Perovskite Solar Cells

Weekly Intelligence Report

2026-06-20 | 18 articles | 7 countries

troy-technical.jp

This Week's Keyword

Perovskite Tandem PV

Efficiency records & commercialization race intensifies

18	7	34.82	Q3 2026
articles	countries	%	(est.)
Total Articles Analyzed	Source Countries	Max Cell Efficiency	Commercial Shipments

All 18 Articles This Week — 5-Axis Evaluation Matrix

How to read columns — Tech Novelty: degree of breakthrough Market Proximity: closeness to commercialization Market Impact: industry-wide effect Data Reliability: quantitative data & peer review US/EU Relevance: direct impact on US/European companies & supply chains

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#01	Oxford PV/Fraunhofer	New Product	●●●●○	●●●○○	●●●●○	●●●●○	●●●●●	Oxford PV & Fraunhofer ISE achieve 25.6% module efficiency with shingle tech, boosting manufacturability.
#02	JinkoSolar 34.82% Cell	Research Breakthrough	●●●●●	●●○○○	●●●●●	●●●●●	●●●●○	JinkoSolar sets new world record 34.82% efficiency for N-type TOPCon perovskite tandem cell.
#03	GCL Shipments Q3 2026	Corporate Announcement	●●●○○	●●●●○	●●●●○	●●●○○	●●●●○	GCL Perovskite to ship commercial modules from 500MW line by Q3 2026, 27% efficiency on 2m² 4T tandem.
#04	LONGi Pilot Production	Market Analysis	●●○○○	●●●○○	●●●●○	●●●○○	●●●●○	LONGi begins pilot production of perovskite-silicon tandem modules, key for N-type market growth.
#05	IPVF/TU Delft 31%	Research Breakthrough	●●●●●	●●○○○	●●●○○	●●●●●	●●●●●	IPVF and TU Delft achieve 31% efficiency for 4cm² perovskite-silicon tandem cell with industrial-compatible slot-die coating.
#06	Cornell Agrivoltaics	Research Analysis	●●●○○	●○○○○	●●○○○	●●●●●	●●●●●	Cornell study projects perovskite tandem PV in agrivoltaics can save water and offset CO2 in US lettuce production.
#07	UtmoLight Module Series	New Product	●●○○○	●●●●○	●●●○○	●●●●○	●●●○○	UtmoLight launches 2.81m², 500W weather-resistant perovskite module (Chuangshi S2) and ultralight S1 series.
#08	Trinasolar 29.2% Module	Research Breakthrough	●●●●●	●●○○○	●●●●●	●●●●●	●●●●○	Trinasolar sets world record 29.2% aperture area efficiency and 907W output for 210mm tandem module.
#09	SKKU Single-Junction	Corporate Strategy	●○○○○	●○○○○	●●○○○	●●○○○	●●●○○	Prof. Park advocates SK focus on single-junction perovskite for AI/space, differentiating from China's tandem.
#10	Perovskite 2026 Status	Market Overview	●○○○○	●○○○○	●●●○○	●●●○○	●●○○○	Perovskite solar cells in 2026 address stability, lead, and scale-up, poised to surpass silicon limits.
#11	LONGi/EPFL 30%+	Research Breakthrough	●●●●●	●●○○○	●●●●●	●●●●●	●●●●○	Perovskite-silicon tandem cells exceed 30% efficiency, with LONGi publishing in Nature and EPFL/CSEM achieving 31.25%.
#12	GCL Satellite Launch	New Product	●●●●○	●●●●○	●●●●○	●●●○○	●●●●○	GCL to launch "computing satellite" this year with 30.2% efficient, 2042cm² perovskite-silicon tandem modules.

#	Article Title	Type	Tech Novelty	Market Proximity	Market Impact	Data Reliability	US/EU Relevance	Summary
#13	PV Value Redefined	Market Analysis	●○○○	●○○○	●●●○	●●○○	●●●●	Perovskite-silicon tandems shift PV value from $/W to area efficiency and bankability, crucial for land-constrained regions.
#14	GCL 500MW & Space	Corporate Announcement	●●●○	●●●●	●●●●	●●●○	●●●●	GCL Perovskite's 500MW line operational, commercial shipments by Q3 2026, targeting space with 4T tandem.
#15	Trinasolar/Tandem PV	Research Breakthrough	●●●●	●●●○	●●●●	●●●●	●●●●	Trinasolar sets 29.2% module efficiency record; US-based Tandem PV launches pilot factory for mass production.
#16	Perovskite Bankability	Market Analysis	●○○○	●○○○	●●●○	●●○○	●●●●	Perovskite commercialization hinges on efficiency, reliability, and bankability, driven by space demand and SpaceX IPO.
#17	Oxford PV/Fraunhofer	New Product	●●●●	●●●○	●●●●	●●●●	●●●●	Oxford PV & Fraunhofer ISE achieve 25.6% module efficiency with shingle design, reducing losses.
#18	SK/China Space Race	Corporate Strategy	●●●○	●●●○	●●●●	●●●○	●●●●	SK and China race for perovskite mass production for space solar, with Hanwha joining lunar probe and China forming alliance.

●●●●○ High ●●●○○ Med-High ●●○○○ Med ●○○○○ Low | Yellow highlight = featured article

Three Questions That Demand Your Decision This Week

❶ Is your PV strategy ready for 30%+ modules?

Chinese and European firms are pushing perovskite-silicon tandem module efficiencies to new highs (25-29% module, 30-34% cell). This redefines $/W and area efficiency, impacting future system designs and LCOE.

❷ How exposed is your supply chain to Chinese dominance?

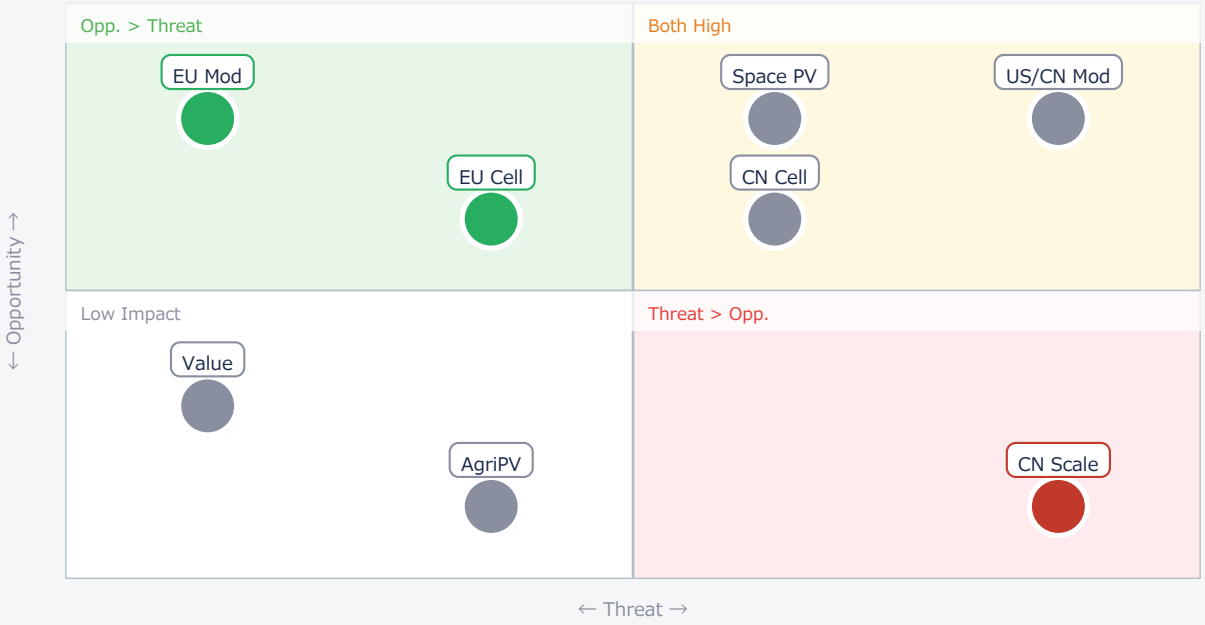
Chinese giants (JinkoSolar, GCL, Trinasolar) are rapidly scaling pilot/mass production and setting efficiency records, including for space applications. US/EU firms must assess competitive gaps and potential dependencies.

❸ Are you leveraging perovskite for niche, high-value markets?

Flexible, lightweight perovskites are ideal for BIPV, distributed PV, agrivoltaics, and space. US/EU firms must identify and capture these specialized segments where high area efficiency and low weight are critical.

Opportunities vs. Threats for US/European Companies

Opportunity vs. Threat Matrix for US/European Companies



Item	Quadrant	↑ Opportunity	↓ Threat
US/CN Mod	Critical	US production	China leads mod
CN Cell	Critical	New cell tech	Tech gap widens
EU Mod	Opp.	Advanced EU tech	Slower scale
CN Scale	Threat	New supplier	Market share loss
Space PV	Critical	New market	US/EU behind
EU Cell	Opp.	Scalable EU R&D;	Small area focus
Value	Ref.	Premium markets	New criteria
AgriPV	Ref.	Sustainable apps	Niche focus

Deep Dive ① — US & China Drive Perovskite Module Records

#15 | 2026/06/14 | CleanTechnica | Tech Novelty●●●●● Proximity●●●○○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●●

Trinasolar achieved a world-record 29.2% efficiency and 907W output for an industrial-sized perovskite-silicon tandem module, verified by TÜV SÜD. This demonstrates the viability of high-efficiency tandem technology at scale.

Concurrently, US-based Tandem PV launched a pilot factory in Fremont, California, for mass production of commercial perovskite-silicon tandem cells. This dual development signals rapid transition from R&D; to large-scale market introduction.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The published numbers are highly credible, verified by TÜV SÜD. Technical barriers remain in long-term stability and cost-effective large-area manufacturing for the perovskite layer. [Opportunity] for US/EU OEMs is to partner with or acquire domestic pilot production facilities like Tandem PV to secure advanced module supply chains and reduce reliance on Asian manufacturers. [Threat] is that Chinese firms like Trinasolar are setting global benchmarks, potentially outpacing US/EU in commercialization speed and scale. Next actions: [Procurement] Evaluate US domestic perovskite module suppliers by Q4 2026. [R&D;] Benchmark Trinasolar's module performance and manufacturing processes by Q3 2026.

Deep Dive ② — JinkoSolar Sets New Cell Efficiency Record

#02 | 2026/06/19 | SolarQuarter | Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●● Data Reliability●●●●● US/EU Relevance●●●●○

JinkoSolar announced a new world record of 34.82% power conversion efficiency for its N-type TOPCon perovskite tandem solar cell, certified by the Shanghai Institute of Microsystem and Information Technology.

This breakthrough, attributed to dual-layer composite passivation and multi-dimensional interface passivation, sets a new benchmark for solar cell efficiency and accelerates technological progress across the industry.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 34.82% cell efficiency is a significant academic breakthrough, independently verified. However, translating this small-area cell efficiency to large-area, stable modules for mass production remains a major technical barrier. [Opportunity] for US/EU IP holders and materials suppliers to develop and license advanced passivation materials or manufacturing techniques that enable such high efficiencies at scale. [Threat] is that Chinese companies are consistently leading in fundamental efficiency records, potentially creating a long-term technology gap. Next actions: [R&D;] Initiate a competitive intelligence deep dive into JinkoSolar's passivation technologies by Q3 2026. [Business Dev] Explore potential licensing opportunities for advanced interface materials.

Deep Dive ③ — EU Advances Perovskite-Silicon Modules

#01 | 2026/06/18 | PV Tech | Tech Novelty●●●●○ Proximity●●●○○ Market Impact●●●●○ Data Reliability●●●●○ US/EU Relevance●●●●●

Oxford PV and Fraunhofer ISE unveiled a perovskite-silicon tandem module prototype with 25.6% aperture area efficiency, integrating Oxford PV's cells with Fraunhofer's Matrix Shingle interconnection technology.

This design enables wider cell cutting due to lower current density, promising significant improvements in manufacturing productivity and paving the way for commercialization of high-performance perovskite tandem solar technology.

▶ Strategic Analyst's Perspective

Strategic Analyst's Perspective: The 25.6% module efficiency is a strong, realistic achievement from reputable EU institutions. The Matrix Shingle technology addresses a critical manufacturing barrier for module integration. [Opportunity] for US/EU OEMs and materials suppliers to adopt or license this shingling technology to improve module-level efficiency and manufacturability. This strengthens the regional supply chain. [Threat] is the speed of scaling compared to Asian competitors who are already announcing gigawatt-scale lines. Next actions: [R&D;] Evaluate the Matrix Shingle technology for integration into existing or planned module production lines by Q4 2026. [Strategy] Assess competitive positioning of EU perovskite module technology against Asian offerings.

Other Notable Articles

LONGi Pilot Production (SolarQuarter)
Tech Novelty●●○○○ Proximity●●●○○ Market Impact●●●●○

LONGi's pilot production of perovskite-silicon tandem modules signals a major shift towards N-type market dominance.

UtmoLight Module Series (pv magazine Global)
Tech Novelty●●○○○ Proximity●●●●○ Market Impact●●●○○

UtmoLight's launch of TÜV-certified, weather-resistant perovskite modules indicates market readiness for diverse applications like BIPV.

LONGi/EPFL 30%+ (SolarQuarter)
Tech Novelty●●●●● Proximity●●○○○ Market Impact●●●●●

Consistent reports of 30%+ cell efficiencies, including EPFL/CSEM's 31.25%, confirm perovskite's scientific validation and potential.

PV Value Redefined (□□ (Charlie))
Tech Novelty●○○○○ Proximity●○○○○ Market Impact●●●○○

Perovskite tandems are redefining PV value from $/W to area efficiency and bankability, crucial for land-constrained markets.

Recommended Actions This Week

Action recommendations based on article evaluation matrix and opportunity/threat analysis.

Immediate (this week)

- [R&D;] Review latest perovskite-silicon tandem cell and module efficiency records to benchmark internal targets.
- [Procurement] Initiate assessment of Chinese perovskite module manufacturers' readiness for commercial supply and pricing.

Short-term (1 month)

- [Strategy] Conduct an internal workshop to evaluate the shift in PV value proposition from $/W to area efficiency and bankability for future projects.
- [Business Dev] Identify high-value niche applications (e.g., agrivoltaics, BIPV, space) where perovskite's unique properties offer a competitive edge.

Medium-long term (quarter+)

- [R&D;] Invest in module-level integration technologies (e.g., shingling) to translate high cell efficiencies into practical module performance.
- [Legal/IP] Monitor the rapidly evolving perovskite IP landscape, especially in China and Europe, for potential licensing or infringement risks.
- [Executive] Develop a long-term competitive strategy to counter Asian mass production scale and secure critical materials/IP for perovskite technology.

PerovskiteSolarCells — Selected Articles

Date: 2026-06-20

Articles: 18

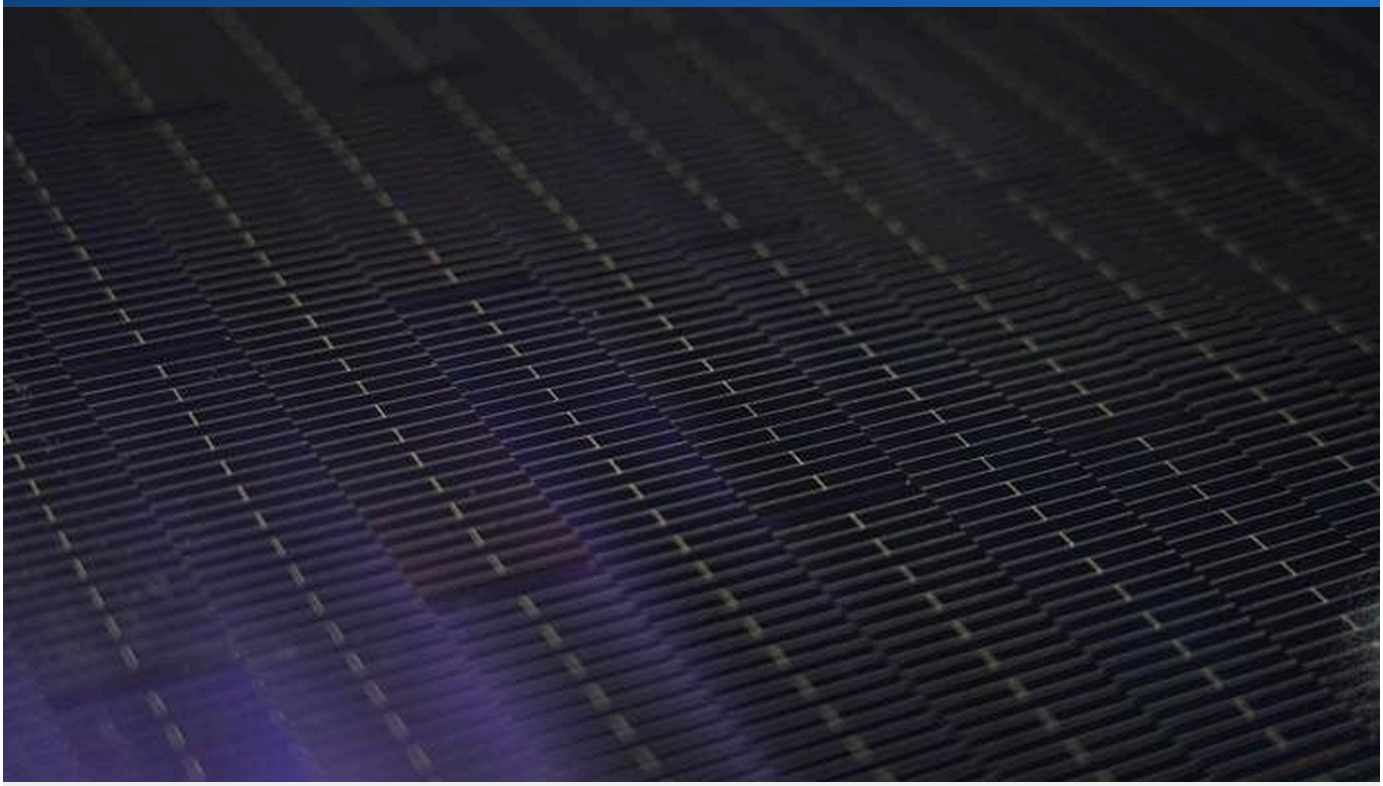
Table of Contents

#17 Oxford PV and Fraunhofer ISE Achieve 25.6% Efficiency for Perovskite-Silicon Tandem Module with Shingled Design

#18 South Korea and China Intensify Perovskite Mass Production Race for Space Solar Market: Hanwha Solutions Joins Lunar Probe, China Establishes Space Energy Alliance

Oxford PV and Fraunhofer ISE Unveil 25.6% Efficient Perovskite-Silicon Tandem Module with Matrix Shingle Technology

Published June 18, 2026 PV Tech Germany



OVERVIEW

Oxford PV and Fraunhofer ISE have jointly announced a new perovskite-silicon tandem module prototype, integrating Oxford PV's high-efficiency tandem cells with Fraunhofer's Matrix Shingle interconnection technology, achieving a module aperture area efficiency of 25.6%. Two prototypes were showcased: a 1.92m^2, 491W rooftop module and a 2.13m^2, 546W bifacial module. This breakthrough design, presented at Intersolar Europe, enables wider cell cutting due to lower current density, promising significant improvements in manufacturing productivity and paving the way for the commercialization of high-performance perovskite tandem solar technology.

IN DEPTH

Key Findings

Oxford PV and Fraunhofer ISE have collaboratively unveiled a new prototype design for a perovskite-silicon tandem solar module, demonstrating a high conversion efficiency of 25.6% across the entire module area. This achievement was demonstrated with two types of large-format modules: a 1.92m^2, 491W rooftop module and a 2.13m^2, 546W bifacial module. Critically, this design incorporates Fraunhofer's innovative Matrix Shingle interconnection technology, marking a significant step toward the commercialization of perovskite solar technology.

Technical Details

The core of this breakthrough lies in the synergy between Oxford PV's leading perovskite-silicon tandem cells and Fraunhofer ISE's advanced Matrix Shingle interconnection technology. The module achieved a verified 25.6% efficiency over its full aperture area, showcasing a remarkable translation of cell-level performance to a practical module scale. The Matrix Shingle approach facilitates wider cell cutting due to lower current density, promising substantial improvements in manufacturing throughput compared to conventional busbar-connected cells. This innovation directly addresses production scalability, a key hurdle for advanced PV technologies. The prototypes, including a 1.92m^2, 491W rooftop variant and a 2.13m^2, 546W bifacial module, combine high power output with practical dimensions suitable for industrial adoption. The technology was prominently featured at Intersolar Europe, drawing considerable industry attention to its commercial viability and performance.

Background & Context

Perovskite-silicon tandem solar cells are globally recognized as a leading pathway to surpass the theoretical efficiency limits of single-junction silicon solar cells, which hover around 26-27%. Oxford PV has been a pioneer in this field, focusing on developing highly efficient perovskite top layers that can harvest higher-energy photons, while silicon bottom cells capture lower-energy light. Fraunhofer ISE, with its extensive legacy in PV research and development, particularly excels in module interconnection and packaging technologies. This collaboration effectively marries Oxford PV's material science prowess with Fraunhofer's engineering and manufacturing expertise. Traditional solar module production processes often face challenges with complex cell interconnections and module-level losses. The Matrix Shingle interconnection technology mitigates these issues by allowing for overlapping cell arrangements, which leads to denser cell packing and more efficient current collection across the module, reducing inactive areas and resistive losses.

Strategic Significance & Outlook

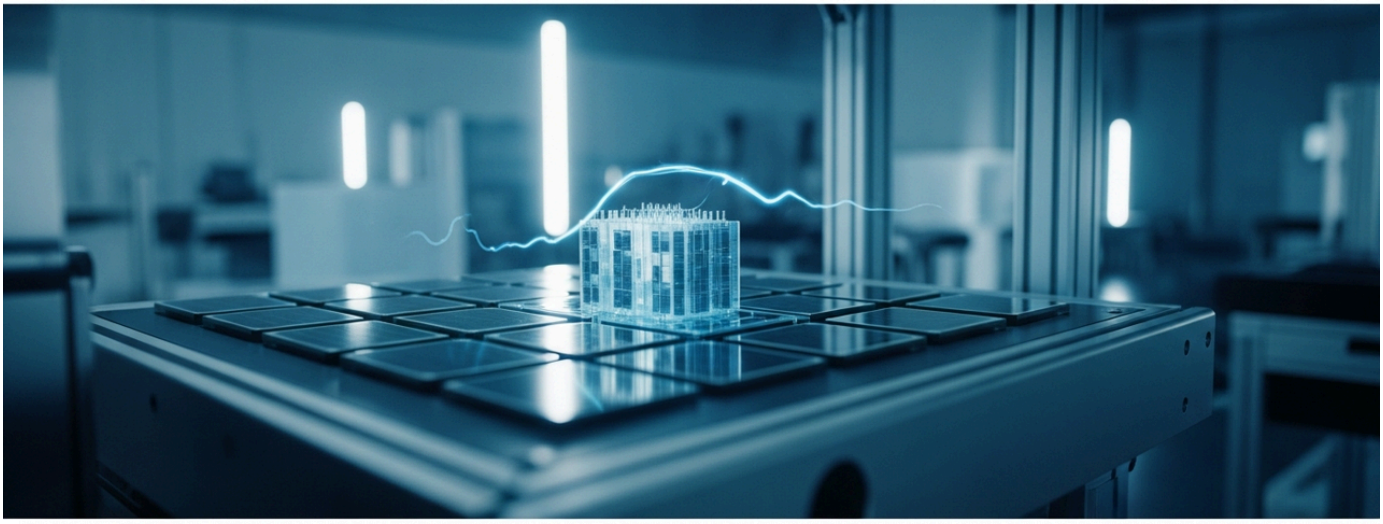
The unveiling of this prototype represents a critical milestone in the journey towards large-scale commercialization of perovskite tandem technology. By simultaneously advancing both efficiency and manufacturability, these modules are expected to drive down the levelized cost of electricity (LCOE) for solar power, thereby accelerating the global adoption of renewable energy. The superior performance and versatility, especially in large-area rooftop installations and bifacial applications, position these new modules with a significant competitive advantage. This advancement suggests that perovskite-silicon tandems are moving rapidly from scientific curiosity to tangible, market-ready products, potentially reshaping the future of the photovoltaic industry.

Source: https://www.pv-tech.org/oxford-pv-and-fraunhofer-ise-combine-technologies-in-new-perovskite-silicon-tandem-module-design/

Collected: June 19, 2026 | Automated Research System (Gemini API)

JinkoSolar Achieves 34.82% World Record Efficiency for N-Type TOPCon Perovskite Tandem Solar Cell

Published June 19, 2026 SolarQuarter China



OVERVIEW

JinkoSolar has announced a new world record of 34.82% power conversion efficiency for its self-developed N-type TOPCon perovskite tandem solar cell, independently certified by the Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences. This marks the company's 33rd world record and is attributed to multiple core technological innovations, including a dual-layer composite passivation contact structure and multi-dimensional interface passivation technology. This achievement sets a new benchmark for solar cell efficiency in commercialization, driving accelerated technological progress across the industry.

IN DEPTH

Key Findings

JinkoSolar has announced a new world record in power conversion efficiency for its self-developed N-type TOPCon perovskite tandem solar cell, achieving an astounding 34.82%. This remarkable achievement, independently certified by the Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, marks the company's 33rd world record. This breakthrough pushes the boundaries of existing solar cell technology, contributing significantly to further efficiency improvements and cost reductions in photovoltaic power generation.

Technical Details

The record-breaking 34.82% efficiency was achieved with an N-type TOPCon perovskite tandem cell. The independent verification by the Shanghai Institute of Microsystem and Information Technology underscores the robustness of this claim. The significant performance enhancement stems from several core technological innovations. These include a dual-layer composite passivation contact structure designed to minimize charge carrier recombination losses and maximize light absorption. Additionally, multi-dimensional interface passivation technology effectively reduces defects at the interface between the perovskite and silicon layers, optimizing carrier transport. Precise materials engineering and structural design have further maximized spectral matching and current generation between the perovskite and TOPCon silicon layers. These advances have allowed JinkoSolar to surpass the theoretical limits of conventional silicon single-junction cells, substantially elevating the commercial viability of perovskite tandem technology.

Background & Context

The solar photovoltaic industry is continuously seeking higher efficiency and lower-cost technologies as a critical solution to global warming. While silicon solar cell efficiency is approaching its physical limits, perovskite-silicon tandem cells offer a promising avenue for further breakthroughs. The perovskite layer efficiently absorbs shorter wavelength light, from visible to ultraviolet, while the silicon layer absorbs longer wavelength light, such as near-infrared, thereby utilizing a broader range of the solar spectrum. JinkoSolar, a global leader in photovoltaic technology, has consistently invested heavily in R&D. N-type TOPCon technology is already one of the most efficient silicon-based technologies, and its integration with perovskite holds the promise for even higher efficiencies. The company's 33 world records are a testament to its technological prowess and commitment to innovation.

Strategic Significance & Outlook

This world-record achievement of 34.82% efficiency signifies that perovskite tandem solar cells are no longer merely a subject of research but are rapidly approaching practical, high-efficiency commercial deployment. Should this technology scale up to mass production, it could dramatically increase the power generation per unit area of solar photovoltaic systems, leading to a relative reduction in installation costs. This technology is particularly promising for applications where maximum power generation is required within limited space, such as residential, commercial rooftops, and even space applications. JinkoSolar is well-positioned to lead the next generation of the solar photovoltaic industry based on this significant breakthrough, accelerating the global energy transition.

Source: https://solarquarter.com/2026/06/19/33rd-world-record-jinkosolar-sets-new-efficiency-benchmark-for-perovskite-topcon-tandem-cells-at-34-82/

GCL Perovskite to Begin Mass Shipment of Commercial Modules by Q3 2026 from 500 MW Line, Achieves 27% Efficiency on Large-Area Tandem

Published June 16, 2026 TaiyangNews (YouTube) China

OVERVIEW

GCL Perovskite announced at SNEC 2026 that it will commence commercial shipments of its perovskite modules by the end of Q3 2026, leveraging its operational 500 MW production line. The company has achieved 27% efficiency for large-area 2m² commercial modules using a 4-terminal (4T) tandem architecture, alongside a world-record 22% efficiency for flexible modules. This significant development marks a crucial transition for perovskite solar cells from research to large-scale commercial deployment, offering a new highly efficient option for the global solar market.

IN DEPTH

Key Findings

GCL Perovskite announced at SNEC 2026 its plans to commence commercial shipments of perovskite modules by the end of the third quarter of 2026. The company has already commissioned a 500 MW production line, signaling readiness for mass production. Notably, GCL has adopted a 4-terminal (4T) tandem architecture, achieving 27% efficiency for large-area 2m^2 commercial modules and 30% for smaller tandem cells. Furthermore, the company has set a world record of 22% efficiency for flexible perovskite modules, underscoring the diverse application potential of perovskite technology.

Technical Details

GCL's ambitious commercialization roadmap includes initiating shipments of its perovskite modules by the end of Q3 2026, supported by an operational 500 MW production line, demonstrating substantial scaling capabilities. The company's strategic adoption of a 4-terminal (4T) tandem architecture is a key technical differentiator. This design allows the perovskite and silicon layers to operate electrically independently, optimizing current extraction from each sub-cell across different spectral ranges. This approach often leads to higher maximum efficiencies compared to 2-terminal (2T) designs due to fewer current matching constraints. GCL reports impressive efficiency benchmarks: 30% for small-area tandem cells and a notable 27% for large-area 2m^2 commercial modules, indicating robust performance for practical applications. A further highlight is their 22% world-record efficiency for flexible perovskite modules, addressing niche markets requiring lightweight and conformable power solutions.

Background & Context

Perovskite solar cells are widely regarded as the next-generation photovoltaic technology due to their high-efficiency potential, low-cost manufacturing capabilities, and versatility in various forms, including thin-film and flexible devices, surpassing the theoretical limits of conventional silicon solar cells. The tandem structure, in particular, dramatically enhances conversion efficiency by enabling perovskite and silicon layers to absorb different parts of the solar spectrum most effectively. GCL Perovskite, as part of the Chinese GCL Group, leverages extensive manufacturing capacity and a robust supply chain. The operationalization of a 500 MW commercial-scale production line and the announcement of concrete shipping plans signify a critical shift from research and development to large-scale commercialization for perovskite technology. The mention of space applications further highlights the advantages of perovskite's lightweight and high-efficiency characteristics for extraterrestrial power generation.

Strategic Significance & Outlook

The impending commercial shipments from GCL Perovskite are poised to introduce new competition into the global solar photovoltaic market. The achievement of 27% efficiency for large modules and the world record for flexible modules are particularly significant, as they have the potential to break traditional installation constraints. This could accelerate the adoption of solar power in areas previously challenging for PV, such as Building-Integrated Photovoltaics (BIPV), space applications, and IoT devices. GCL's roadmap suggests a future where perovskite technology becomes a leading contributor to the energy transition, offering an exciting prospect for investors and engineers alike, demonstrating the rapid maturation and broadening application scope of this innovative solar technology.

Source: https://www.youtube.com/watch?v=F_fP_H2h4-Q

Collected: June 19, 2026 | Automated Research System (Gemini API)

Perovskite-Silicon Tandem Commercialization Key to N-Type Solar Module Market Growth; LONGi Initiates Pilot Production

Published June 19, 2026 SolarQuarter International

OVERVIEW

The commercialization of perovskite-silicon tandem cells is identified as the most critical long-term development for the N-type solar module market. LONGi achieved a 33.9% efficiency record for perovskite-silicon tandem research cells in 2023 and commenced pilot production of tandem modules at its Xi'an R&D facility in November 2025. Silicon heterojunction (HJT) cells are noted as the optimal bottom cell architecture for 2-terminal perovskite-silicon tandem structures, already exceeding 33% certified cell efficiency at the research level. This technological trajectory is crucial for establishing the future market dominance of N-type modules.

IN DEPTH

Key Findings

The commercialization of perovskite-silicon tandem cells has been identified as the most significant long-term development for the N-type solar module market. The report highlights LONGi's achievement of a 33.9% efficiency record for its perovskite-silicon tandem research cells in 2023, followed by the initiation of pilot production for tandem modules at its Xi'an R&D facility in November 2025. This indicates that tandem technology is poised to play a central role in the N-type market's pursuit of higher efficiencies.

Technical and Market Details

The market analysis firmly places the commercialization of perovskite-silicon tandem cells as the paramount long-term advancement within the N-type solar module sector. LONGi, a prominent industry player, demonstrated a significant breakthrough by achieving a 33.9% efficiency record for its perovskite-silicon tandem research cell in 2023. Further solidifying its commitment to this technology, LONGi commenced pilot production of tandem modules at its Xi'an R&D facility in November 2025, a critical step towards large-scale deployment. Silicon Heterojunction (HJT) cells are specifically identified as the optimal bottom cell architecture for 2-terminal perovskite-silicon tandem structures, due to their excellent surface passivation and high open-circuit voltage characteristics. These HJT cells have already achieved certified efficiencies exceeding 33% at the research level, making the perovskite-HJT combination a powerful synergy for developing next-generation ultra-high-efficiency solar cells.

Background & Context

The photovoltaic industry relentlessly pursues cost reduction and efficiency enhancement. N-type technology is progressively becoming dominant over P-type due to its superior efficiency and better performance stability. Within N-type, new cell technologies like TOPCon and HJT are competing fiercely. However, as single-junction silicon solar cells approach their theoretical efficiency limits, perovskite-silicon tandem technology stands out as the most promising approach to further boost efficiency. This tandem structure allows the perovskite layer to absorb shorter-wavelength light and the silicon layer to absorb longer-wavelength light, enabling more efficient utilization of the entire solar spectrum. The initiation of pilot production by major manufacturers like LONGi signals a steady transition of this technology from the research phase to commercialization. This shift is expected to have a profound impact on the entire market, potentially restructuring supply chains and creating new investment opportunities.

Strategic Significance & Outlook

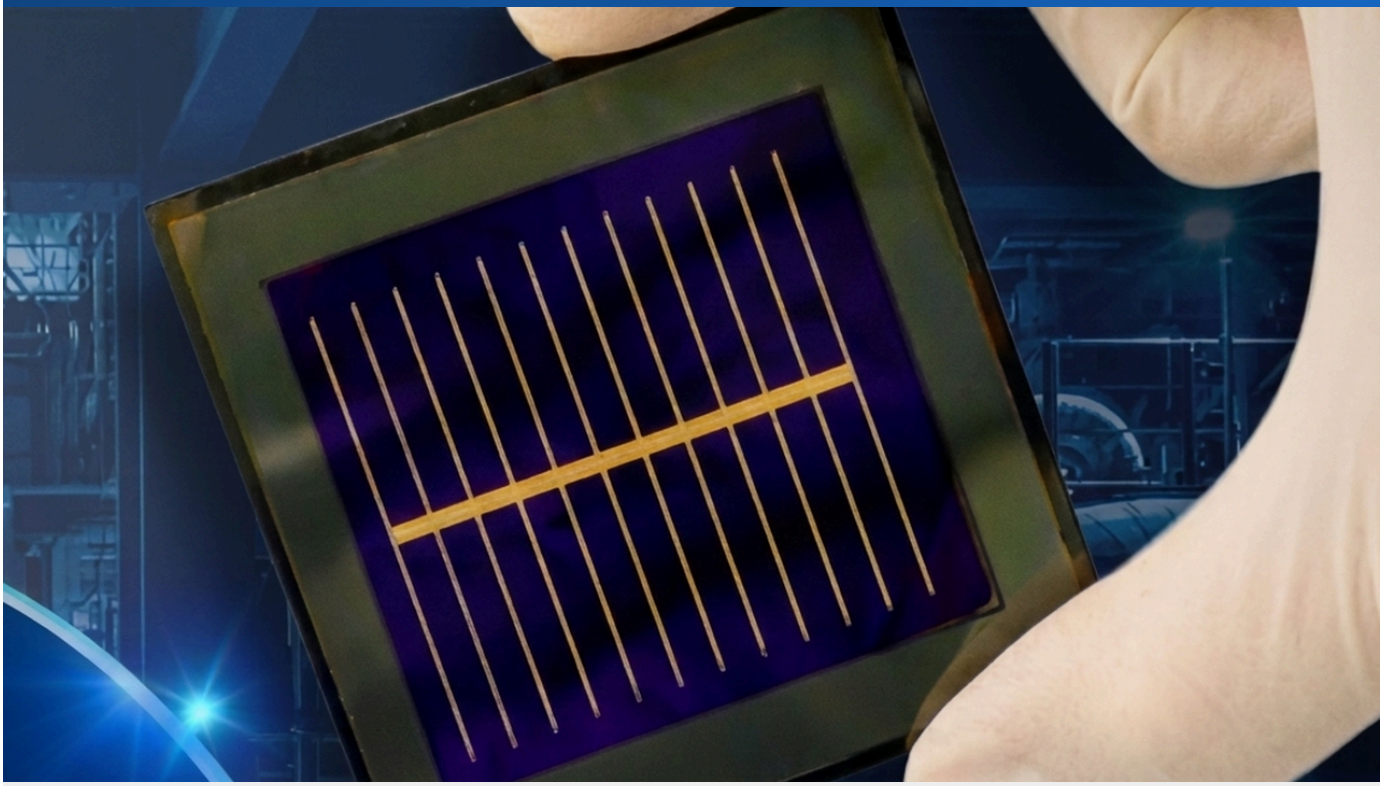
The full-scale commercialization of perovskite-silicon tandem cells is anticipated to be the primary driver of growth in the N-type solar module market from 2026 to 2035. The 2-terminal tandem structure, particularly when utilizing HJT cells as the bottom layer, holds significant potential to establish market dominance due to its exceptional efficiency. The widespread adoption of this technology will further enhance the cost-effectiveness of solar power, accelerating the global transition to renewable energy. Investors should closely monitor advancements in this field and the expansion of production capacities, while engineers will find critical demand for skills related to the design and manufacturing of these next-generation high-efficiency modules. The market outlook clearly indicates a future shaped by the innovation in high-efficiency tandem technology.

Source: https://solarquarter.com/2026/06/19/n-type-solar-module-market-share-outlook-2026-2035/

Collected: June 19, 2026 | Automated Research System (Gemini API)

IPVF and TU Delft Achieve 31% Efficiency for 4cm² Perovskite-Silicon Tandem Cell Using Industrial-Compatible Process

Published June 18, 2026 pv magazine Global France / Netherlands



OVERVIEW

Researchers from France's IPVF and the Netherlands' Delft University of Technology (TU Delft) have achieved 31% power conversion efficiency for a 4cm² two-terminal perovskite-silicon tandem solar cell. The device combines a nanostructured silicon heterojunction bottom cell with a perovskite top cell manufactured using an ambient air slot-die coating process, compatible with industrial scale-up. This significant achievement marks a crucial step towards the commercialization of high-efficiency next-generation photovoltaic technology, accelerating the development of sustainable energy solutions.

IN DEPTH

Key Findings

Researchers from France's IPVF and the Netherlands' Delft University of Technology (TU Delft) have achieved a remarkable 31% power conversion efficiency for a 4cm^2 two-terminal perovskite-silicon tandem solar cell. This groundbreaking accomplishment was realized using manufacturing processes compatible with industrial scale-up, marking a crucial step towards the commercialization of next-generation photovoltaic technology. This efficiency significantly surpasses current records for single-junction silicon solar cells.

Technical Details

The achievement of 31% efficiency on a 4cm^2 two-terminal device is a major milestone. This high performance was realized through a sophisticated device architecture and fabrication approach. The bottom cell utilizes a nanostructured silicon heterojunction design, which enhances light trapping and broadens absorption across the infrared spectrum. The perovskite top cell was manufactured using an ambient air slot-die coating process, a highly scalable solution processing technique. Slot-die coating is particularly advantageous for industrial production due to its ability to deposit uniform thin films over large areas at high speeds and lower costs compared to vacuum-based methods. The compatibility of this fabrication process with industrial scale-up is critical, as it bridges the gap between laboratory-level efficiencies and commercial viability. The combination of efficient light harvesting in the nanostructured silicon and optimized perovskite absorption layers, coupled with a scalable manufacturing method, underscores the maturity of this tandem technology.

Background & Context

In the field of photovoltaics, as the efficiency of single-junction silicon solar cells approaches its theoretical limits, tandem structures are increasingly seen as the next major breakthrough. Perovskite-silicon tandem solar cells are particularly promising because perovskites efficiently absorb short-wavelength light, while silicon excels at absorbing long-wavelength light, thereby utilizing a broader range of the solar spectrum and achieving higher efficiencies. While high-efficiency tandem cells have been reported previously, many were small-area laboratory devices, posing challenges for industrial-scale manufacturing. IPVF is a leading French photovoltaic research institute, and TU Delft is a globally recognized university for materials science and energy technology. Their collaboration demonstrates Europe's commitment to driving innovation in this field, focusing not just on high efficiency but also on developing commercially viable manufacturing processes.

Strategic Significance & Outlook

The achievement of 31% efficiency on a 4cm^2 device, particularly when realized through an industrially compatible process, strongly indicates the rapid progression towards commercialization of perovskite-silicon tandem solar cells. Should this technology be widely adopted, it could significantly increase the power generation per unit area of current photovoltaic systems, leading to improved land-use efficiency and relative reductions in installation costs. In the future, this high-efficiency technology will likely form the foundation for more sustainable and economical energy solutions across a wide range of applications, including residential, commercial, and even space-based power systems. This accomplishment therefore carries profound significance in shaping the future of solar energy, highlighting the accelerating pace of innovation in advanced PV technologies.

Source: https://www.pv-magazine.com/2026/06/18/ipvf-tu-delft-achieve-31-efficiency-for-4-cm2-perovskite-silicon-tandem-solar-cell/

Collected: June 19, 2026 | Automated Research System (Gemini API)

Cornell Study Projects Perovskite Tandem PV in Agrivoltaics Could Offset 30.9 Million Tons CO_2 and Save 8.4 Billion m^3 Water Annually

Published June 17, 2026 pv magazine Global USA

OVERVIEW

Researchers at Cornell University evaluated the sustainability potential of integrating perovskite tandem PV (both perovskite-silicon and perovskite-perovskite) into agrivoltaics lettuce production in the U.S. Their "farm-to-fork" life cycle assessment suggests that combining advanced tandem solar cells with agriculture can significantly reduce irrigation demand and greenhouse gas emissions. Under favorable conditions, this integration could offset up to 30.9 million tons of CO_2 emissions and save approximately 8.4 billion m^3 of water annually, highlighting a crucial path towards sustainable coexistence of food and energy production.

IN DEPTH

Key Findings

Researchers at Cornell University have evaluated the sustainability potential of integrating perovskite tandem PV (both perovskite-silicon and perovskite-perovskite configurations) into agrivoltaics lettuce production in the United States. This comprehensive "farm-to-fork" life cycle assessment (LCA) revealed that the coexistence of advanced tandem solar cells with agriculture can significantly reduce irrigation demand and substantially cut greenhouse gas emissions. Under favorable conditions, the study projects a potential annual offset of up to 30.9 million tons of CO_2 emissions and savings of approximately 8.4 billion m^3 of water.

Technical & Environmental Details

The study focused on integrating perovskite tandem PV, including both perovskite-silicon and perovskite-perovskite configurations, into agrivoltaics systems for lettuce production across the U.S. The methodology employed a "farm-to-fork" life cycle assessment to comprehensively quantify environmental impacts. The integration demonstrated dual environmental benefits: a reduction in irrigation demand due to shading from the solar panels, which minimizes soil moisture evaporation and thus the water required for lettuce cultivation, and a significant reduction in Greenhouse Gas (GHG) emissions. The GHG reduction comes not only from direct electricity generation displacing fossil fuels but also from reduced energy consumption associated with water transportation and pumping, thanks to water savings. Quantitatively, under optimal conditions, the system could offset up to 30.9 million tons of CO_2 emissions and save approximately 8.4 billion m^3 of water annually. This research underscores how perovskite tandem PV, with its ability to utilize a broader light spectrum more efficiently, combined with agrivoltaics' environmental merits, can offer an innovative solution to the triple nexus challenge of food, energy, and water resources.

Background & Context

Agrivoltaics, the sustainable practice of co-locating solar power generation with agriculture, is gaining global attention as an efficient way to maximize limited land resources for both food and energy production. In the U.S., its adoption is particularly anticipated given vast agricultural areas and rising energy demands. Perovskite tandem solar cells are especially suited for agrivoltaics due to their high conversion efficiency and their ability to absorb a wider range of the solar spectrum than conventional silicon cells. This allows for module designs with specific light transmittance optimized for plant growth, potentially minimizing negative impacts on crop yields while maximizing energy output. Cornell University's practical sustainability assessment plays a crucial role in facilitating technology adoption and clearly demonstrating the benefits to policymakers, farmers, and energy operators. This integrated approach is particularly vital amidst escalating global warming and water scarcity, as it addresses multiple environmental challenges simultaneously.

Strategic Significance & Outlook

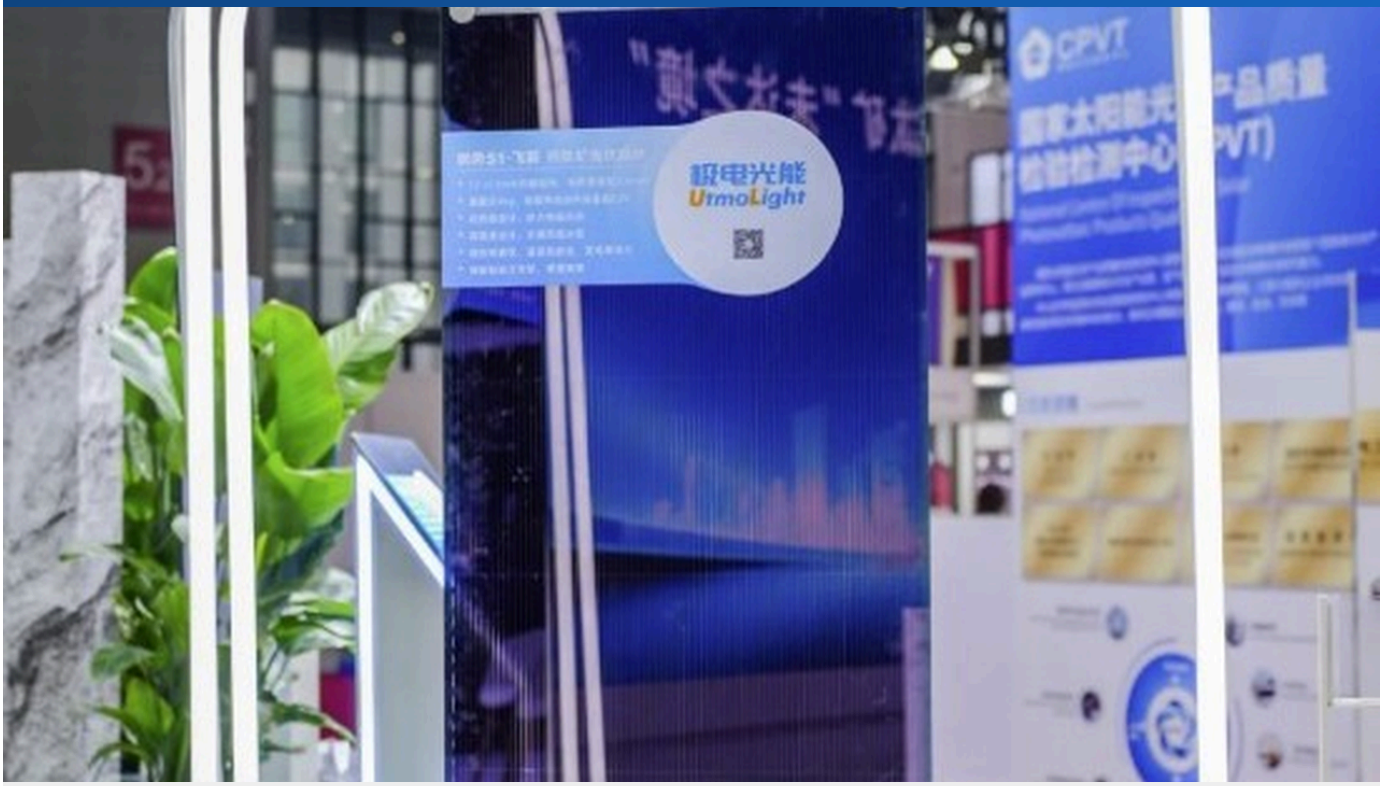
The findings from Cornell University's study highlight the immense potential of perovskite tandem PV in agrivoltaics. The projected annual CO_2 reductions of tens of millions of tons and water savings of billions of cubic meters could have a profound impact on both climate change mitigation and water resource conservation. If this research leads to further demonstration projects and policy support, agrivoltaics could become a leading strategy for achieving both renewable energy targets and food security. Investors should view this sector through an Environmental, Social, and Governance (ESG) lens, recognizing the potential for sustainable growth. Engineers will be crucial in developing new designs and deployment methods to optimize perovskite tandem PV for agricultural environments, ensuring both energy yield and crop vitality. This study illuminates a future where energy and food systems are more integrated and sustainable.

Source: https://www.pv-magazine.com/2026/06/17/perovskite-tandem-pv-for-agrivoltaics/

Collected: June 19, 2026 | Automated Research System (Gemini API)

UtmoLight Unveils New Perovskite Solar Module Series at SNEC 2026, Including 2.81m², 500W Weather-Resistant "Chuangshi S2"

Published June 16, 2026 pv magazine Global China



OVERVIEW

Chinese perovskite solar module manufacturer UtmoLight launched its new "Chuangshi S2" and "S1" module series at SNEC 2026. The Chuangshi S2 is a large 2.81m², 500W weather-resistant module designed to withstand 5,400Pa mechanical loads and has received TÜV Rheinland certification. The Chuangshi S1, an ultralight module, targets distributed PV, BIPV, and low-load rooftop applications. These product introductions indicate perovskite solar cells are entering a commercialization phase, addressing diverse market demands with practical, robust solutions.

IN DEPTH

Key Findings

UtmoLight, a Chinese perovskite solar module manufacturer, unveiled its new "Chuangshi S2" and "S1" module series at SNEC 2026. The "Chuangshi S2" is particularly notable: a large-format 2.81m² module delivering 500W output, engineered to withstand 5,400Pa mechanical loads, and certified by TÜV Rheinland for its robust weather resistance. The "Chuangshi S1" is an ultralight module specifically designed for distributed PV, Building-Integrated Photovoltaics (BIPV), and low-load rooftop applications. These product launches signal that perovskite solar cells are moving beyond the research phase, entering the market as comprehensive commercial products addressing diverse demands.

Product Details and Technical Specifications

The Chuangshi S2 module represents a robust offering for high-performance applications. With dimensions of 2.81m² and a power output of 500W, it is designed for demanding environments, capable of withstanding mechanical loads up to 5,400Pa. Its TÜV Rheinland certification provides crucial validation of its reliability and durability, targeting large-scale rooftop installations and industrial applications where high power and resilience are paramount. In contrast, the Chuangshi S1 module features an ultralight design, making it ideal for distributed PV systems, Building-Integrated Photovoltaics (BIPV), and low-load rooftops—applications where weight and flexibility are critical considerations due to structural limitations or aesthetic integration requirements. Both series leverage advanced perovskite solar cell technology, capitalizing on its inherent advantages of high efficiency, thin-film potential, and lightweight construction. The introduction of these diverse series demonstrates UtmoLight's increasing maturity in perovskite technology, positioning the company to meet various market demands effectively.

Background & Industry Context

Perovskite solar cells are hailed as a next-generation technology with the potential to surpass the theoretical efficiency limits of silicon solar cells. However, commercialization has faced challenges related to improving stability, establishing large-scale production techniques, and ensuring cost competitiveness. China stands as a global leader in the solar photovoltaic industry, with numerous companies dedicating significant efforts to perovskite research, development, and mass production. The market introduction of concrete product series by companies like UtmoLight, coupled with third-party certifications, serves as crucial evidence that these commercialization hurdles are being overcome. Durability and certification are indispensable for commercial adoption. Certification from international bodies such as TÜV Rheinland guarantees product reliability and quality, accelerating market acceptance. Furthermore, ultralight modules open new possibilities for BIPV and existing building rooftops, where traditional heavy silicon modules were impractical, expanding the addressable market for solar energy.

Strategic Significance & Outlook

UtmoLight's launch of its new module series is expected to intensify competition within the perovskite solar cell market and further accelerate technological innovation. High-power, high-durability modules like the Chuangshi S2 are likely to see adoption in large-scale projects and industrial facilities, while lightweight, flexible modules such as the Chuangshi S1 will tap into new market segments, including urban buildings and mobile applications. This diversification will enable solar power to penetrate society in more varied forms, strongly driving the transition to renewable energy. Investors should closely observe the market reception and expansion of production capacity for these products. Engineers will be tasked with developing designs and installation solutions that maximize the unique characteristics of perovskite technology, ensuring its optimal integration into diverse environments and accelerating its impact on global energy sustainability.

Source: https://www.pv-magazine.com/2026/06/16/utmolight-launches-new-perovskite-solar-module-series/

Trinasolar Sets World Record with 907W Output and 29.2% Aperture Area Efficiency for 210mm Perovskite/C-Si Tandem Module

Published June 18, 2026 Renewable Energy Magazine China

OVERVIEW

Trinasolar announced a new world record for its independently developed perovskite/crystalline silicon tandem module, achieving a peak output of 907W and 29.2% aperture area module efficiency, verified by TÜV SÜD. This achievement is based on the industry-standard 210mm large-area tandem cell technology system. Performance improvements were realized through multiple technological innovations, including enhanced uniformity of the perovskite thin film, upgraded interface passivation solutions, and optimized spectral absorption matching in the tandem structure. This represents a significant advance towards commercializing high-efficiency solar modules at scale, poised to significantly alter the competitive landscape of the photovoltaic industry.

IN DEPTH

Key Findings

Trinasolar has announced a new world record for its independently developed perovskite/crystalline silicon tandem module, achieving a peak output of 907W and an aperture area module efficiency of 29.2%, as verified by TÜV SÜD. This groundbreaking achievement is built upon an industry-standard 210mm large-area tandem cell technology system, clearly demonstrating its suitability for industrial applications and its high potential for large-scale commercial manufacturing. This represents a significant leap forward in pushing photovoltaic efficiency to the next level.

Technical Details

The record-setting module achieved a 907W peak power output and an impressive 29.2% module aperture area efficiency, rigorously verified by the German independent certification body, TÜV SÜD. This performance was realized through a sophisticated 210mm large-area tandem cell technology system, making it directly compatible with existing high-volume manufacturing lines. Key factors contributing to this enhanced performance include significant improvements in the uniformity of the perovskite thin film, an upgrade in interface passivation solutions, and optimized spectral absorption matching within the tandem structure. The perovskite layer is engineered to efficiently absorb high-energy wavelengths, while the silicon layer captures the remaining light spectrum, resulting in a synergistic boost in overall efficiency far exceeding conventional single-junction silicon modules. This achievement not only demonstrates Trinasolar's leadership but also firmly positions Chinese companies at the forefront of advanced photovoltaic technology.

Background & Context

Photovoltaic technology is in a constant state of evolution, with perovskite-silicon tandem technology emerging as the most promising approach globally to surpass the theoretical efficiency limits (approximately 26-27%) of traditional silicon solar cells. Trinasolar, as one of China's leading solar manufacturers, has driven the development of this cutting-edge technology, backed by substantial R&D investments and massive production capabilities. While many research institutions and companies have reported efficiency improvements in tandem cells over the past few years, achieving over 900W output and high aperture area efficiency in a commercially scalable module indicates that its practical deployment is imminent. Furthermore, the global competition for commercialization is intensifying, as evidenced by U.S. startup Tandem PV also achieving 29.7% efficiency with its perovskite-silicon panels and establishing a demonstration factory for commercial production.

Strategic Significance & Outlook

This world record set by Trinasolar holds the potential to be a game-changer for the solar photovoltaic industry. High-power, high-efficiency modules can generate more electricity from a limited installation area, thus contributing to relative cost reductions and maximizing power generation for residential, commercial, and even large-scale solar farms. This will further accelerate the adoption of solar power and strongly support the transition to renewable energy. Notably, Trinasolar's first commercial contract with a high-end distributed generation customer in New Zealand signals that this technology is already gaining market acceptance, making its future global market expansion a keenly watched development.

Source: https://www.renewableenergymagazine.com/pv_modules/trinasolar-achieves-907w-power-output-for-its-tandem-20260618

Collected: June 19, 2026 | Automated Research System (Gemini API)

Sungkyunkwan Professor Park Advocates for South Korea to Focus on Single-Junction Perovskite Cell Advances Amid Rising AI, Space Demand

Published June 16, 2026 Maeil Business News Korea (Mk.co.kr) South Korea

OVERVIEW

Professor Park Nam-gyu of Sungkyunkwan University, a global authority on solid-state perovskite solar cells, highlighted the surging demand for lightweight, high-efficiency next-generation solar cells in AI data centers and the space industry. Amid China's construction of gigawatt-scale perovskite-silicon tandem factories, Professor Park advocates for South Korea to concentrate on advancements in single-junction perovskite cells. Research aimed at improving perovskite stability and efficiency is accelerating the global race for commercialization, and this strategic recommendation outlines a unique path for South Korea to maintain competitiveness in the global solar market.

IN DEPTH

Key Findings

Professor Park Nam-gyu of Sungkyunkwan University, a global authority on solid-state perovskite solar cells, has advocated for South Korea to strategically focus on advancing single-junction perovskite cell technology. This recommendation aims to meet the growing demand for lightweight, high-efficiency next-generation solar cells in emerging sectors such as AI data centers and the space industry. This emphasis comes as China builds gigawatt-scale perovskite-silicon tandem factories, underscoring the need for South Korea's unique competitive strategy. Continued research into perovskite stability and efficiency is accelerating the global commercialization race.

Technical and Policy Recommendation Details

Professor Park Nam-gyu, a world-renowned expert in solid-state perovskite solar cells from Sungkyunkwan University, has put forth a strategic recommendation for South Korea. He emphasizes focusing on the technological advancement of single-junction perovskite cells to address the escalating demand for lightweight and high-efficiency next-generation solar cells from sectors like AI data centers and the burgeoning space industry. This policy recommendation is particularly significant given China's aggressive pursuit of gigawatt-scale perovskite-silicon tandem factories. Professor Park argues that while China targets large-scale tandem production, South Korea should carve out its niche by excelling in single-junction technology, leveraging its strengths in precision manufacturing and materials science. The ongoing research priorities revolve around enhancing the stability and efficiency of perovskite materials, which are critical factors in the global race for commercialization. Perovskites offer distinct advantages in weight and flexibility over traditional silicon, making them highly suitable for space applications where mass is directly correlated with performance and cost.

Background & Industry Context

Perovskite solar cells are among the fastest-evolving photovoltaic technologies, often dubbed "dream solar cells" due to their high conversion efficiency and ease of manufacturing. However, their commercialization has primarily been challenged by issues of long-term stability, lead toxicity, and scalability for mass production. China, with substantial government support and investment, is leading the world in perovskite commercialization, particularly in developing perovskite-silicon tandem structures and constructing gigawatt-scale factories. South Korea, leveraging its strengths in precision manufacturing and materials science from its semiconductor and display industries, has a strong track record in perovskite research. Professor Park’s recommendation stems from the recognition that South Korea needs to pursue a distinct, competitive niche market strategy, differing from China's large-scale tandem approach. Single-junction perovskite cells, with their lightweight and flexible properties, could generate high added value in specific high-end applications like spacecraft, drones, and wearable devices.

Strategic Significance & Outlook

Professor Park's strategic recommendation could significantly influence the direction of South Korea's perovskite solar cell R&D. If single-junction cell stability and efficiency further improve, these cells could become groundbreaking energy solutions, contributing to energy savings in AI data centers and meeting the demands of space development companies like SpaceX. Specifically, realizing "dream solar cells" for the space industry, with their light weight and high efficiency, could revolutionize space exploration and commercial space activities by enabling increased payloads and extended mission durations. This field for South Korea will be a critical factor in future technology roadmaps and market competition, making it a key development for researchers, engineers, and investors to watch closely. This tailored strategy could secure South Korea a unique and valuable position in the global advanced solar market.

Source: https://www.mk.co.kr/news/english/11059424

Perovskite Solar Cells in 2026: Stability, Lead Management, and Manufacturing Scale-Up Poised to Surpass Silicon Limits

Published June 17, 2026 TaiyangNews (YouTube) International

OVERVIEW

An analysis on the status of perovskite solar cells in 2026 highlights stability, toxicity (lead management), and manufacturing scale-up as key areas of focus. The discussion emphasizes advancements in tandem cells, improved long-term stability, progress in large-scale production techniques, and breakthroughs in lead emission control. It concludes that perovskite solar cells, capable of high efficiency and low-cost manufacturing, possess the potential to surpass the theoretical limits of conventional silicon-based solar cells. This underscores both the immediate challenges and immense potential for the commercialization of next-generation photovoltaic technology.

IN DEPTH

Key Findings

A video from TaiyangNews provides a detailed analysis of the current status of perovskite solar cells in 2026, highlighting stability, toxicity (lead management), and manufacturing scale-up as primary areas of focus. The discussion emphasized significant progress in tandem cell technology, notable improvements in device stability, and innovations in manufacturing processes tailored for large-scale production. These advancements conclude that perovskite solar cells are capable of high-efficiency, low-cost manufacturing, and possess the potential to surpass the theoretical limits of conventional silicon-based solar cells.

Technical Challenges and Progress

Historically, maintaining performance under long-term environmental exposure has been a major challenge for perovskite solar cells. However, significant progress has been made through novel encapsulation techniques and material refinements, substantially enhancing their stability, particularly against moisture and heat. Regarding toxicity, concerns over the environmental impact of lead, commonly used in perovskite solar cells, are being addressed. This includes developing technologies for reducing lead content, implementing robust encapsulation strategies to prevent lead leakage, and actively researching lead-free perovskite materials. Scaling up from small-area laboratory cells to commercially viable large-area modules has also been a significant hurdle. Now, efficient and low-cost large-scale manufacturing techniques, such as slot-die coating and roll-to-roll processes, are maturing. Furthermore, perovskite-silicon tandem cells, which combine perovskite with silicon solar cells, have already achieved efficiencies exceeding 30%, breaking the limits of single-junction cells by utilizing a broader spectrum of solar energy. These collective technical advancements clearly indicate that perovskite solar cells are steadily progressing towards practical application and commercial viability.

Background & Industry Context

Since their first report in 2009, perovskite solar cells have garnered attention as a "game-changer" in the photovoltaic industry due to their rapid efficiency improvements. However, despite their high efficiency, commercialization has been hindered by issues of durability, environmental safety (especially lead content), and the establishment of mass production technologies. The global photovoltaic industry constantly seeks new technologies that offer higher efficiency and lower Levelized Cost of Electricity (LCOE) to accelerate the worldwide shift towards renewable energy. By 2026, numerous concrete solutions to these challenges have been proposed and are entering the demonstration phase. The video illustrates that major companies and research institutions are actively focusing on developing technologies to manufacture stable, high-efficiency modules while mitigating environmental impact.

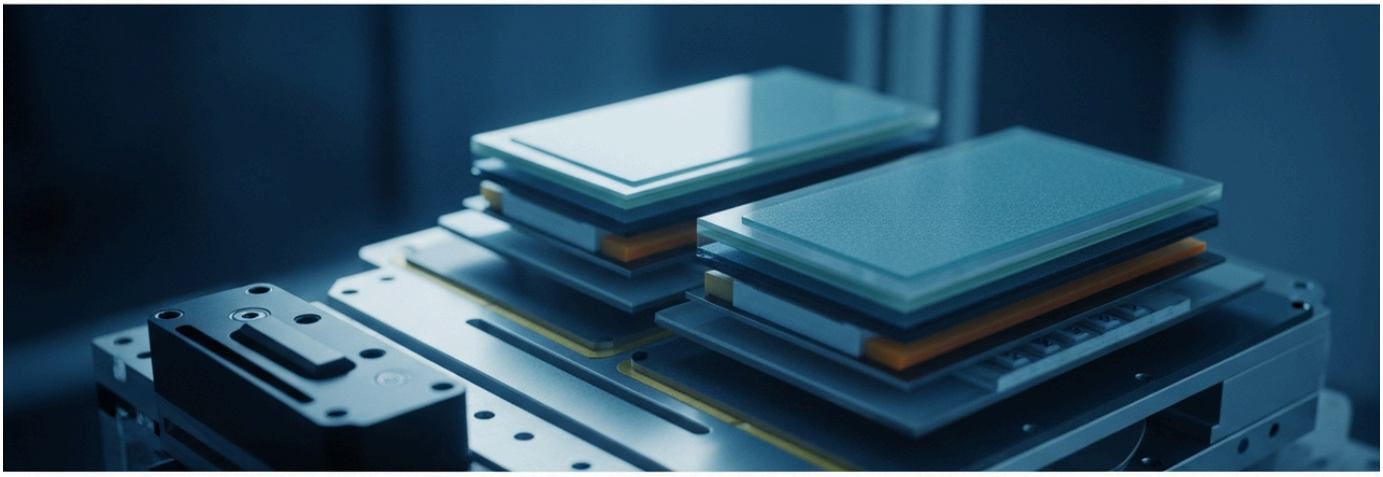
Strategic Significance & Outlook

Breakthroughs in stability, toxicity management, and manufacturing scale-up are poised to significantly accelerate the commercial adoption of perovskite solar cells. The combination of high efficiency and low-cost manufacturing capabilities will dramatically enhance the cost-effectiveness of solar power, potentially complementing or partially replacing the existing silicon solar cell market. Given their lightweight and flexible nature, perovskites are expected to find diverse applications, including Building-Integrated Photovoltaics (BIPV), wearable devices, IoT sensors, and space applications. The evolution of this technology will further expand the role of solar power in the global energy mix, becoming indispensable for achieving a sustainable society. Investors, policymakers, and engineers must continue to pay close attention to the opportunities and challenges presented by this rapidly evolving field, as it promises to be a pivotal component of future energy infrastructures.

Source: https://www.youtube.com/watch?v=S3O_7eFz8S0

Perovskite-Silicon Tandem Solar Cells Exceed 30% Efficiency, LONGi Publishes 31.25% Breakthrough in Nature

Published June 11, 2026 SolarQuarter International



OVERVIEW

A recent tech newsletter reports that perovskite-silicon tandem solar cells are pushing photovoltaic efficiency above 30%. This stacked architecture significantly reduces energy losses, enabling conversion efficiencies far surpassing conventional silicon modules. The newsletter also highlights LONGi's publication in Nature on its silicon-perovskite tandem solar cell research using a double-layer interface passivation, and EPFL and CSEM's achievement of 31.25% efficiency with a perovskite-on-silicon tandem solar cell. These advancements underscore the rapid evolution of next-generation solar cell technology.

IN DEPTH

Key Findings

A recent weekly tech newsletter reported that perovskite-silicon tandem solar cells are pushing photovoltaic efficiency beyond 30%. This stacked architecture significantly reduces energy losses, enabling conversion efficiencies far surpassing conventional silicon modules. Specifically, LONGi announced research findings on silicon-perovskite tandem solar cells utilizing double-layer interface passivation in Nature, and EPFL and CSEM jointly achieved 31.25% efficiency with a perovskite-on-silicon tandem solar cell. These reports indicate that next-generation solar cell technology is rapidly evolving and establishing new standards for high efficiency.

Technical Details and Efficiency Records

The core finding is that perovskite-silicon tandem solar cells are consistently achieving efficiencies above 30%, representing a significant leap over single-junction cells. This is primarily due to their stacked architecture, which effectively minimizes energy losses by utilizing different spectral absorption ranges. LONGi's research, published in the prestigious journal Nature, highlights the success of a double-layer interface passivation technique for silicon-perovskite tandem solar cells. This advanced interface engineering is crucial for reducing recombination losses at critical interfaces, thereby boosting overall efficiency. Concurrently, a joint effort by EPFL (Swiss Federal Institute of Technology Lausanne) and CSEM (Swiss Center for Electronics and Microtechnology) has achieved a verified 31.25% efficiency for a perovskite-on-silicon tandem solar cell. These technologies capitalize on the ability of the perovskite layer to absorb short-wavelength light efficiently and the silicon layer to capture longer-wavelength light, maximizing the utilization of the solar spectrum.

Background & Industry Context

The solar photovoltaic industry is relentlessly pursuing efficiency improvements as a cornerstone of addressing climate change and achieving energy sustainability. With conventional silicon solar cells nearing their physical efficiency limits, new technologies are imperative for further breakthroughs. Perovskite-silicon tandem solar cells have emerged as one of the most promising solutions to this challenge, with numerous research institutions and companies fiercely competing to enhance their efficiency. Publications in prestigious scientific journals like Nature and record-breaking achievements by top-tier research institutions such as EPFL and CSEM signify that this technology is scientifically well-validated and making steady progress towards practical application. The focus on detailed technical innovations, such as double-layer interface passivation, is critical for reducing charge carrier recombination losses and further pushing efficiency boundaries.

Strategic Significance & Outlook

The consistent achievement of over 30% efficiency by perovskite-silicon tandem solar cells, coupled with reports from leading scientific journals and research institutions, signals a very bright future for solar power. As these technologies scale up to commercial production, the cost-effectiveness of solar electricity is expected to dramatically improve, accelerating widespread adoption globally. Maximizing power generation per unit area will become feasible across residential, commercial, and utility-scale solar farms, significantly contributing to the expansion of renewable energy. Investors should keenly observe the commercialization and market rollout of these high-efficiency technologies, while engineers will be crucial in designing and optimizing manufacturing processes to integrate these cutting-edge advancements into real-world products. This evolution is key to making a sustainable energy future a tangible reality.

Source: https://solarquarter.com/2026/06/11/weekly-tech-newsletter-explore-the-latest-breakthroughs-in-solar-storage-and-more/

Chinese Solar Giants to Launch "Computing Satellite" with GCL's 30.2% Efficient Perovskite-Silicon Tandem Modules This Year

Published June 11, 2026 Yicai Global China

OVERVIEW

Chinese solar power giants are venturing into space-based solar power, investing in perovskite technology to achieve cost-effective and scalable space energy systems. GCL Optoelectronic Material and Ziwei Network Technology announced plans to launch their self-developed "computing satellite" within the year, which will be equipped with GCL's perovskite solar cell array. GCL has achieved a certified conversion efficiency of 30.2% for its 2,042 square centimeter perovskite-silicon tandem module, holding the potential to revolutionize power supply in space.

IN DEPTH

Key Findings

Leading Chinese solar power companies are aggressively entering the space-based solar power (SSPP) market, investing heavily in perovskite technology to realize cost-effective and scalable space energy systems. GCL Optoelectronic Material and Ziwei Network Technology have announced plans to launch their self-developed "computing satellite" within the year, which will be equipped with GCL's perovskite solar cell array. GCL has already achieved a high certified conversion efficiency of 30.2% for its 2,042 square centimeter perovskite-silicon tandem module, demonstrating its potential to revolutionize power supply in space.

Technical and Space Application Details

Chinese solar giants are making a strategic foray into the space-based solar power (SSPP) market, driven by the potential of perovskite technology to offer lower costs and enhanced scalability for extraterrestrial energy systems. GCL Optoelectronic Material, in collaboration with Ziwei Network Technology, plans to launch its proprietary "computing satellite" before the end of the year. This satellite will feature a perovskite solar cell array developed by GCL. Critically, GCL has already demonstrated a robust certified conversion efficiency of 30.2% for its perovskite-silicon tandem module, sized at a practical 2,042 square centimeters. Perovskite solar cells are exceptionally well-suited for space applications due to several key advantages over traditional silicon cells, including their lighter weight, greater flexibility, and potential for higher radiation tolerance. The impressive 30.2% efficiency is crucial for maximizing power generation from the limited surface area available on satellites, enabling more ambitious missions and extended operational lifetimes in orbit.

Background & Context

Space-based solar power has long been envisioned as one of the ultimate solutions to Earth's energy crises. However, its realization has been hampered by significant challenges: the need for ultralight and highly efficient solar cells, and substantial cost reductions for deployment. China has made rapid advancements in space exploration and is increasingly interested in SSPP to secure energy independence and technological leadership. Perovskite solar cells are uniquely positioned to address these challenges. Beyond their excellent power conversion efficiency, their thin-film, lightweight nature, and ability to be deposited on various flexible substrates offer significant design freedom for satellite and spacecraft solar arrays. Furthermore, their relatively lower manufacturing cost is a crucial advantage for the large-scale deployment required by SSPP projects, differentiating them from traditional, more expensive space-grade solar cells.

Strategic Significance & Outlook

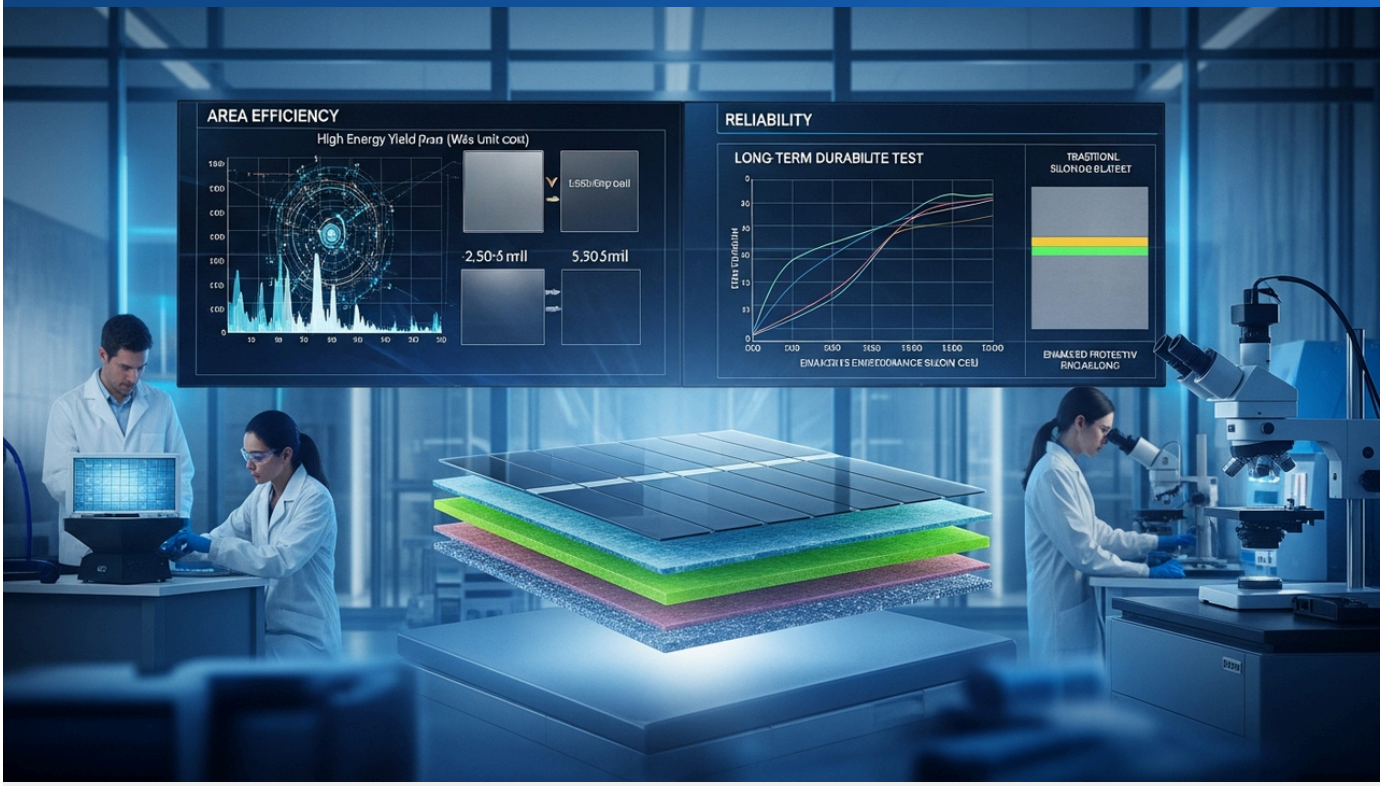
The launch of GCL's "computing satellite" will mark one of the first instances where perovskite solar cell technology demonstrates its performance under the extremely harsh conditions of space. The 30.2% efficient 2,042 cm^2 tandem module has the potential to dramatically enhance satellite power capabilities, enabling larger payloads and longer mission durations. This will open new opportunities in areas such as space communications, Earth observation, and even deep-space exploration. This move by Chinese solar giants signals the dawn of new competition in the space energy market and represents a critical step in expanding the commercial application scope of perovskite technology beyond Earth. Investors should closely monitor the long-term growth opportunities presented by this nascent "space energy revolution," as it promises to be a transformative force in both energy and aerospace sectors.

Source: https://www.yicaiglobal.com/news/chinese-solar-giants-venture-into-space-power-with-lower-cost-pv-tech

Collected: June 19, 2026 | Automated Research System (Gemini API)

Perovskite-Silicon Tandem Technology Redefines Solar PV "Value Proposition" from $/W to Area Efficiency & Bankability

Published June 11, 2026 찰리 (Charlie) South Korea



OVERVIEW

Perovskite-silicon tandem solar cells are fundamentally shifting the solar PV industry's value criteria from simple cost per watt to maximum power generation per limited area and financial bankability. This technology surpasses conventional silicon cell efficiency limits, offering significant economic and strategic importance, particularly in land-constrained regions like Japan, Korea, and Europe.

IN DEPTH

Key Findings: Perovskite-Silicon Tandems Reshape Solar PV Investment Metrics

The emerging perovskite-silicon tandem solar cell technology is fundamentally transforming the solar photovoltaic industry's valuation framework. The focus is rapidly shifting from a simple dollars-per-watt ($/Wp) metric to maximizing power output per unit of land area and, crucially, establishing project bankability. This represents a paradigm shift beyond incremental efficiency gains, impacting how investors and developers evaluate solar projects globally.

Technical & Economic Details: Breaking Efficiency Barriers and Financial Viability

Perovskite-silicon tandem cells hold the promise of significantly exceeding the theoretical efficiency limit of single-junction silicon cells (approximately 27%), with projections reaching over 30% efficiency. This higher efficiency is particularly critical in regions with high land costs and limited available space, such as Japan, South Korea, and parts of Europe, where maximizing energy yield from a smaller footprint drastically improves return on investment. The concept of "bankability"—the ability of a project to secure financing from major financial institutions—is paramount. For perovskite technology, this not only requires high efficiency but also proven long-term stability, durability under real-world conditions, and reliable performance guarantees. Extensive outdoor demonstration data and robust reliability assessments are currently underway to meet these stringent financial criteria.

Background & Industry Context: Rising Demand for Space-Efficient Renewable Energy

As the global transition to sustainable energy accelerates, solar power continues to expand its role as a primary renewable source. However, traditional silicon solar cells have faced a plateau in efficiency improvements. Perovskite-silicon tandem technology offers a compelling solution to this challenge, enabling more clean energy generation from smaller land areas. This innovation is especially vital for meeting increasing energy demands in urban environments and developing nations, where high area-efficiency power generation technologies are indispensable.

Strategic Significance & Outlook: Enhancing Competitiveness in Premium Markets

With its potential for high efficiency and miniaturization, perovskite-silicon tandem technology is poised to enhance competitiveness in premium markets where land is a scarce resource. In such markets, power generation per unit area is valued more highly than simple cost-per-watt, giving this technology a significant competitive edge and allowing for greater added value. As mass production capabilities advance and reliability is further established, perovskite-silicon tandems are expected to play a central role in the global energy mix and become an increasingly attractive option for investors seeking high-performance, sustainable energy assets.

Source: https://brunch.co.kr/@charleyk/177

Collected: June 19, 2026 | Automated Research System (Gemini API)

GCL Perovskite Announces 500MW Production Line Operation and Commercial Module Shipment by Q3 2026 at SNEC 2026, Targeting Space Applications with 4T Tandem

Published June 16, 2026 TaiyangNews (YouTube) China

OVERVIEW

GCL Perovskite President Dr. Phan announced at SNEC 2026 that the company's 500MW production line is operational, with commercial perovskite module shipments starting by Q3 2026. The company emphasized the advantages of its 4-terminal (4T) tandem architecture, including improved performance on cloudy days, and highlighted a world-record 22% efficient flexible module paving the way for next-generation space applications.

IN DEPTH

Key Findings: GCL Perovskite Commences 500MW Production Line and Initiates Commercial Module Shipments

At SNEC 2026, Dr. Phan, President of GCL Perovskite, announced a significant milestone for the company: their 500MW perovskite solar cell production line is now fully operational, with commercial module shipments slated to begin by the end of Q3 2026. This declaration positions GCL as a frontrunner in the industrial-scale commercialization of perovskite photovoltaic technology, marking a pivotal moment for the global solar industry.

Technical & Manufacturing Details: Advantages of 4T Tandem and Forays into Space Applications

Dr. Phan elaborated on the distinct advantages of GCL's 4-terminal (4T) tandem architecture. This design is engineered to significantly enhance power generation efficiency, particularly under suboptimal conditions such as cloudy days, addressing a key limitation of traditional silicon-based solar cells. Furthermore, GCL Perovskite has achieved a world-record 22% conversion efficiency with its flexible perovskite modules, a breakthrough poised to unlock next-generation space applications, including power sources for satellites and space stations. The operational 500MW production line provides the necessary capacity to mass-produce these high-efficiency modules for diverse terrestrial and extra-terrestrial markets.

Background & Industry Context: China's Dominance in Commercialization Race

This announcement by GCL Perovskite reinforces China's accelerating leadership in the perovskite solar cell commercialization race. While many competitors are still in the research and pilot stages, GCL is demonstrating concrete mass production capabilities and a clear shipment timeline, solidifying its position as an early market entrant. The specific mention of space applications is strategically significant, indicating perovskite's potential to not only address terrestrial energy challenges but also to revolutionize power supply for space exploration and satellite technology.

Strategic Significance & Outlook: Market Penetration and New Frontier Creation

The commencement of commercial module shipments by GCL Perovskite is a critical step towards broader market penetration for perovskite solar cells. The superior performance of their 4T tandem technology, particularly in varying light conditions, is expected to enhance customer value and stimulate new market demands. Moreover, GCL's expansion into space applications highlights the technology's versatile potential and its capacity to open new frontiers beyond existing markets. The impact of perovskite solar cells on the energy industry is expected to be profound in the coming years, driven by such commercialization efforts and innovative application developments.

Source: https://www.youtube.com/watch?v=F3P_M6k1h7M

Collected: June 19, 2026 | Automated Research System (Gemini API)

Trinasolar Achieves World-Record 29.2% Efficiency for Perovskite-Silicon Tandem Solar Module; Tandem PV Initiates Mass Production in US

Published June 14, 2026 CleanTechnica USA

OVERVIEW

Trinasolar set a world record on June 9th, achieving 29.2% power conversion efficiency and 907 watts output for an industrial-sized perovskite-silicon tandem solar module, verified by TÜV SÜD. Concurrently, US-based Tandem PV launched a pilot factory in Fremont, California, to establish mass production for commercial perovskite-silicon tandem solar cells. These developments accelerate the commercialization of high-efficiency tandem technology.

IN DEPTH

Key Findings: Trinasolar Sets World Record with 29.2% Efficiency for Perovskite-Silicon Tandem Module

A new benchmark has been established in the solar photovoltaic industry: Trinasolar, a leading solar manufacturer, achieved a world record of 29.2% power conversion efficiency for an industrial-sized perovskite-silicon tandem solar module, yielding an impressive 907 watts. This achievement, independently verified by TÜV SÜD on June 9, 2026, unequivocally demonstrates the commercial viability of achieving high efficiencies with tandem technology at scale.

Technical & Manufacturing Details: High-Power Modules and US Manufacturing Expansion

The 29.2% efficiency mark attained by Trinasolar significantly surpasses the conventional limits of silicon-only solar cells, realized by integrating a perovskite layer on top of a silicon heterojunction cell. The module's 907-watt output makes it highly attractive for large-scale commercial and industrial applications. In a parallel development, US-based Tandem PV has launched a pilot factory in Fremont, California, aimed at establishing mass production capabilities for perovskite-silicon tandem solar cells for the commercial market. This facility is crucial for scaling up production and bolstering domestic clean energy manufacturing capacity within the United States, signifying a rapid transition from research to practical, large-scale deployment.

Background & Industry Context: Global Efficiency Race and Commercialization Pressures

The global solar market is under continuous pressure to enhance efficiency and reduce costs to meet escalating demands for climate action and energy security. Perovskite-silicon tandem technology is recognized as one of the most promising solutions to these challenges, with major companies and research institutions worldwide intensely competing to break efficiency records and develop mass production techniques. Trinasolar's record underscores the fierce competition and the rapid pace of innovation characterizing this cutting-edge field.

Strategic Significance & Outlook: Accelerating Energy Transition and Market Impact

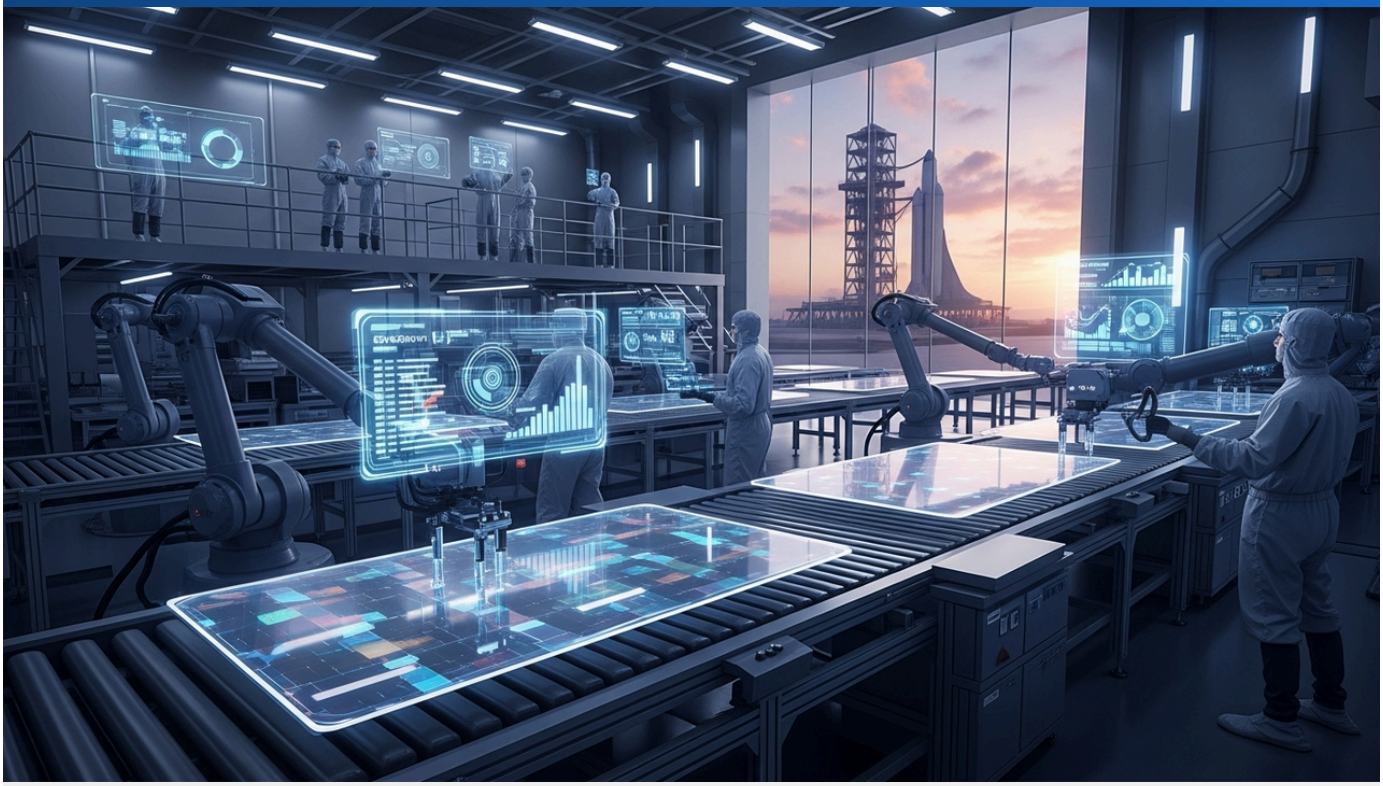
The dual milestones of Trinasolar's efficiency record and Tandem PV's operational pilot factory in the US signal that perovskite-silicon tandem solar cells are poised for large-scale market introduction in the near future. This will likely lead to further improvements in the cost-performance ratio of solar PV, accelerating the global transition to renewable energy. Crucially, the ability to generate significantly more power from a limited installation area will catalyze solar adoption in urban environments and land-constrained regions, thereby diversifying the energy mix and making a substantial contribution to sustainable development.

Source: https://cleantechnica.com/2026/06/14/world-record-solar-efficiency-perovsite-silicon-trinasolar/

Collected: June 19, 2026 | Automated Research System (Gemini API)

Perovskite Solar Cells' "High Efficiency, Reliability, and Bankability" Become Key to Commercialization as SpaceX IPO Nears

Published June 11, 2026 시사저널e (Sisajournal-e) South Korea



OVERVIEW

With SpaceX's IPO approaching, interest in perovskite solar cells as a next-generation technology is surging. Success in the commercialization race hinges not just on high efficiency but crucially on real-world outdoor performance data, long-term product warranties, and project bankability. Perovskite-silicon tandem cells, in particular, are poised to establish a new paradigm in the solar industry.

IN DEPTH

Key Findings: Perovskite Commercialization Success Factors Re-evaluated Amid SpaceX IPO Buzz

As Elon Musk's space exploration company, SpaceX, moves closer to its initial public offering (IPO), attention on perovskite technology as a promising next-generation solar cell has reignited. Within this context, the critical success factors for commercializing perovskite solar cells are being re-evaluated. It is becoming clear that merely achieving high power conversion efficiency is insufficient; long-term outdoor performance data, robust product warranties, and the overall financial bankability of projects are now considered paramount for market adoption.

Technical & Market Details: Tandem Architecture's Potential and Market Expectations

Specifically, perovskite-silicon tandem solar cells, which combine a perovskite layer with conventional silicon cells, offer the potential to surpass the efficiency limits of standalone silicon technology, promising to establish a new paradigm in the solar industry. This technology's ability to generate more power from a smaller footprint provides significant added value, especially in urban areas and for specialized industrial applications where land costs are high. However, for the market to fully embrace this technology, laboratory-scale efficiencies must be complemented by years of proven stable operation in outdoor environments and robust reliability data that can satisfy financial institutions for project financing. Companies and research institutions worldwide are currently accelerating validation and evaluation efforts to meet these stringent commercialization requirements.

Background & Industry Context: Energy Innovation for Space and Earth

SpaceX's expansive operations, particularly the deployment of its Starlink satellite constellation, dramatically increase the demand for power in space. Perovskite solar cells, owing to their lightweight, flexibility, and high efficiency, are considered ideal candidates for powering spacecraft and satellites, which further amplifies interest in their terrestrial applications. Success in the space sector could, in turn, bolster confidence in terrestrial commercialization. Thus, the twin trends of clean energy solutions on Earth and advanced space infrastructure are collaboratively driving perovskite technology forward.

Strategic Significance & Outlook: Reliability and Scalability as Cornerstones

For perovskite solar cells to achieve widespread commercial success, establishing long-term durability, reliability, and large-scale manufacturing capability (scalability) is crucial, alongside maintaining high efficiency. Investors and project developers will assess not only initial costs but also comprehensive lifecycle costs, including maintenance, stability of power generation, and product lifespan. Moving forward, companies that successfully overcome these challenges and secure the trust of financial markets will likely emerge as leaders in the next-generation solar cell market. The commercialization race is transitioning to a phase where adaptability to market needs and risk management capabilities are as vital as technological superiority.

Source: https://www.sisajournal-e.com/news/articleView.html?idxno=308461

Collected: June 19, 2026 | Automated Research System (Gemini API)

Oxford PV and Fraunhofer ISE Achieve 25.6% Efficiency for Perovskite-Silicon Tandem Module with Shingled Design

Published June 18, 2026 pv magazine Global Germany

OVERVIEW

Oxford PV, in collaboration with Fraunhofer ISE, achieved 25.6% power conversion efficiency for a perovskite-silicon tandem module incorporating Fraunhofer ISE's Matrix Shingle architecture. This innovative shingling design significantly reduces resistive and shading losses, thereby enhancing module-level energy yield and accelerating the commercialization of next-generation high-efficiency PV technology.

IN DEPTH

Key Findings: Oxford PV and Fraunhofer ISE Break Efficiency Barriers with Innovative Tandem Module

Oxford PV, a leader in perovskite solar cell technology, in collaboration with Germany's Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE), has successfully achieved a remarkable 25.6% power conversion efficiency for a perovskite-silicon tandem module utilizing the Matrix Shingle architecture. This significant breakthrough marks a substantial advancement in practical module-level efficiency, representing a crucial step towards the widespread commercialization of next-generation photovoltaic technology.

Technical Details: Performance Enhancement through Shingled Design

The new tandem module features the innovative "Matrix Shingle" design developed by Fraunhofer ISE. Shingling technology involves overlapping individual solar cells, similar to roof tiles, effectively reducing resistive losses at inter-cell connections and shading losses on the module surface. Unlike conventional module designs, which incur power losses due to gaps and wiring between cells, this shingled structure maximizes the module's effective light-absorbing area, leading to a substantial increase in energy yield. The synergy between Oxford PV's cutting-edge perovskite technology and Fraunhofer ISE's advanced module integration techniques ensures that high cell-level efficiencies are maintained at the module level, bolstering the competitive edge of this practical product.

Background & Industry Context: Driving High-Efficiency Technology Development in Europe

Europe has consistently been at the forefront of renewable energy technology development and commercialization, particularly in high-efficiency solar photovoltaics. Collaborations between leading institutions like Oxford PV and Fraunhofer ISE are vital strategies for rapidly translating research breakthroughs into market-ready products. Perovskite-silicon tandem technology is considered a game-changer, holding the potential to surpass the efficiency limits of existing silicon solar cells and deemed essential for achieving Europe's ambitious energy transition targets.

Strategic Significance & Outlook: Accelerating Commercialization and Diverse Installation Options

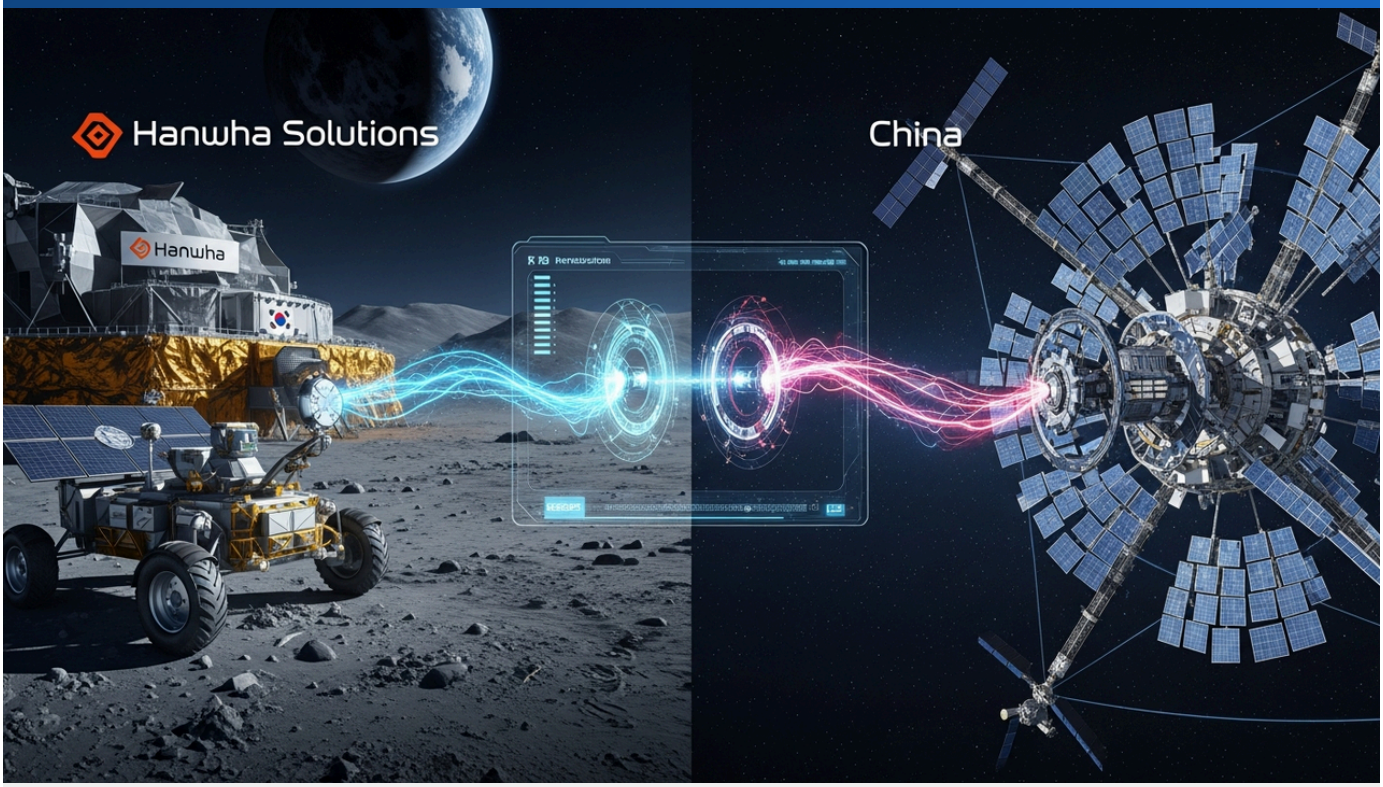
The announcement of this 25.6% efficient shingled tandem module indicates that Oxford PV is moving closer to commercial production. This technology is highly adaptable, suitable for various installation environments, including rooftop applications and large-scale solar farms. The reduction in resistive and shading losses directly translates to higher energy generation in real-world conditions, making it an attractive option for utilities and end-users alike. Further details are expected to be unveiled at Intersolar 2026, which will likely provide greater clarity on the technology's specific market deployment strategies and its potential to diversify global solar energy solutions.

Source: https://www.pv-magazine.com/2026/06/18/oxford-pv-achieves-25-6-efficiency-for-perovskite-silicon-tandem-module-based-on-shingled-design/

Collected: June 19, 2026 | Automated Research System (Gemini API)

South Korea and China Intensify Perovskite Mass Production Race for Space Solar Market: Hanwha Solutions Joins Lunar Probe, China Establishes Space Energy Alliance

Published June 17, 2026 유니콘팩토리 (Unicorn Factory) South Korea



OVERVIEW

South Korea and China are intensifying their mass production race for perovskite solar cells in the burgeoning space solar market. Hanwha Solutions (Korea) is accelerating its entry into the space sector by participating in a lunar probe demonstration project. Concurrently, Chinese solar companies have formed a new space energy alliance to develop perovskite cells for satellites, as both nations compete for leadership in space-based energy supply.

IN DEPTH

Key Findings: South Korea and China Vie for Perovskite Mass Production Dominance in Space Solar

A fierce mass production race for perovskite solar cells is underway between South Korea and China, specifically targeting the rapidly expanding space solar power market. Hanwha Solutions of South Korea is consolidating its foothold in the space sector through participation in a lunar probe demonstration project. In parallel, leading Chinese solar companies have formed a new space energy alliance, fast-tracking the development of perovskite solar cells for satellite applications. This trend underscores perovskite technology's potential to open new frontiers beyond terrestrial uses, addressing critical power supply needs in outer space.

Technical & Strategic Details: Contrasting Space Strategies from Korea and China

Hanwha Solutions is participating in a lunar probe demonstration project with the objective of validating the performance of high-efficiency, lightweight perovskite solar cells in the extreme space environment. This is a crucial step towards proving their reliability and durability for future space missions and infrastructure. Concurrently, a consortium of Chinese solar companies, backed by national initiatives, is accelerating the development of space energy technologies, focusing keenly on perovskite's potential as a power source for satellites. Perovskites are highly advantageous for space applications due to their lightweight nature, flexibility, and promising radiation resistance compared to traditional silicon-based solar cells. Both nations are striving to translate these technological advantages into mass production to establish leadership in the burgeoning space market.

Background & Industry Context: Expanding Space Economy and Energy Demands

The recent rapid expansion of the space industry, driven by increased satellite launches and ambitious lunar and Martian exploration plans, has dramatically amplified the demand for high-efficiency, reliable power solutions in space. The space environment presents extreme challenges, including drastic temperature fluctuations, intense radiation, and micrometeoroids, making it far more demanding than terrestrial conditions. Developing solar cells that can function stably in such an environment is critical for the success of space exploration, and perovskite technology, with its inherent lightweight and manufacturing flexibility, has emerged as a compelling candidate to address this formidable challenge.

Strategic Significance & Outlook: Global Diffusion of Perovskite in Space

The intensifying mass production race for space-grade perovskite solar cells between South Korea and China is a harbinger of the technology's widespread adoption in the extraterrestrial market. Both nations' competition is expected to further accelerate technological innovation, fostering the development of even higher-performance and more durable space-ready solar cells. In the long term, perovskite solar cells could become indispensable power sources for various space infrastructures, including lunar bases, orbital space stations, and vast satellite constellations, potentially ushering in a new era of space development and exploration.

Source: https://unicornfactory.co.kr/news/2026061708230559648