Introduction to Problem:

The solar market is actively moving to embrace bifacial solar panel technology. But to realize maximum gain of the second side or the back side of solar panels, many external variables need to be in place, including the 1) reflectivity of smooth freshly fallen snow, 2) best time of day, 3) best geographic location, 4) module mounting height, 5) most effective tilting of the solar array and a few others.

This reflectivity AND smoothness (of freshly fallen snow) is measured with an albedometer and prior studies have indicated that the ground must have an albedo of .8 or higher to assist in maximum gain.

From our conversations with numerous bifacial panel users, it appears that many do not clearly understand the foregoing. Developers are investing in bifacial technology without the assurance that gains (often stated by bifacial panel manufacturers on their product technical data sheets with specific percentages) are possible. Albedo is the fraction of light reflected from the surface. So, because a manufacturer states that the second side of a bifacial panel is capable of xx% gain increase, that gain cannot be guaranteed without the five external variables mentioned above.

To approximate freshly fallen snow, we have spoken to many developers who have considered and tested these materials:

1. White Gravel or Rock

Because some white rock is inconsistently colored, the albedo might be less consistent. When maintenance vehicles drive over white gravel, their tires will tend to disburse the rocks which may "fly" and other rocks will be pushed further into the soil. So, at some point, additional white gravel or rock may have to be delivered. White gravel or rock can cost $17-$20/sqm

2. White Agricultural Fabric

While white fabric agricultural ground cover is an option, it will not last for 30 years. White specialty fabric can cost $5 per sqm. Costs do not factor in installation and maintenance cost.

In 2019, Burns McDonnel shared the following in their white paper “Bifacial Modules” authored by Will Porter:

“Albedo — Annual energy production increases of 5% to 10% are typical with bifacial modules. In most areas, imported groundcover is often needed to push the increase much over 10%. The question is, does it pay to bring in light-colored gravel or roofing to control albedo? The answer to this question is both location- and project-specific, and a cost evaluation is needed to make the final determination. The estimated albedo for various surfaces is outlined in Figure 2.”

In turn, Burns McDonnel referenced this albedo test from SolarWorld:

Green field / grass	23
Concrete	16
White painted concrete	60-80
White gravel	27
White roofing material	56
Light gray roofing foil	62
White roofing foil for solar	>80

Center photo: **This installation does not exist.** This picture has been retouched using Photoshop so one can see a proposed installation of soil stabilizer on a fixed tilt system.

Simulate freshly fallen snow for 30 continuous years.

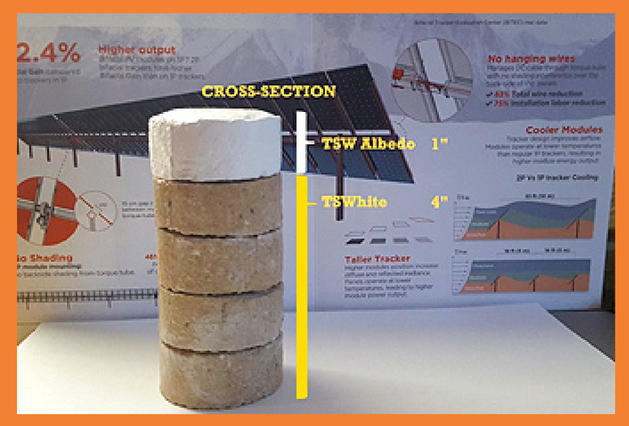
Leverage bifacial solar panel technology in solar farms.

Methods (experimental design, techniques)

Texas-based Eco Estates International, in conjunction with the University of Texas worked to create a liquid soil stabilizer that permanently binds and transforms the ground into a concrete-pavement-like-layer.

When sprayed on prepared soil, the soil stabilizer changes the color of the ground and achieves the albedo of snow. The soil stabilizers are proprietary polymer-based emulsions that use water dilutions for the application process.

Fundamentally, the soil stabilizer represents a highly sophisticated piece of “equipment”.



The higher the albedo of the surface under your bifacial panel, the more gain you can realize from your bifacial panel. The darker the surface under your bifacial panel, you will not be able to realize the complete xx% UNLESS you have the albedo of smooth fresh fallen snow which is 0.80 to 0.90. We believe this soil stabilizer can give the ground a permanent, consistent and highly reflective surface.

We believe it will solve the albedo problem and provide easier financial modeling, accurate engineering design and accurate prediction for bifacial panels.

As Asphalt roads are not eco-friendly and their construction comes with the generation of toxic fumes and high costs, we believe this soil stabilizer will enable the creation of cheap eco-friendly access roads to reach a solar farm.

Because the soil stabilizer behaves as pavement, we believe it will block vegetation growth where it is applied: possible savings in maintenance costs might result.

Because the soil stabilizer behaves as pavement, it can reduce Shading Loss. Therefore, a possible increase in power generation might result.