

# Mirror of sand: Middle East reflects US bifacial boom



**Bifacial** | The low prices achieved in some of the recent Middle Eastern solar auctions have been made possible in a large part because of the inclusion of bifacial module technology. Tom Kenning examines how booming deployment in the US is helping drive bifacial's uptake in the Middle East, where the conditions are optimal for the technology

Credit: TÜV Rheinland

**V**ast deserts of bright sand and rock make the Middle East a pristine location for installing bifacial solar modules, which can take advantage of the sun's irradiation not just from above but also reflected from the ground. In many respects, it is a no-brainer to deploy the technology in this region. However, no PV plants using bifacial panels have been operating long enough to provide bankability metrics and the industry also has a problem with hoarding rather than sharing data, which could be tethering the financial community to an unnecessarily conservative outlook. Rest assured, some companies in the Middle East and North Africa (MENA) must have access to encouraging data as the arid region

has started to see its first bifacial projects of more than 100MW capacity being built this year. Otherwise, it may only be prospects of significant yield gains by generating power from the backside of the panels that has pushed some investors to take the risk of being early adopters.

What is now clear, that was once a mystery two years ago, is that some of the lowest solar tariffs in the world, located in this region, were based fundamentally on bifacial technology. Famously, ACWA Power put in a record low bid in Saudi Arabia that left the industry scratching its head, only for it later to emerge, as revealed by our website publication *PV Tech*, that it pinned its hopes on bifacial technology well ahead of the global curve.

**Testing of bifacial technologies by TÜV Rheinland in desert conditions has shown promising early results**

If the US market continues hoovering up bifacial panels with its current appetite, then there will be positive knock-on effects for other suitable regions like the Middle East (see boxout). This may leave one wondering if traditional monofacial modules have any long-term future in the region. Bifacial technology's potential could all rest heavily on the first data coming out of bifacial plants that have been operating for five years, but the industry must wait another two to three years for this.

Traditionally China has been the pioneer in bifacial adoption because of its Top Runner programme that incentivises high-efficiency technology, but with the US' growing appetite, the worldwide



Credit: Scatec Solar

### Middle East PV projects are proving to be an important early adopter of bifacial solar technology, notably Egypt's Benban solar park

market has woken up to bifacial and the Middle East is an emerging market that is seeing much of the growth, says Xiaojing Sun, senior research analyst, global solar at Wood Mackenzie. The research firm projects bifacial installs of 175MW in the Middle East in 2019, but this is going to see "very rapid growth" to annual deployment of 2.1GW in the region by 2024. Manufacturer outlooks give credence to this forecast, with Chinese Silicon Module Super League (SMSL) member JA Solar expecting glass-glass bifacial modules to become the mainstay of the Middle East market.

"Compared with regular modules, the double-glass module is more advantageous in wind and sand resistance, working life and so on," Dr Xinming Huang, senior vice president, JA Solar, told *PV Tech* as early as February this year.

Indeed, the Middle East region has bifacial projects small and large emerging, from the El-Mor Renewable Energies' 2MW system in Israel, to Oman's major 600MW bifacial project pipeline. There is a 320MW giant plant tabbed for the United Arab Emirates (UAE) and nearby in North Africa, Egypt's 1.8GW Benban Solar Park, close to Aswan, has seen Oslo-headquartered developer Scatec Solar start grid-connecting a 390MW (6 x 65MW) project, the largest using bifacial in the world.

#### Sand-suited

The three main drivers for adopting bifacial systems are technology, climatic conditions and economics, says Johanna Bonilla, project manager, performance

and analytics PV modules & systems, at testing body TÜV Rheinland Energy, which has been testing the technology in various desert settings. In terms of technology, the glass-glass structure offers a high resistance to weathering impacts, in a region that suffers high winds and storms. For climatic advantages, the desert, apart from superb irradiation, has sand with albedos ranging from 19% to 35% depending on whether the sand is clear, dark or has cracks. As the arid region also has less vegetation and a lower likelihood of bushes growing up seasonally, one can also calculate albedo with minimal variability, which is good for modelling expected yield gains. Some investors globally are even starting to put artificial bright surfaces beneath their panels, although this can come unstuck as we shall see later.

Data so far shows bifacial modules on fixed mounting structures with one-year in the field have gains of 12% in coastal desert climates (Saudi Arabia) and 8% in arid desert climates such as in the US, whose conditions in some areas are similar to those of the Middle East, says Bonilla. The challenge is that the gain depends not only on climate and technology, but also on the installation. Therefore, shading, mismatch losses, pitch and use of trackers all have effects. TÜV Rheinland has yet to see major differences resulting from temperature at the module level. While this data shows bifacial plants do have gains and are operating well in the first year, Bonilla stresses that data over five years is needed to say confidently what will be the long-term performance of such modules.

It's important for installers planning a bifacial installation to realise that bifacial modules operate with higher currents (8.5% to 10% more than the front-rated ISC) than monofacial systems.

#### Backside blunders

While a major regional challenge is soiling, says Dr Radovan Kopecek, one of the founders of ISC Konstanz, the key bifacial-related mistakes include failing to realise that inverters will need to operate at a higher current, poor construction – such as having the modules too close to the ground – and poor use of artificial albedo enhancers.

It's known that at least one major company in Asia put white rocks directly underneath its bifacial panels but without any placed in-between the arrays, resulting in very little yield gain.

Another common mistake is to survey a site and assume strong albedo throughout the year in modelling, only to discover grass and green bushes emerging during certain seasons which impact the albedo, says Xiaojing Sun. Grass, next to water, is the least reflective surface. Without uniform reflection on the backside, one may also face the "nightmarish" scenario of physical damage to the module in the form of a hotspot.

#### Secret weapon

Instead of bifacial rolling steadily in to become the mainstay of record-breaking projects over time, it snuck in as far back as September 2017, when Masdar and EDF put in a bid around US\$0.0179 per kWh for the 300MW Sakaka project in Saudi Arabia. Mouths dropped to the floor across the world, but a few months later *PV Tech* revealed that the two firms were banking on bifacial technology in order to reach low tariffs, the likes of which had never been seen.

Local firm ACWA Power won the bid despite quoting a far higher tariff, perhaps reflecting a Saudi-authority fear over the long-term performance of bifacial technology. However, this October, ACWA Power also signed a 200MW project in Saudi Arabia based on bifacial technology with a bid of US\$0.02752/kWh.

"We have already seen by 2018 bids of around US\$0.03/kWh in Egypt and even lower for big utility-scale projects," say Bonilla. "This year for the tender issued by the Dubai Electricity and Water Authority (DEWA) the bids discussed were around US\$0.017per kWh."



Back in 2017, margins for monofacial projects were wafer thin, but having bifacial as a secret weapon allowed players to have an extra cushion in terms of yield projections, says Ben Attia, research analyst, solar, at WoodMac. Nonetheless, the technology is still being treated with a bit of caution, he adds – “with kid gloves”.

### Blind banking

As we’ve heard, data is a missing piece of the puzzle that is closely tied in with the bankability and financing of bifacial.

EDF evaluated bifacial technology at a very early stage, says Kopecek, and after spreading doubt about it, then made the first offer ever below two US cents per unit in Saudi Arabia with bifacial modules at the Sakaka plant, as mentioned earlier.

Meanwhile, Scatec Solar’s 390MW Benban installation in Egypt was the first major bifacial project to be supported by banks, meaning that it had enough data to show to banks that the technology was bankable. Module supplier LONGi also gave a guarantee on the bifacial gain in the system.

“The biggest problem for the bifacial community is that this data is not shared between companies,” says Kopecek. “I can understand it because they would like to install maybe other large systems in very similar scenarios and so they do not share with others.”

Ultimately, laboratory measurements of reliability are too distilled to make a technology bankable. ISC Konstanz has itself carried out testing for a huge bifacial system of 200MW capacity and calculated a gain of more than 12%.

“Validation is needed to build trust and to consider a project or a technology bankable,” says Bonilla. “The lack of data and the fact that this is a new technology

is actually making the financing conservative. It will take a while to build trust but it’s moving in that direction.”

The European Bank for Reconstruction and Development (EBRD) was the bank that backed Scatec Solar’s Benban plant.

“It was a good opportunity for us to understand more the implications of installing bifacial panels in a big plant,” says Ahmad El Mokadem, principal banker at EBRD. “How would you beat the fact that there is not much data? And the short answer is that you have to wait and see. This development is well proven, but it comes with some risks that may not be assessed at the very beginning, including for example the impact of overheating on degradation given that you are now employing both sides of the panel. We have even less than a year of operations so it’s really early stages for us to assess.”

El Mokadem stresses that EBRD likes to bank projects on the basis of very conservative bifacial gains in the base case analysis. From a lending perspective it is also important to have a strong sponsor and an EPC contractor who will be able to back a more conservative guarantee in terms of performance of the plant, he adds.

Investors are getting more comfortable with the technology after some initial reticence to understanding the actual gain, says Attia. This is due to the early adopters at Benban and the low tariffs across the region in Egypt, Jordan, Tunisia, the UAE, Oman and the pending Saudi Round 2.

“Most of them are predicated on favourable financing assumptions for lots of reasons in the Middle East, but also on pretty aggressive technology assumptions as well,” says Attia. “And increasingly, we’re starting to see that developers are not

## US bifacial boom to lift Middle East

Bifacial modules with trackers are fast becoming standard in the US, spurred on by the dropping of import taxes from Asia last summer, which has knock on effects for the rest of the world. Lobbies are pushing for the reintroduction of the taxes, according to ISC Konstanz’s Radovan Kopecek, making the US a kind of “wild West” at the moment. Many large EPCs have told him, however, that even if the taxes were reintroduced next year then they would still choose bifacial now that they know more about the technology.

If 90% of US solar installations in 2020 use bifacial with trackers, then the technology will come more naturally to the Middle East as it will be made bankable and therefore more easily installed in other geographies.

“Then the US market will be bifacial markets almost 100% for large systems,” says Kopecek. “This will be more or less reflected to the MENA states.”

US demand will not be a problem for the Middle East either, since the US has implemented so many layers of tariffs, according to Xiaojing Sun of Wood Mackenzie, there is only a specific slice of global manufacturing capacity that can cost-effectively access the US. This is mainly in Southeast Asia, where they are spared of the anti-dumping and countervailing duties that Chinese and Taiwanese manufacturers will need to pay, and the 301 tariff specific to China. Southeast Asian manufacturers represent less than 8% of the total global capacity so the majority of bifacial capacity is still in China and this can easily supply the Middle East without impact from high demand in the US.

able to compete in some of those tenders, without assuming the adoption of bifacial technology.”

### Bifacial beyond

Whatever happens in the Middle East, bifacial technology certainly has a grip on the world market, with Enel planning a 400MW+ system in Chile and a Chinese firm building a 500MW system in Hangzhou. The industry is now awaiting the first 1GW project and Kopecek reckons that a sub US\$1 cent/kWh tariff with bifacial modules and trackers could come in three years.

Bifacial is here to stay, says Sun, who believes most detractors can only point at marketing exaggerations rather than truly challenging the technology. Moreover, the industry as a whole is now more mindful of exaggerated claims such as 20% electricity generation bonuses. More importantly, there are many data collection projects underway all around the world, collaborating behind laboratories and vendors to really test bifacial performance:

“Once we have that wealth of data, the market is going to become more rational. And if the data does show favourably about bifacial, which I believe they will, it will [attract] more mature institutions, investors and financial institutions to actually throw their weight behind bifacial products financing.”



Credit: Radovan Kopecek

**Chile’s 2.5MW La Hormiga project. Bifacial technology is well suited to conditions in the South American country**