

Global Next-generation Solar Cells Market - 2025 -2032

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Abstracts

Global Next-Generation Solar Cells Market reached US\$ 4.21 billion in 2024 and is expected to reach US\$ 19.62 billion by 2032, growing with a CAGR of 21.21% during the forecast period 2025-2032.

The global next-generation solar cells market is advancing rapidly, fueled by innovations in perovskite and tandem solar technologies. Government-backed R&D is playing a central role—for instance, Japan has committed over US\$ 330 million through its Green Innovation Fund to support commercialization of next-gen solar cells. In the US, national labs like NREL are scaling research on high-efficiency solar technologies to enable mass production and grid integration. These developments signal growing institutional commitment to high-performance, sustainable solar solutions.

Next-Generation Solar Cells Market Trend

A key trend in the next-generation solar cell market is the rapid advancement of perovskite-silicon tandem technology, which reached a record efficiency of 33.7% in 2024, according to the US Department of Energy's National Renewable Energy Laboratory (NREL). Governments are actively backing this innovation—Japan's New Energy and Industrial Technology Development Organization (NEDO) allocated over ?6 billion (US\$ 40 million) in 2023 to support commercial-scale tandem cell research.

The European Union's Horizon Europe program committed €95 million (US\$ 103 million) toward next-gen solar R&D between 2022–2025. Meanwhile, China's Ministry of Science and Technology is funding over ?8 billion (~\$1.1 billion) for perovskite-silicon pilot lines. These public investments are accelerating commercialization and shaping a market expected to disrupt traditional PV by 2030.

Market Dynamics

Rapid Decline in Solar Cell Manufacturing Costs

The rapid decline in solar cell manufacturing costs is significantly driving the global next-generation solar cells market. According to the International Energy Agency (IEA), solar panel costs have decreased by 30% over the last two years, with prices for minerals and metals crucial for energy transitions also sharply dropping, especially the metals required for batteries. This reduction in costs has made solar photovoltaic (PV) technologies increasingly economically competitive with traditional fossil fuels, accelerating their adoption worldwide.

The IEA's Clean Energy Equipment Price Index hit a record low in early 2024, reflecting a 60% fall compared to 10 years ago, with Chinese solar panel prices down 60% and wind turbine prices down 50% since 2022. This significant cost reduction is attributed to factors such as economies of scale, technological advancements, and increased manufacturing capacity. The OECD also highlights that the dramatic increase in solar production capacity since 2020 has coincided with falling module prices and lower capacity utilization, indicating a strong correlation between increased capacity and reduced costs. These developments underscore the pivotal role of declining manufacturing costs in driving the growth and competitiveness of the next-generation solar cells market globally.

Supply Chain Challenges for Critical Raw Materials

Global supply chain challenges for critical raw materials are significantly impacting the next-generation solar cells market. The International Energy Agency (IEA) reports that high commodity prices and supply chain bottlenecks led to a 20% increase in solar panel prices over the past year, resulting in delays in solar panel deliveries worldwide.

Additionally, the Organization for Economic Co-operation and Development (OECD) highlights that export restrictions on critical raw materials have increased more than fivefold since 2009, with over 500 new raw mineral products affected by export restrictions in 2023 alone. These restrictions, particularly from countries like China, Vietnam, and Russia, have disrupted supply chains and increased prices, undermining the global expansion of renewable energy.

Segment Analysis

The global next-generation solar cells market is segmented based on solutions, material

type, application and region.

On-Grid Systems Segment Driving Next-Generation Solar Cells Market

The on-grid solar systems segment is a major driver of the global next-generation solar cells market. According to the International Renewable Energy Agency (IRENA), on-grid solar capacity worldwide reached over 950 GW by 2024, reflecting rapid adoption. The global share of on-grid solar in electricity generation increased to nearly 4.5% in 2023, up from under 0.5% a decade ago. IRENA projects on-grid solar could supply up to 30% of global electricity by 2030, driven by falling costs and government incentives. Advances in smart grid integration and energy storage are enhancing on-grid system efficiency and reliability. This growth supports decarbonization goals and strengthens energy security worldwide.

Geographical Penetration

North America Drives the Global Next-Generation Solar Cells Market

The demand for next-generation solar cells in North America is experiencing significant growth, driven by technological advancements and supportive policies. In the first half of 2024, the US produced 4.2 GW of photovoltaic (PV) modules, marking a 75% year-over-year increase, with production evenly split between thin-film and crystalline silicon technologies. This surge in domestic manufacturing reflects a strategic shift towards enhancing local production capabilities.

Notably, thin-film technologies, such as cadmium telluride (CdTe), are gaining traction due to their cost-effectiveness and efficiency in various applications. The US Energy Information Administration (EIA) forecasts a 75% increase in solar power generation, from 163 billion kilowatt-hours (kWh) in 2023 to 286 billion kWh in 2025, underscoring the expanding role of solar energy in the national grid. This growth is further supported by federal incentives and state-level renewable energy mandates.

Sustainability Analysis

The global next-generation solar cells market is emerging as a critical player in sustainable energy transitions. According to the International Energy Agency (IEA), solar PV additions must reach 630 GW annually by 2030 to align with net-zero targets, requiring a rapid expansion of manufacturing capacity. Despite comprising just 3% of global deployments from 2015 to 2023, thin-film PV technologies—common in next-gen

cells—makeup 17% of US utility-scale solar, as reported by the US Department of Energy. The National Renewable Energy Laboratory (NREL) notes that solar PV made up 56% of new global power capacity in 2022, but still accounts for only 5% of total electricity generation, indicating significant room for growth.

Competitive Landscape

The major global players in the market include JinkoSolar Holding Co., Ltd., Trina Solar Co., Ltd., JA Solar Technology Co., Ltd., First Solar, Inc., Hanwha Q CELLS Co., Ltd., Oxford Photovoltaics Ltd., Kaneka Corporation, Ascent Solar Technologies, Inc., GCL-New Energy Holdings Limited, and MiaSol?

Key Developments

In March 2024, State-of-the-art printed flexible solar cell technology developed by Australia's national science agency, CSIRO, was successfully launched into space today aboard Australia's largest private satellite, Optimus-1, on Space X's Transporter-10 mission. CSIRO is exploring the potential of printed flexible solar cells as a reliable energy source for future space endeavors, in collaboration with Australian space transportation provider, Space Machines Company.

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