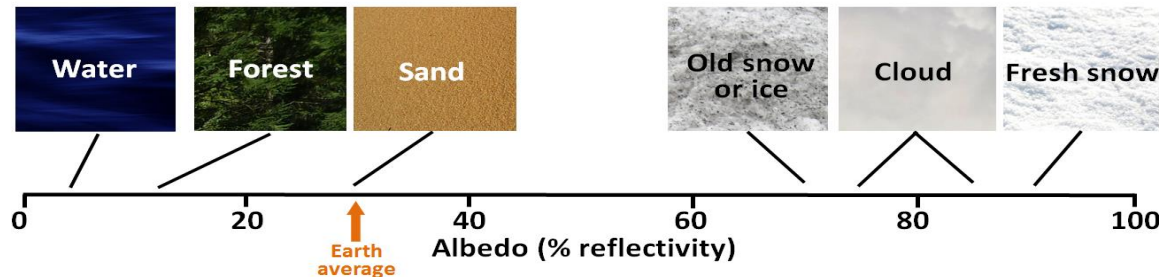
ALBEDO

- Albedo (also called as solar reflectance) is defined as the ratio of the diffuse reflection of solar radiation to the total incoming solar radiation, it is dimensionless and expressed as a number between 0 and 1. Where 0 is total absorption and 1 is total reflection

$$\text{Albedo } (\rho) = \frac{\text{Reflected radiation}}{\text{Global radiation}}$$



Albedo values for Earth surfaces



COST PARAMETERS

- **Modules Cost:** *Depending on specific bifacial technology*
- **BoS cost :** *Increase in tracker cost, cables, combiner boxes (added no. of inputs), addition of clamp cost*
- **Installation Cost:** *Increase in foundation length, cable trenching cost*
- **Land cost:** *Optimum row-to-row distance is higher for bifacial compared to monofacial PV systems, leading to a lower ground cover ratio for bifacial PV systems*
- **O&M cost:** *If measures have been taken to artificially increase the ground albedo, CAPEX and O&M cost might be increased*
- **Financing:** *Depending on the maturity (and track record) of a given bifacial PV technology (and the specific module supplier), the financing terms can be less beneficial for PV system based on bifacial modules compared to a system using standard monofacial modules*
- **Land preparation**
- **Project development**

YIELD PARAMETERS

- **Site**
 - *Ground albedo*
 - *Soil type (color and reflectivity)*
- **Module technology**
 - *Bifaciality factor of the module*
 - *Loss factors*
 - *Degradation*
- **System configuration**
 - *Tracker Height*
 - *Pitch*
 - *Height: Width*
 - *DC:AC*
 - *Tracker losses and shading effect*
 - *Other components and their laying (minimize shading)*

ADVANTAGES

- **Higher Efficiency** - *The Bifacial solar modules ensure that indirect light of reflected sun rays is captured from the rear of solar cells and therefore, they achieve a higher efficiency*
- **Extended durability** - *By embedding of solar photovoltaic cells in a glass composite, they are highly protected against environmental and mechanical influences and therefore last longer*
- **More flexibility in solar PV system designs** - *With the use of bifacial solar modules, the direction that the modules are facing is of less importance*
- **Extended Warranty** - *Mostly these panels often come with an extended warranty of 30 years*
- **Lower Degradation** - *Annual degradation rate is 0.5%*
- **PID Free**
- **No Grounding required** - *The frameless panels are devoid of Aluminum frames. Hence, there is no need to ground these modules.*

ISSUES/ DISADVANTAGES

- **Heavy** – *Glass-glass Bifacial solar modules are made of double glass, which makes the module heavier*
- **PV modules are typically sold in price per Wp** - *How to address the bifacial gain on the PV module*
- **Albedo**
 - *Albedo depends on the properties of the surface*
 - *Albedo below PV modules varies*
 - *in space over a power plant*
 - *over the day depending on local shading patterns*
 - *Seasonally depending on vegetation and shading patterns*
- **Whether framed bifacial panels or frameless bifacial panels**
 - *Frameless modules tend to cause less backside shading. However , total BOS may be higher*
 - *Framed bifacial modules can trap sand or other soiling materials*
- **Mismatch between front and rear surface**
 - *Irradiance > Rear side irradiance lies in the range 130-140 W/m²*
 - *Cell Temperature*
- **O&M**
 - *O&M cost for maintaining ground properties*
 - *Back side cleaning*



Thank You

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