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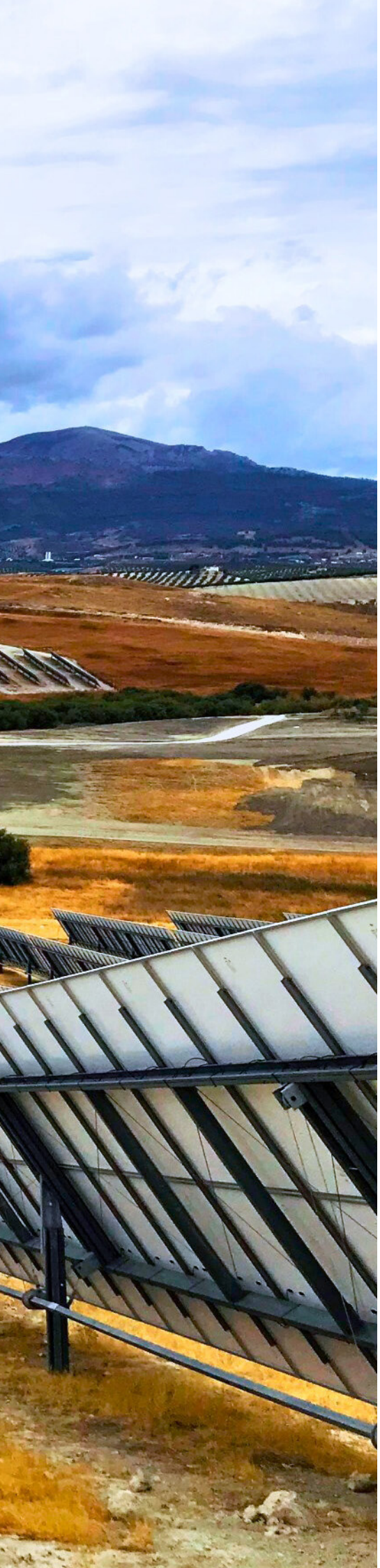


Next generation solar tracking

The requirements of solar parks are increasingly changing, with significant consequences for the tracker technologies used. There has recently been a discussion in the industry about raising the risk category from the current class I. This usually means an increase in the project-specific design wind speed for the structural calculation of the tracker.

Instead of the designed wind speed of 132 mph (3-sec-gust) in risk category I, category II is already designed for a design wind speed of 141 mph (3-sec-gust). For many trackers manufacturers, this is achieved by using significantly more material, up to 20 to 30%. In high wind regions, it can lead, in the worst case, to the underlying tracker technology no longer being designed for this wind speed, for example.

This means that significantly higher wind speeds will have to be demonstrated for tracker systems in the future.

Another trend, especially for solar modules, is the increasing module size. Module lengths of over 245cm are no longer a rarity on the market. For a tracker, this firstly means a significantly higher force impact on the tracker structure itself and also the risk of microcracks in the solar modules, due to the bending of the solar modules and rail structure itself.

Maximization of electric yield

The optimization and forecast of energy production are also becoming increasingly important, especially to manage PPA requirements.

In particular, the question arises over which stow position a tracker takes when the wind speed increases, also known as stow strategy, or even when the tracker moves to the maximum safety position.

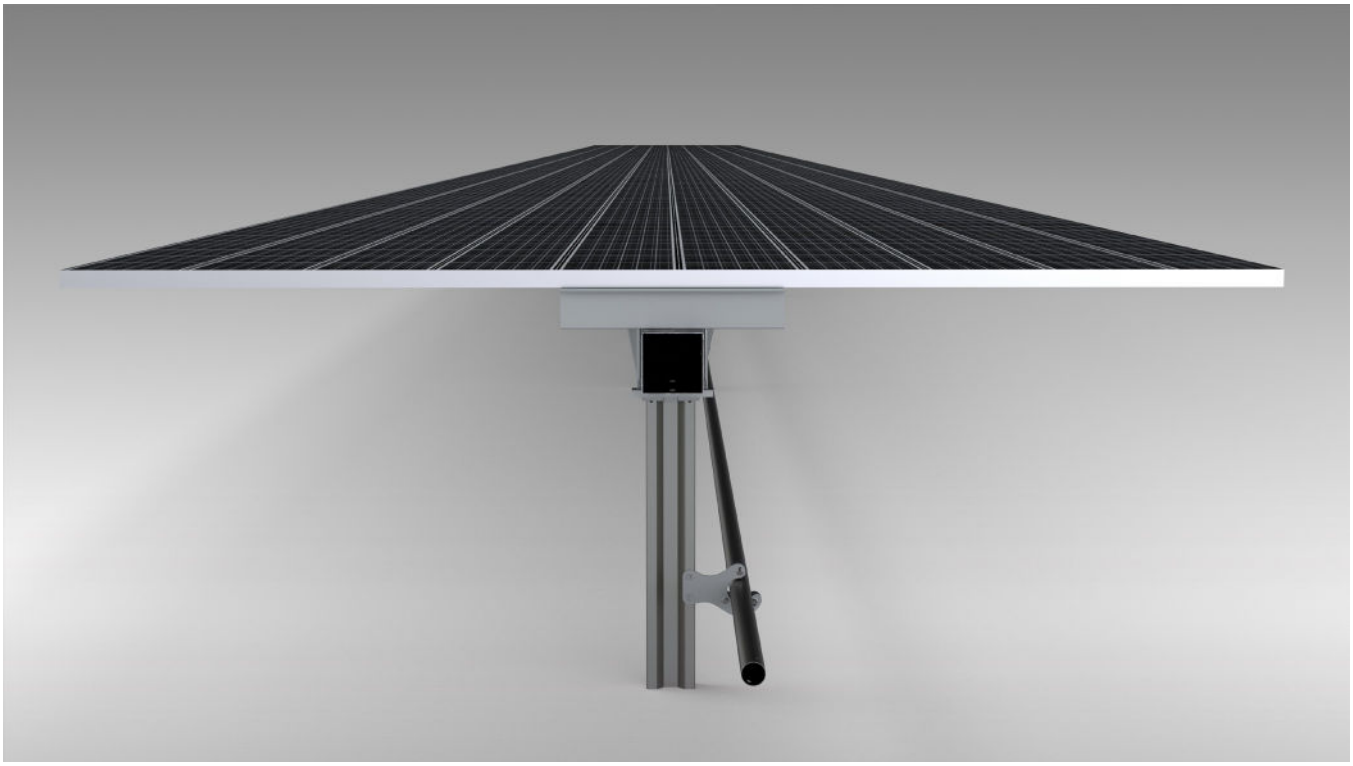
In this context, if you look at the constantly changing wind speeds over a rather windy day in a real environment, the nose-down stow tracker will move into the wind depending on the wind direction, completely independent of the current sun position. which makes an energy forecast much more difficult and has a negative effect on energy production. In comparison, the flat-stow tracker will move into a horizontal position during high wind and will be able to harvest more solar energy. Yield forecast simulations have shown that flat-stow can generate up to 16% higher energy yield during windy days compared to nose-down tracker systems.

Besides more energy and better yield forecast, the flat-stow strategy benefits from much lower wind forces and the associated reduction in the amount of additional material used in the tracker structure. The dissipation of the forces is also reduced and leads to a comparatively more efficient binding system for the tracker.

Overstressing of the solar module due to deflection is avoided, thus reducing the risk of microcracks. Flat-stow also offers the advantage that structural protection against rapidly changing wind directions is always provided. There is, so to speak, a full 360° wind protection of the solar park at any time.

It is already becoming apparent in some regions that have ideal conditions for solar farms, that flat terrain is dwindling. More and more projects in Europe show medium to heavy terrain topographies. In such cases, one will have to deal with grading, or even cut and fill to make the terrain accessible for tracker systems. A tracker system that can simply follow the given terrain without much effort is more forward-looking.

The solar industry is developing at an enormous pace. A steady increase in project sizes can also be observed. Large solar projects are also mostly financial projects,



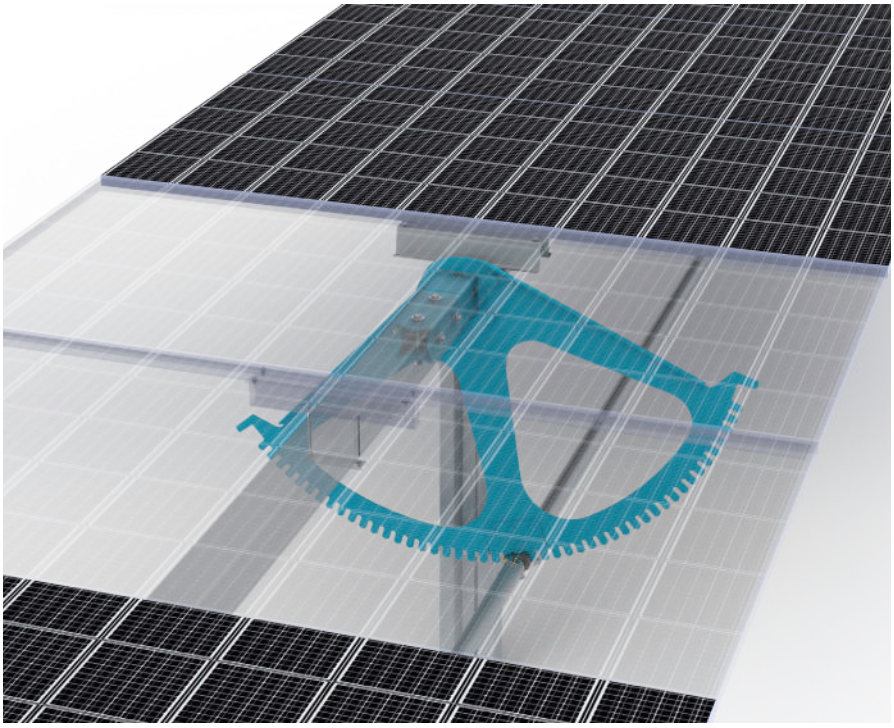
which must be insured and financed. Here the risk assessment of the investments plays a major role. For the tracker technology, this means that external partners, so-called technical advisory, are usually involved in examining the tracker solutions in detail and evaluating them for project-specific use.

In the meantime, tracker certifications such as IEC 62817:2014 are just as much a minimum standard as bankability reports and cleanly conducted wind tunnel tests at the renowned test centers of the industry. For future approvals, tracker manufacturers will have to meet new requirements such as fatigue strength verification.

IDEEMATEC has developed solutions for the technically very demanding 2P tracker market over the last 15 years and has launched the H4+ Horizon Tracker for specific projects. With more than 4 GW installed power, this solution rightly enjoys an impeccable reputation among customers.

Future requirements for tracker systems

- High wind
- Risk category
- Microcracks
- Yield optimizing stow strategy
- Terrain flexibility
- Certifications and aeroelastic approvals

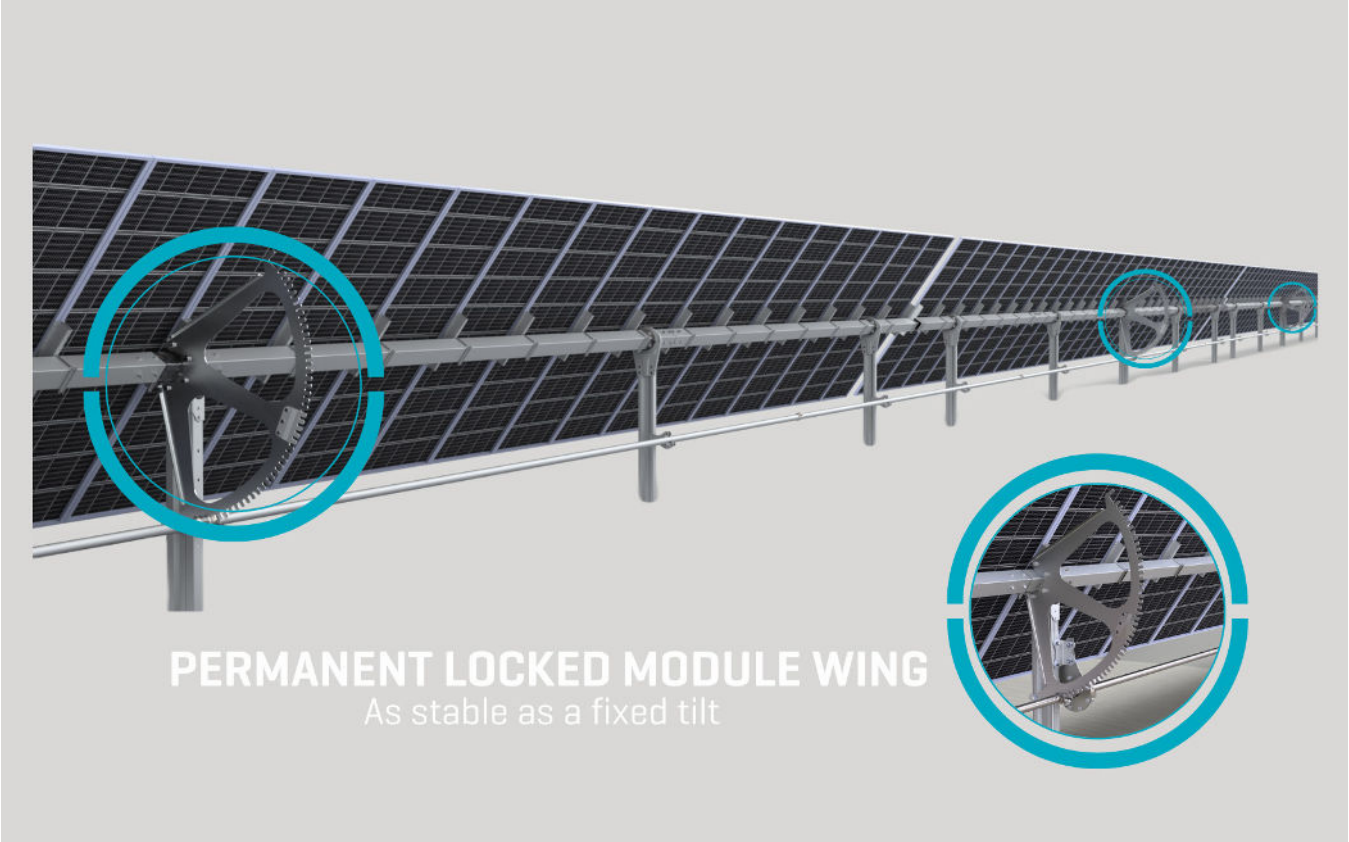


Now, it is time to develop a new tracker technology based on these many years of experience. With the L:TEC technology, a technological platform has now been developed with solutions for 1P as well as for 2P applications. L:TEC 1P and L:TEC 2P technology is essentially based on the already proven key technologies flat-stow and the patented Decoupled Drive and complements this now with the Locking Technology.

The unique interaction of these three key technologies makes the L:TEC a pioneering system on the market, a next-generation tracking system.

Decoupled drive

Unlike many other trackers on the market, the L:TEC uses a decoupled drive system. This decoupled drive technology delivers customers. Every solar park has limited



resources and also topographic challenges. The decoupled drive solves this problem. The L:TEC can extend one tracker system up to 260m in length by connecting up to eight string-conform tables following difficult terrain with only one drive unit.

To operate on difficult terrain, competitors would require at least triple the motors, which would double operating costs due to power consumption and also double the risk of failure. By using a short tracker, with only one string-conform table and also the longest tracker of 260m, the L:TEC can maximize the ground cover ratio of over 8% for every project, especially if the shape is very fragmented.

At the same time, the decoupled drive allows the L:TEC to follow the highest slopes in a north-south and also in an east-west direction up to 36% between each table. Overall, this key technology ensures less grading in more challenging terrain, maximized ground cover ratio, and lower operational costs due to overall lower power consumption.

Flat stow

Weather events such as high winds, are the main cause of damage to solar modules and tracker structures. The L:TEC is using the flat-stow strategy in all areas of the solar park. As already mentioned, this means avoiding microcracks on the solar modules, bringing in 360° wind protection, and needing less structure weight in high wind projects.

In addition, this leading technology gives L:TEC a USP to allow for the highest wind speeds on the market. The L:TEC tracking system can withstand wind speeds of up to 75 m/s (3-sec-gust), significantly higher than all other trackers on the market in a standard configuration. IDEEMATEC has already started to test the L:TEC 1P in 2023 in Australia for wind speeds of up to 110 m/s, that's 396 km/h. This will be a world record in the market. More importantly, it will mean that the company's L:TEC can also operate in hurricane conditions, such as the Caribbean region, or high wind areas like the Australian coastal region.

Multi locking technology

The third and final key technology is the patented locking technology, which delivers greater structural stability to the L:TEC tracking system. This is a simple and smart solution that was engineered by the IDEEMATEC team.

When a force comes from the wind to the solar module it normally has a direct load impact on the motor of the drive system. If that force is too big, the motor will be made to rotate, or the drive system could collapse. This locking technology ensures the tracker is mechanically self-locked and only minimal loads will come to the drive unit. This locked structure is as stable as a fixed tilt system. This fixing means that fewer motors are required. It also provides a flexible setup of multiple fixation points so that IDEEMATEC can control galloping effects in high wind events due to flat stow, without using more drive units.

IDEEMATEC calls it 'multilock'. For a similar performance to its competitors, up to 6x more motors would be required for the same structural and aeroelastic effect. Another benefit is that the combination of decoupled drive and locking technology allows for a much more flexible setup of tracking systems and the tracker range is maximized from 28m up to 260m.

Overall, this locking technology will enable lower cost of ownership, higher performance, and improved robustness, even in challenging conditions.

This all is combined with state-of-the-art power and connectivity options that the market might expect for the highest level of operations. Different options as AC-powered solutions are available, along with self and string powered DC wireless systems based on ZigBee or LoRa.

IDEEMATEC invites all interested persons to visit its stands at the major international Trade Fairs in 2023 for renewable energy, in Munich, Sao Paolo, Las Vegas, or in Melbourne.

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