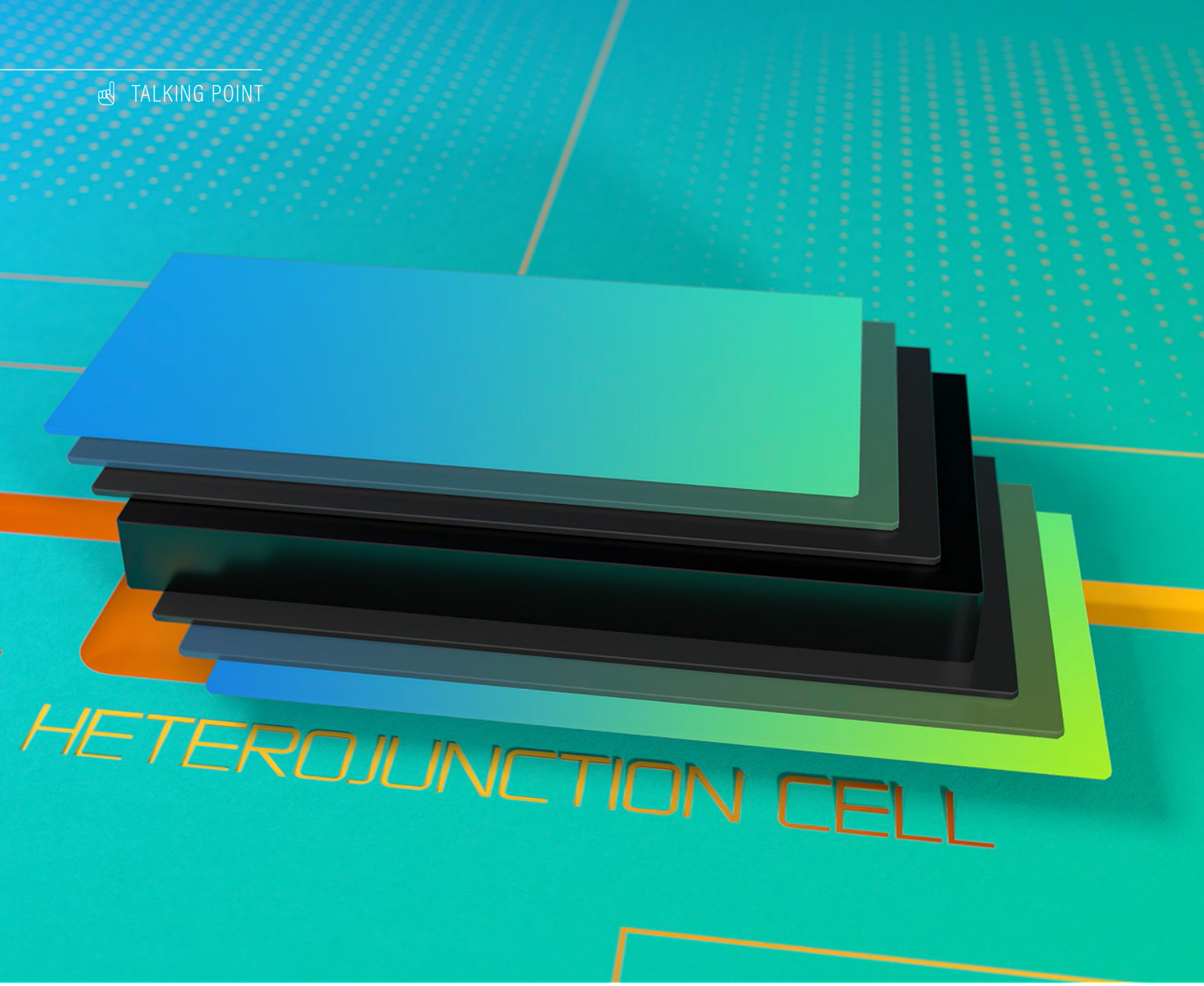
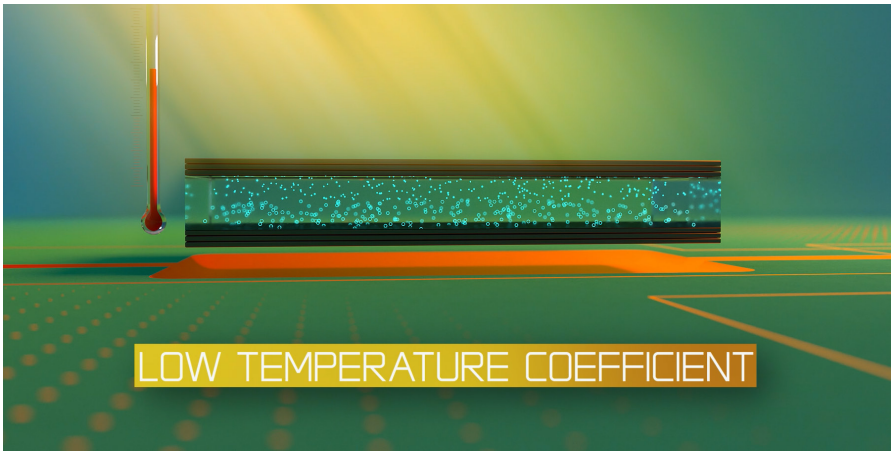


Mastering HJT, the solar technology of the future

Heterojunction solar cell technology (HJT) has revolutionised the way we think about solar energy. The cells are made from two materials, crystalline silicon and amorphous thin-film silicon, to create a ‘sandwich’ effect, layered on top of each other and separated by a thin layer of intrinsic amorphous silicon. This combination allows for better charge carrier separation and collection, resulting in a more efficient capture of sunlight and transfer of electrons in general, a higher energy conversion rate potential, and a better outcome for homeowners and businesses.



One of the key advantages of HJT technology is its ability to minimise energy loss caused by recombination. Recombination occurs when the positive and negative charges within a solar cell come back together, releasing energy in the form of heat instead of electricity. By reducing such recombination thanks to the good passivation by hydrogenated amorphous silicon, HJT cells can achieve higher efficiency levels compared to traditional silicon-based solar cells.

Better performance in hot climate conditions

Thanks to their distinct structure, generating higher Voc and reduced recombination, HJT cells have a lower temperature coefficient than other cell technologies. This means their performance is less affected by increases in ambient temperature. As temperatures rise, all silicon-based solar cells experience a decrease in efficiency due to heat build-up inside the solar cell, but with their better tolerance of heat, HJT cells limit such losses and offer improved performance at higher temperatures. This ensures consistently high energy production, both in regions with a hot climate all year-round and also in more temperate areas, during peak times when the sun shines strongest.

Best option for future developments

While the majority of solar panel manufacturers have moved to TOPCon cells as a quick and simple successor to PERC technology to offer some incremental efficiency gains, HJT is considered as a pioneering technology, presenting the biggest potential for greater progression in cell and panel efficiency in the near future. In fact, all recent world records for cell efficiency in the lab are based on HJT.

'Based on our deep experience with HJT cells since 2019, REC believes this cell technology holds immense potential for efficiency growth and is the best option for future developments like tandem structures', says Shankar G. Sridhara, Chief Technology Officer at REC Group. In fact, based on its Alpha HJT technology, REC was able to bring the most powerful 60-cell solar module to the market in 2019.

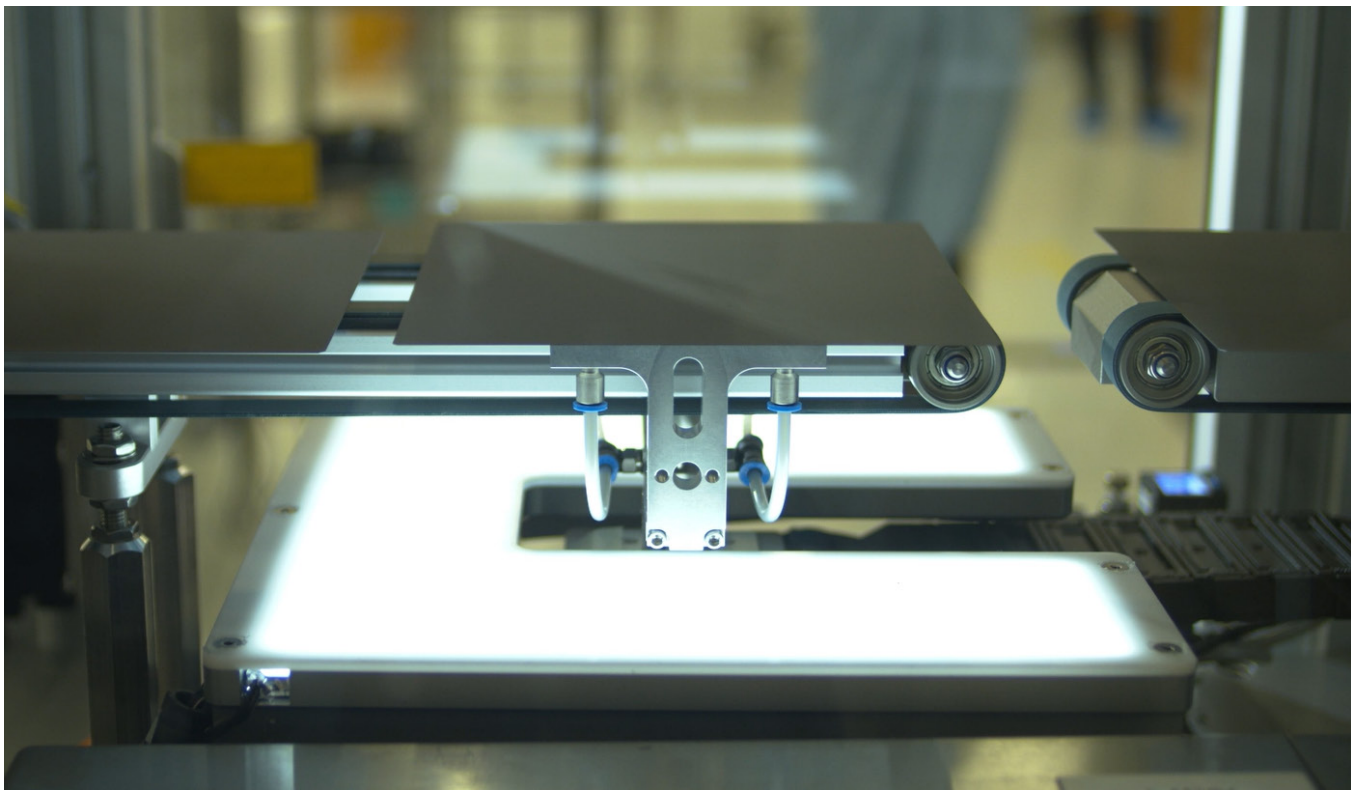
Minimum 92% guaranteed performance after 25 years

Looking at the range of TOPCon solar panels on the market today and their performance warranties, the majority come with a degradation of 0.4% per year, offering 89.X% power after 25 years. REC's Alpha HJT product line-up guarantees at least 92% power output at year 25.[1] This is a clear testament to the long-term performance of Alpha HJT, giving consumers and installers greater peace of mind.

Reduced energy consumption during production

HJT is considered a superior technology compared to conventional n- and p-type mono TOPCon cells thanks to its use of engineering principles to maximise power production and minimise energy consumption during panel production.

[1] Under the comprehensive REC ProTrust warranty package, subject to conditions



Manufacturing HJT cells requires significantly fewer production steps compared to TOPCon, six versus 11 to 14 respectively, and REC's special low temperature production process for HJT cells significantly reduces energy consumption, helping to better protect the environment.

When it comes to solar cell technologies, for REC as an innovator with more than 25 years of solar experience, HJT cells are the clear winner, offering superior and reliable performance to end users. HJT is a true pioneering technology and the basis for the most efficient solar products of the future. While most manufacturers will likely follow this route at some point, REC is already there and continuing to innovate on this platform, enabling more people to enjoy more clean solar power.

Mastering HJT with REC Alpha technology

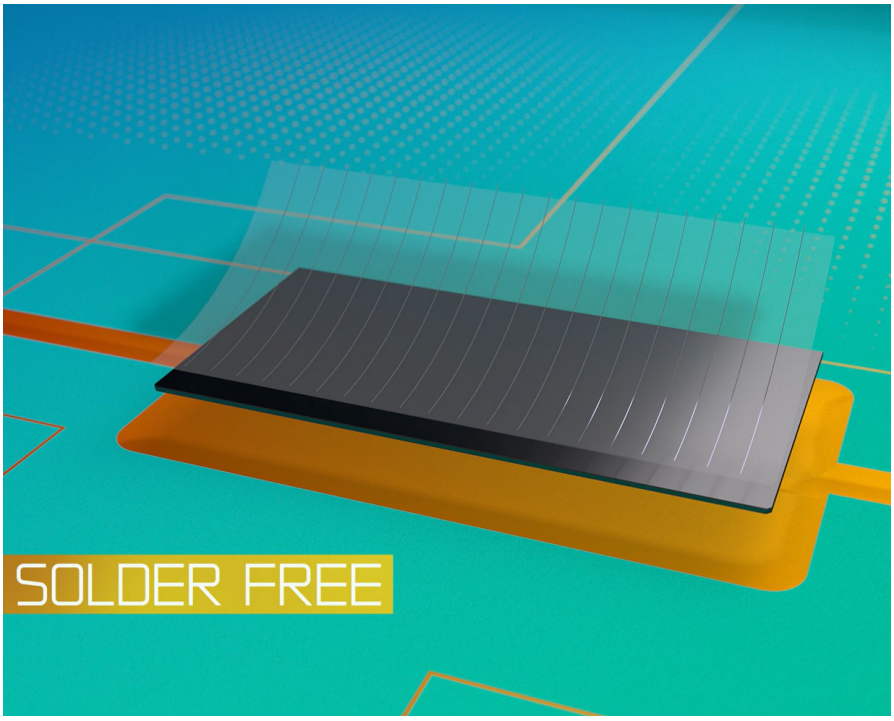
With its Alpha revolution ongoing since 2019, REC has proved its mastery of HJT technology, increasing panel performance while minimising environmental footprint. With the launch of its first HJT product, the REC Alpha Series, the pioneering manufacturer brought the world's most powerful 60 cell solar module to the global market, reaching 380 Wp.

In 2021, the company launched its lead-free and RoHS compliant REC Alpha Pure Series, with power reaching 410 Wp in a compact format. Since 2019, the Advanced Cell Connection Technology used in REC's Alpha cells had already fully eliminated lead, so with the REC Alpha Pure, launched in 2021, it was a case of removing lead from all other soldered components, i.e., cross-connectors, junction box and connectors, then finding the correct

production parameters to ensure continued high quality and high performance.

The combination of high-power density and a lower impact on the environment convinced the international jury to honor the REC Alpha and the Alpha Pure with the prestigious 2020 and 2022 Intersolar Awards.

In 2022, REC launched a new solar panel with the world's highest-power for residential installations with G12 HJT cells, the REC Alpha Pure-R Series. With up to 430 Wp packed into less than two square meters, it hit the sweet spot in terms of power output, size, weight, and handling.



Introducing AMI

One crucial enabler to overcoming the challenge of combining large G12 wafers with REC's Alpha HJT technology is Advanced Module Interconnections (AMI). This innovative solder-free foil and wire cell connection technology is enabling REC to advance the boundaries of HJT technology even further and to achieve higher throughputs.

As the solar industry races towards larger wafers for higher efficiencies, it faces challenges to switch to the larger G12 wafer and cell platform on HJT. REC's use of AMI provides a solution to overcome these, with this interconnection technology incorporated into the REC Alpha Pure-R Series for the first time.

In addition, the AMI foil and wire combination provides higher resistance against potential cell defects compared to busbar connections. By eliminating the need for cell level soldering and freeing the cell from printed busbars, REC's HJT cells do not require high temperature firing, this retains cell integrity and avoids localised heating during production. In addition, the increased contact between cell and metallization increases current flow to ease resistance and increase cell power. In this way, AMI ensures more durability and a reliable high performance solar panel for the long-term.

AMI is key to unlocking the full potential of G12 wafers with REC's Alpha HJT technology, and to propelling the industry forward with higher throughputs, improved reliability, and eco-friendly solar products. So buckle up, because the future of solar energy has never looked brighter.

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