

Bifacial can smash its own glass ceiling

Bifacial | Having suffered from a chicken and egg status, bifacial solar is making ground and the advent of single-glass modules could lower costs and tip the odds in 2019. John Parnell reports



Credit: NexTracker

Nothing becomes mainstream while it's trapped in a niche. Saying a product or service is mainly targeting early adopters is effectively a polite way of saying 'this isn't commercially viable yet'. When technology surpasses this inflection point growth can be rapid. It's a familiar path already trodden by polycrystalline solar, First Solar's CdTe recipe thin-film modules and now monocrystalline panels too.

Bifacial solar has had a slightly more unusual path so far. As many a keen-eyed reader has pointed out to PV Tech, to call it new is something of a misnomer. The basic technology has been in the lab for 20 years. In the field though, the journey has been slightly tougher.

The aforementioned rise of mono-PERC modules and glass-glass modules opened the door. The price premium is fairly nominal, especially given the fall in module

prices witnessed in 2018. With returns from the rear-side quoted from a conservative 5% to as high as 30% additional power, that price premium is surely easy to make back.

It's been obvious to all parties that the real issue with bifacial solar's slow take-up has been the lack of real-world data.

There are strong signs in 2019 that something has changed. A shift in the approach to project financing has undoubtedly helped (see box). An emerging technology trend could be set to improve the access and levelised cost of electricity (LCOE) for projects too, especially those with high labour costs. Typically, such markets also have better access to finance (think Western Europe, the United States, Australia, Japan, South Korea). These would have been many people's pick as the early adopters for bifacial solar and that trend may well now play out through 2019 and into next year.

Bifacial is beginning to make the transition from niche to mainstream technology

Through the looking glass

Bifacial modules have thus far been exclusively the domain of glass-glass modules. DuPont's development of a transparent backsheet provides the opportunity to change that.

"The clear backsheet is actually 18 years old," explains Mark Ma, global marketing manager for PV at DuPont. "This is not something we have developed from scratch. It was developed for use in BIPV markets. The new interest is driven by mono-PERC bifacial cells. Most module firms are going glass-glass because it is the only choice they have. What Mike [Demko] and his team have been doing is lowering the cost and improving the performance."

Demko is principal investigator at DuPont Photovoltaic and Advanced Materials and leads on new product development using DuPont's Tedlar films.

"We have a pre-existing field benchmark for the improvements that we have made. We are holding it to the same standards as our other Tedlar backsheets," Demko says. "We have improved the photostability of the transparent PVF film and it provides more permanent protection to the PET [polyethylene terephthalate] core."

The competition for the use of a transparent backsheet is obviously the use of dual-glass modules and that offers another benchmark for comparison.

"We are targeting a 30-year guarantee to match glass-glass modules. That is what is required in the market. To be honest, I'm not sure that glass-glass can actually last that long. The transparent backsheet has a higher requirement on both inner layer and outer layer for 30 years," says Ma.

Demko says the interest from manufacturers is clear. "They understand the benefits and it is something they want as an option. They want to see the data around the 30-year reliability. We have a lot of discussions about the test conditions," he says.

JinkoSolar is the first manufacturer to take a transparent bifacial module to the market with a soft-launch at the World Future Energy Summit in Abu Dhabi earlier this year. DuPont's Ma expects more to follow.

"At the moment, there is still more glass-glass bifacial modules. But in the long run we think glass-transparent backsheets will be the norm, just like mono-facial modules. A lot of the major manufacturers are testing transparent backsheets now and in H2 2019 we'll see more manufacturers using the transparent backsheets," he predicts.

"Different manufacturers have different opinions on the module construction. A lot have committed to glass-glass, even though there are issues. A lot are still building confidence in the new transparent backsheets.

"We are working on field data to show that there is an improvement. The power degradation rate might be lower and also the cell temperature compares favourably with some of the higher cell temperatures seen with dual-glass modules. That data set will be complete at the end of this year or early next year." Despite the wait for that data, Ma is bullish about how it will likely compare with dual glass.

"We're unconvinced by claims that glass-glass modules can last 30 years. We've seen field failure issues such as delamination and hot spots," he says.

First mover

Jinko's Swan range of bifacial modules use 158 half-cut cells offer both a glass-glass option and the transparent backsheets from DuPont in a standard aluminium frame.

"The main reason to choose a single-glass solution is based on the consideration of installation convenience," says Dany Qin, VP, JinkoSolar. "Some of our customers find glass-glass a little complex for installation, awkward, heavier etc. They have to use different mounting with clamps. It's a different approach than with conventional modules. As a result, it increases BOS cost particularly in the regions where the labour cost is relatively high."

Jinko already uses DuPont backsheets on 90% of its modules so the partnership on the transparent product was a comfortable decision says Qian.

Information on the comparative performance of the two Swan modules is not for public consumption but Qian says they are very similar.

"In terms of the LCOE and ROI, to some extent it depends on the cost gap between glass and transparent backsheets and which price comes down faster. If the cost of the single-glass module is similar to the dual glass, I think customers will prefer single glass. If the single glass is higher than the dual glass, the decision will come down to other factors influencing the customer's selection," she says adding that some may be more comfortable with one option, regardless of the fluctuating price of glass.

"For example, some EPCs are very familiar with working with dual glass so they will have no problems with that. But if an installer would have to put in additional effort through training, adding to their workforces, then they will be better with single glass."

The weight reduction alone offers the potential for great savings. The 9kg saving makes each module a one-person lift. The

How to finance bifacial power – don't

In theory, a project expecting, say, 10% more power generation, courtesy of the rear side, should be able to trade that greater yield for more favourable financing conditions. Any sensible financier is going to look for guarantees on that power ideally from field data. This is where bifacial solar has run into problems in the past.

Competitive projects have been sidelined from tenders for not using "proven" technology. In the absence of an open access data bank demonstrating bifacial performance in a variety of settings and configurations, how can projects capture the added value of rear side power? An emerging pattern suggests the key is actually not to bother.

PV Tech understands that the 160MW Southern Oak bifacial project in the US state of Georgia, is not initially financed against rear-side power. Once a few years of site-specific performance data is available the project can be refinanced on better terms. The European Bank for Reconstruction and Development (EBRD) has confirmed that it is taking a "very similar" approach for 400MW of bifacial solar it is co-financing in Egypt. GRIDSERVE's 37.4MW bifacial project in the UK is using a conservative contribution for its financing model. All three of these projects transpired in the first three months of this year. The stars are aligning.



Credit: Enel Green Power

Enel Green Power began installing bifacial modules at the Magdalena II plant in Mexico in April

regular frame can be used with the entire universe of mounting and, significantly, tracking hardware. The potential for break-ages is reduced as well.

At the moment the potential scale of LCOE savings has not been quantified. Not publicly at least. For now individual customers will need to discuss those figures with a prospective module supplier.

"One thing is for sure, bifacial generation modules, no matter with dual glass or single glass, will be the future. The cost is approaching that of monofacial and as that gap closes then everyone will choose bifacial because of its additional generation capacity.

"We need more data to prove the technology, especially bifacial plus trackers. We are collecting more data to demonstrate to the financial sector that this is a very strong solution. It is enough already to show the benefit, but we plan to track all the established project field performance with our Swan panels and establish a databank that we can use to show that Swan is one of the best solutions."

Transparent backsheets offer a promising alternative to the typical glass-glass construction of bifacial modules



Credit: DuPont