



One-track mind

Credit: Array Technologies

Trackers | In a relatively short space of time, single-axis trackers have become the mounting technology of choice in utility-scale PV plants. Danielle Ola reports on the technological and economic drivers that have fuelled their meteoric rise and look set to ensure continued growth around the world for some time to come

The global demand for solar PV trackers is intensifying as prices for PV components continue to decline, paving the way for tracking to become more of a standard technology. Track-records that now extend over several years have demonstrated essential bankability by showing that trackers can be used effectively without having a detrimental effect on the operations and maintenance of projects. That upfront work over the past few years has enabled tracker products to come forward into maturity within this past year.

For large utility-scale projects, most developers globally are opting for trackers because of the increased yield they offer, that can be as much as 20-25% more energy production than fixed-tilt. In fact, it is very rare to see a large utility-scale project with fixed-tilt these days except for in the far northern latitudes such as Europe and Canada and in high-wind zones such as the Caribbean and Southeast Asia, where hurricanes, cyclones or typhoons mean fixed-tilt is still a preferable option.

Global markets

The US remains the largest market for trackers, accounting for 62% of all tracking installations globally in 2015, according to GTM Research. Forecasts for 2016 suggest 25% of utility-scale ground-mount installations globally will be built with tracking systems, up from 13% in 2015, and rising to more than 40% by the end of the decade. Trackers are now overtaking fixed-tilt in the ground-mount market by significant margins.

The North American market has certainly been a trailblazer for tracker technologies, dominated by home players such as Array Technologies and NEXTracker. This market increased by 135% year on year, reaching 5.5GW of shipments in 2015.

Latin America is taking off as a strong market base as a lot of European developers have stepped in to service those markets; Chile being one of the bigger opportunities for trackers, ranking as the second strongest market in 2015. A lot of the European suppliers are establishing a significant market share here, leveraging key partnerships and bringing along their

preferred partners; utilising their technology without having to go through an extensive education process. With penetration rates in Latin America essentially similar to those in the US, this region is interesting from a competitive landscape perspective as North American and European vendors are claiming roughly an equal market share.

But interest in trackers is now global. Array Technologies is anticipating that a third of its business will be international in future, as the appetite for trackers increases in regions such as the Middle East, North Africa and Australia. Despite the general consensus on the advantages of the higher energy production, paired with their cost-competitiveness, tracker deployment varies globally from market to market, according to GTM solar analyst Scott Moskowitz.

"In the US this year there is some 70% of ground-mount projects being installed with trackers relative to fixed-tilt, whereas in markets like China it's below 5%," he says. "There are reasons for that variation; in places like China and India the markets are very low-cost and it doesn't make as much

sense for trackers as it does in a place like North America.”

A lot of the variation can be attributed to how a market is structured and how solar is purchased or incentivised. Early tracker markets were mostly in Europe because of the feed-in tariffs that made it attractive to construct solar projects that had more output, rather than lower upfront cost. Now, as trackers are much lower cost, it makes more sense in other markets than it used to.

Supply and demand

The increased uptake in trackers has meant that many manufacturers have had to expand capacity to meet demand – but this has not resulted in a bottleneck. Trackers differ from module manufacturing or inverter manufacturing in that they rely on large steel manufacturers who source from multiple locations. Even with a ramp-up in steel demand, most tracking vendors, despite surges this year, will be able to meet that demand.

“We have a model where we are the tracker system designer and integrator but we are not the actual manufacturer – we subcontract all that out and have all the components drop shipped and assembled at the site,” says Marco Garcia, NEXTracker’s chief commercial officer. “Because of that supply-chain strategy, we’ve been able to scale with our demand. The other thing we’ve done is diversify our manufacturing geographically to minimise lead and shipping times from factory to factory to project site. We minimise time on the water by manufacturing not only in Asia but also in Europe, North America and South America.”

Duel of the trackers

Tracking now is predominantly single-axis as they are cheaper, simpler systems than their dual-axis counterparts, with fewer failures, faster install times, all whilst still giving a relatively comparable performance to dual-axis trackers in terms of yield. The higher performance dual-axis gives is still not enough to overcome the increased cost relative to a single-axis tracker, in the same way that a single-axis tracker overcomes the increase cost relative to fixed-tilt.

“I think the application for dual-axis is definitely there, it’s just about the price point,” says Camron Barati, North America solar analyst at IHS Technology. “We don’t see too much of a market for dual-axis outside of a few key projects in the US, namely in Texas, where local content preferences are a big part of that choice as well.”

Trackers in action

Project name: Red Horse 3
Location: Willcox, Arizona
Size: 30MW AC
Type: Solar-wind hybrid

Swinerton Renewable Energy’s recently completed 30MW Red Horse 3 project generates electricity that connects directly into the Tucson Electric Power grid. It features Array Technologies DuraTrack HZ single-axis trackers.

“We find clients are dictating trackers to get a better return on investment, as opposed to a fixed-tilt system,” says Scott Stites, Swinerton’s procurement manager. “We are seeing trackers deployed in areas that were predominantly fixed tilt, which is the northern part of the US – say Minnesota, for instance. We are seeing trackers being selected there when in that latitude it was predominantly fixed tilt.”

Stites also mentions that it is likely Swinerton will not deploy a single fixed-tilt project in 2016. “Part of it is the higher output that you are going to get from using a tracker, but some of it is our client base as well: we have a lot of repeat clients, and those repeat clients gravitated towards a single-axis tracker for its performance benefits.”

Due to the utility-scale of Swinerton’s projects, they are exclusively single-axis as opposed to dual-axis. “Dual-axis trackers are significantly more expensive and don’t lend themselves to projects 20MW and above,” Stites says.



Credit: Swinerton Renewable Energy

Apart from the price issue, technically, dual-axis technologies do not fare as well compared to single-axis, with two moving components that move east-west and north-south, causing more durability issues.

“The problem with a dual-axis tracker is that it casts a long shadow,” says Bob Bellemare, chief financial officer at Array Technologies. “You do not get the power density that you do by just going east to west. Interestingly, you get more power out by area by going single-axis than dual. You have to space dual-axis trackers so that they do not shadow each other and then your power density goes down.”

That being said, dual-axis trackers lend themselves more to smaller applications as the extra cost for only a small gain in yield usually will not work out in larger projects. Therefore, the dual-axis tracker at this point represents only a small percentage of the overall market, with traditional dual-axis vendors such as Sun Action Trackers in Texas transitioning to single-axis, especially now the solar market is dominated by PV; dual-axis tracking makes more sense for technologies like concentrated solar power (CSP), where that flexibility is warranted. But for utility-scale solar PV, single-axis tracking is the dominant technology.

Drivers for the global uptick

Traditionally, the main barrier to the deployment of single-axis trackers was the upfront cost. But as the global trend in declining PV components reaches tracker technologies, the premium is low enough over fixed-tilt that the increased performance gained makes the economics overwhelmingly

favour trackers in most mature solar markets.

“It comes down to economics. In the US, solar has become a highly commercial market,” says Bellemare. “Maybe four years ago it was little more R&D-ish, a little more demonstrational, but now it’s full-on commercial and every penny counts. There is a lot of competition for jobs and if you’re not using a tracker, you’re probably not competitive because fixed-rack doesn’t give you that power density.”

The decline in costs is driven by intensified competition and increased market size, which in turn creates more buying power in the market. This can be used, for example, to buy more steel, which gives stakeholders more negotiating possibilities to diversify supply chains. As markets are growing with increased economies of scale, prices are dropping. In the confluence of all those factors, there is a positive wave for the solar industry that is filtering down into tracking.

As far as the ITC extension goes, there is mixed opinion as to how instrumental this has been in spurring market activity. On the one hand, it provides a demand market for tracking vendors for the next several years. According to Moskowitz, prior to the incentive, the US utility-scale market in particular was facing a steep impending drop-off that would have required most major US vendors to look globally in order to grow their volume year-over-year. With the extension however, tracking can rely on a much better launcher market. On the other hand, whilst it lowers the upfront cost, even without the ITC, there are ways, certainly in the US market, to finance projects due to the low-cost of capital.

Bankability

Even more influential in driving market growth than the ITC has been the steadily improving bankability of tracker technology. Tracking really captured solid investor confidence around 2008-2009 when it became a standard component in a utility-scale project. The shift from dual-axis to single-axis has ameliorated a lot of the maintenance and cost issues that initially gave tracking a bad reputation.

"It was funny because years ago we were all undergoing technical due diligence to confirm that we were serious companies with serious products," says Maria Lahuerta, marketing director at French tracker manufacturer Exosun. "Today investors are seeing the numbers, and seeing that the machines are easy to maintain."

It has been the track records of some of the major suppliers that have helped drive the market forward with confidence. Certain European firms such as Grupo Clavijo and STI Norland have been in the solar market for decades, have installed fixed-tilt and tracking projects and offer their own tracker solutions. Whilst they may not have tens of gigawatts on the ground, the companies themselves have been around a long time and are considered to be bankable. At the other end of the spectrum are the US giants like NEXTracker and Array Technologies who are both highly established brands.

Advances in technology and manufacturing

In an increasingly saturated market, it is critical to improve technologies in order to remain competitive. "Most tracking vendors are just trying to incrementally improve their technology – make them faster to install, lower part counts and reduce failure points," says Moskowitz. "From a manufacturing perspective, the primary thing that makes a company competitive is if they have a global supply chain so that they are able to meet project demand in different locations; so that they are able to be flexible in the event of rising steel prices or steel tariffs."

Flextronics buying NEXTracker last year gave the latter increased capabilities and the opportunity to produce local content, as well as reduce on shipping and logistics. "Flex is manufacturing our control, so there's a benefit with being in the same company that manufacturers aerospace and automotive parts," says Alex Au, NEXTracker's chief technology officer. "We are able to learn off of these manufacturing methods."

NEXTracker also employs existing motors

that have already been proven in the industry and applies them to a low-duty cycle application. Secondly, Au claims the distributed architecture of its technology means that any loss in production of a single motor is negligible in the scheme of an entire utility-scale plant. NEXTracker spearheaded this model, which Au believes helped it gain its place as a frontrunner.

Conversely, Array Technologies claims its centralised model helps it remain competitive. "We believe in simplicity, speed of install and highly reliable components," says Bellemare. "Our technology has roughly 180-190 electro-mechanical components in a 100MW project. Some other technologies will be pushing nearly 30,000 – and those are all potential failure points. Our product has zero-schedule maintenance and we are the only ones that have that," he adds.

Future developments

The global tracker market is now in a place where there is a lot of new product introduction, with an array of new players looking to capitalise on the sudden shift in preference for technologies. IHS predicts that as the market matures, there will be 20 or 30 tracker companies consolidating a place. By then, as the dust settles in 2017/2018, it will become clearer who is really winning big deals that will come to fruition at the end of the decade; and those are the ones that will become leaders in this new consolidated market. Diversification is evident as more nuanced capabilities are cropping up on the tracker landscape, with some players diverting attention from the utility-scale landscape and looking more into distributed generation solutions where there is more flexibility in terms of terrain.

Trackers are expected to have a greater share of the market in 2017 at over 70%, as more EPCs adopt tracker technology. As international interest grows, the tracker market will shift from being dominated by domestic US players to a global market. Whilst the intensification of competition will add pressure to lower single-axis costs, it should continue to drive improvement in products. "There is a real fight mainly based on prices and we also are seeing new companies entering the tracker market, so that of course is having influence on market dynamics," says Cristina Clavijo, head of strategic business development at Spain's Grupo Clavijo. "It puts a little bit of pressure on the traditional suppliers, which is good." ■

Turn to the next page for a closer look at some of the innovative single-axis tracker technologies shaping the market

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