

Solar Cell Market Assessment, By Type [Monocrystalline Cells, Polycrystalline Cells, Thin Film Cells, Passivated Emitter and Rear Contact Cells], By Application [Rural Electrification, Stand-Alone Systems, Solar Farms, Building-Integrated PV], By End-user [Residential, Commercial, Industrial], By Region, Opportunities and Forecast, 2018-2032F

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Report description:

Global solar cell market is projected to witness a CAGR of 15.07% during the forecast period 2025-2032, growing from USD 140.81 billion in 2024 to USD 432.84 billion in 2032. The market has experienced significant growth and is expected to maintain the same over the upcoming years. The requirement for solar cells worldwide is due to the necessity of using non-polluting and renewable energy sources to monitor climate change and reduce dependence on fossil fuels. Solar cells are a viable option for producing power with minimal negative environmental impacts because there is a rise in electricity consumption worldwide. Furthermore, governments are introducing policies and regulations worldwide to promote the growth of solar energy, thereby facilitating energy security and sustainability objectives in different parts of the world.

For instance, in March 2024, the European Commission recently introduced its 'Horizon Europe Strategic Plan 2025-2027,' which consists of a Co-Programmed European Partnership for solar photovoltaic cells in cooperation with the European Technology and Innovation Platform (ETIP PV). It is intended to facilitate the solar sector's research and innovation. This strategic plan will provide finance to support research and innovation in the solar energy field and so solve vital problems through concerted efforts from the public and private sectors.

Rise in Utilization of Monocrystalline Solar Cells is Amplifying Market Growth

Monocrystalline cells are crucial as they have a higher efficiency, usually around (15% to 20%), and are the most effective means of converting sunlight directly into electricity. These cells have a single-crystal structure that allows the electron to flow better, making them capable of producing more power per square foot compared to polycrystalline and thin-film cells. Furthermore, they

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occupy less space in installations with limited roof areas. Monocrystalline solar cells are also long-lasting, and their ability to perform in lower light conditions enhances their value in all applications, thereby driving market growth. In October 2023, JinkoSolar Holding Co., Ltd. set a new record for the high-efficiency, 182mm, N-type monocrystalline silicon solar cell with a maximum solar conversion efficiency of 26.89% as confirmed by the National PV Industry Measurement and Testing Center. This marks an enormous step forward for the solar industry. Advanced metallization enhancement, bulk material passivation, and light trapping technologies developed were major elements in achieving the breakthrough. The initiative highlights the company's commitment to ongoing research and development to enhance product efficiency and reliability, positioning them as leaders in the solar industry.

Rural Electrification is Expediting Market Growth at an Exponential Rate

Solar cells are frequently used in rural electrification, as they are a reliable source of energy for far-off areas without regular power grids. This has helped communities harness sunlight to reduce their dependence on non-renewable sources. Solar power development improves the quality of life by providing a regular power supply while promoting economic growth through employment opportunities and skills enhancement. Furthermore, solar PV installations promote energy independence, making communities less vulnerable to power outages and contributing to overall community development.

For example, in September 2024, the Asian Development Bank sanctioned a loan of USD 434.25 million for enhancing solar energy capacity and energy security in Assam, India. The Assam Solar Project proposes setting up a 500 MW grid-connected solar photovoltaic (PV) facility in the Karbi Anglong district (rural Assam). It aims to develop a battery energy storage system to ensure grid stability and meet peak demand. The project also addresses upgrading electricity distribution and installing new transformers in rural communities.

Increase in Usage of Water Heating Systems is Fostering Market Growth

Solar water heating systems utilize solar cells to turn sunlight into electricity, thereby effectively supplying heating water for household or commercial usage while minimizing dependency on traditional energy sources. Water heating systems are in high demand in both rural and urban regions. These systems ensure comfort and hygiene through a proper hot water supply for cleaning, cooking, and bathing. Apart from these, the low-cost and energy-effective water heating systems lessen expenses and can also conserve energy, thus making it eco-friendly. These systems also ensure that energy use is effective, reduces greenhouse gases, and mitigates the impacts of climate change, mainly through renewable energy sources, particularly solar. For instance, in May 2024, Waaree Energies Ltd installed a 25,000-LPD capacity solar water heating system for the Ladakh Renewable Energy Development Agency at Leh, Ladakh. The objective of the system is to penetrate the challenging terrain of the solar thermal market while considerably reducing carbon emissions. By replacing diesel oil, which would otherwise emit 58.85 kg of CO₂ to generate the same hot water, WAAREE's system will help cut toxic emissions by approximately 17,000 kg per day. The installation utilizes advanced vacuum tube technology with a special coating, thereby increasing efficiency and sustainability in the region.

Rapid Technological Advancements in Solar Cells is Augmenting the Market Growth Significantly

Technological improvement in solar cells is believed to significantly increase demand by maximizing efficiency, reducing costs, and increasing applications. New breakthroughs such as higher efficiency materials, including perovskite and tandem cells, allow more light energy to be converted from the sun, making solar power more competitive with traditional power sources. Improved manufacturing also reduces the cost of production while making solar installations more affordable to consumers and businesses. Furthermore, smart technology advancements and flexible solar panels provide flexibility in the system to be applied to different scenarios. All these factors, together, encourage more solar energy usage in the system for a changeover towards green energy alternatives, thereby fostering market growth.

For instance, in June 2024, Canon Inc. announced the development of a material capable of significantly enhancing the durability and mass-production stability of the perovskite solar cell. This recent move is to overcome specific obstacles in the production and lifespan of perovskite technology, which has encountered many degradation and consistency problems. By improving these aspects, Canon's innovation could facilitate more reliable manufacturing processes and promote the broader adoption of perovskite solar cells, which can be positioned as a viable option in the renewable energy landscape.

Asia-Pacific Emerged as the Market Leader

Asia-Pacific has emerged as the market leader due to the availability of abundant solar cells in the region, especially in China and

India. China and India are at the forefront of global solar cells, accounting for the lion's share of production and exports. With a huge capital outlay, the countries lead every stage of the solar supply chain, from silicon cells to panel manufacturing. The installed capacity in both countries has reached a staggering height, covering a huge part of the total installed power globally. Moreover, a combination of strong government policies, highly advanced manufacturing capabilities, and a rapid rise in innovation has reduced the costs of solar energy to a great extent and has made solar energy the cheapest source of electricity available in more than two-thirds part of the world.

For instance, in November 2024, China's Huasun Energy successfully rolled out the first batch of its 210HP heterojunction (HJT) solar cells from the Xuancheng Phase V 1 GW production facility. The organization aims to achieve solar PV efficacy of around 26.24%, in the upcoming time. This goal reflects Huasun's efforts towards innovations and efficiency in the solar technology domain as the company aspires to improve production through advanced processes and technologies to meet the growing demand for high-quality solar PVs.

Future Market Scenario (2025 – 2032F)

□□Rising concerns about carbon emissions and the need for sustainable energy sources are driving up demand for solar cells in the residential, commercial, and utility sectors, which is expected to create extensive market opportunities in the future.

□□The continuous growing trend of solar energy generation will increase solar usage, particularly in underdeveloped countries without reliable electrical access, thereby leading to ample growth opportunities for the market over the upcoming years.

□□Solar cell technology and production have reached new heights through the collaborations made in solar projects. These collaborations enhance the bonding and trust between research institutes and companies that improve innovation, efficiency, and cost reduction, thereby ensuring a promising growth rate in the market over the upcoming years.

Key Players Landscape and Outlook

The demand for solar cells is rising continuously as the key players compete fiercely to gain a competitive edge in the industry. Furthermore, they are also getting engaged in various collaborations for rapid technological advancements in solar cells by spending a large sum of money. These collaborations are expected to result in significant possibilities for market expedition at present and over the upcoming years.

In August 2023, Panasonic Holdings Corporation unveiled the world's first long-term demonstration project for building integrated Perovskite solar cells in Fujisawa Sustainable Smart Town in Japan. This innovative project is expected to enhance energy efficiency and sustainability within the community through advanced photovoltaic glass technology. Fujisawa SST, with eco-friendly living and smart technologies, is a model for future urban developments, incorporating solar energy solutions to reduce carbon emissions significantly and promote a self-sustaining lifestyle among its residents.

In June 2024, LONGi Green Energy Technology Co., Ltd. announced that it had set a new world record in achieving an efficiency of 30.1% for its commercial M6-size wafer-level silicon-perovskite tandem solar cells during the Intersolar Europe event in Munich, Germany. The Fraunhofer Institute for Solar Energy certified the efficiency after LONGi had already set a previous record at 34.6% during the 2024 SNEC EXPO in Shanghai. The new record beats the 28.6% efficiency for M4 wafers established in May 2023, representing a major step forward in tandem solar cell technology.

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