

Solar Equipment Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Equipment (Solar Panels, Mounting and Racking Systems, Tracking System, Storage System, Others), By Application (Residential, Non-Residential, Utility), By Region & Competition, 2019-2029F

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# **Abstracts**

Global Solar Equipment Market was valued at USD 122.08 Billion in 2023 and is expected to reach USD 287.76 Billion by 2029 with a CAGR of 15.19% during the forecast period.

The Solar Equipment market encompasses the production, distribution, and utilization of various technological components and systems designed for harnessing solar energy from the sun and converting it into electricity or thermal energy. This market primarily revolves around equipment and devices used in solar power generation, including solar panels (photovoltaic cells), solar inverters, mounting and tracking systems, solar thermal collectors, and associated electrical and control components.

Solar equipment serves as the backbone of solar energy systems, enabling the capture, conversion, and utilization of renewable solar energy for diverse applications. Photovoltaic solar panels are perhaps the most recognizable component, as they convert sunlight into electricity through the photovoltaic effect. In contrast, solar thermal equipment focuses on using sunlight to heat fluids for applications such as space heating, water heating, and industrial processes.

The Solar Equipment market is pivotal in the global shift toward clean and sustainable energy sources. It plays a crucial role in reducing carbon emissions, mitigating climate



change, and providing a reliable and renewable energy source for residential, commercial, industrial, and utility-scale applications. As environmental concerns grow and the demand for renewable energy solutions rises, the Solar Equipment market continues to expand and innovate, contributing to a greener and more sustainable future.

For instance, Under Asia-Pacific region, India was ranked fourth in wind power capacity and solar power capacity, and fourth in renewable energy installed capacity, as of 2023. Installed renewable power generation capacity has increased at a fast pace over the past few years, posting a CAGR of 15.4% between FY16 and FY23. India has 125.15 GW of renewable energy capacity in FY23. India is the market with the fastest growth in renewable electricity, and by 2026, new capacity additions are expected to double.

**Key Market Drivers** 

# Falling Solar Panel Costs

The plummeting cost of solar panels is a key driver behind the global solar equipment market's expansion. Over the past decade, advancements in solar technology, increased manufacturing efficiency, and economies of scale have led to a significant reduction in solar panel prices. This cost decline has made solar energy more accessible and appealing to residential, commercial, and industrial consumers alike.

Technological innovations, such as higher efficiency solar cells and thinner, more durable materials, have boosted solar panel performance while lowering production costs. Additionally, increased competition in the solar equipment manufacturing sector has intensified cost-cutting efforts, making solar energy an increasingly cost-competitive option compared to traditional fossil fuels.

## Environmental Concerns and Sustainability

Growing environmental concerns and a heightened focus on sustainability are driving the global solar equipment market. With the dire consequences of climate change becoming increasingly apparent, individuals, businesses, and governments worldwide are seeking cleaner and greener energy alternatives. Solar power represents a sustainable solution that produces electricity without greenhouse gas emissions or other harmful pollutants.

Consumers are increasingly choosing solar energy to reduce their carbon footprint and



contribute to a more sustainable future. Businesses, too, are adopting solar power to meet corporate social responsibility goals and improve their environmental reputation. Governments are promoting solar energy as a means of achieving renewable energy targets and reducing their countries' overall carbon emissions.

This growing environmental awareness and the desire to transition to cleaner energy sources are propelling the demand for solar equipment globally, making it a driving force in the energy transition.

Key Market Challenges

Intermittency and Energy Storage

One of the primary challenges facing the global solar equipment market is the inherent intermittency of solar energy generation. Solar power production is highly dependent on weather conditions, with energy generation dropping to zero during the night and being significantly reduced on cloudy or rainy days. This variability poses challenges for grid stability and reliable energy supply, especially in regions that rely heavily on solar power.

To address this challenge, energy storage solutions, such as batteries, are becoming increasingly important. Energy storage systems store excess solar energy during periods of high generation and discharge it when the sun is not shining. While energy storage technologies have advanced considerably, challenges remain in terms of cost, efficiency, and scalability.

Cost is a significant barrier to widespread energy storage adoption. High upfront costs and the limited lifespan of some battery technologies can deter homeowners, businesses, and utilities from investing in energy storage systems. Moreover, the efficiency of energy storage solutions needs improvement to minimize energy losses during charging and discharging processes.

Scalability is another challenge. Large-scale energy storage facilities are required to support grid-level energy needs, and integrating them into existing energy infrastructure can be complex and costly. Developing standardized approaches to grid integration and improving the interoperability of different energy storage systems are ongoing challenges for the industry.

To fully unlock the potential of solar energy, addressing the intermittency challenge and



improving energy storage technologies are critical goals for the solar equipment market.

Supply Chain Vulnerabilities and Raw Material Availability

The global solar equipment market is highly reliant on complex supply chains, and disruptions in these supply chains can pose significant challenges to the industry. The solar supply chain encompasses the production of various components, including solar panels, inverters, mounting systems, and semiconductor materials. These components often rely on global sourcing of raw materials, manufacturing, and distribution.

One key challenge is the availability and price volatility of raw materials, particularly rare earth metals and silicon, which are essential components in solar panels and semiconductor devices. These materials are subject to supply constraints due to geopolitical factors, trade disputes, and fluctuating demand, leading to price fluctuations and potential shortages. Such disruptions can impact the cost-effectiveness of solar equipment and hinder market growth.

Another challenge related to supply chains is the transportation and logistics of solar equipment. Delays at ports, shipping bottlenecks, and other logistical issues can result in project delays, increased costs, and uncertainty for solar developers and installers. Additionally, regulatory changes and trade barriers can affect the flow of solar equipment across borders, further complicating the supply chain.

To mitigate these challenges, the solar industry is exploring strategies such as diversifying the sourcing of raw materials, investing in domestic manufacturing capacity, and adopting more sustainable and eco-friendly materials. Strengthening supply chain resilience and reducing dependence on vulnerable sources are essential for the continued growth and stability of the global solar equipment market.

**Key Market Trends** 

Technological Advancements Driving Solar Equipment Market Growth

In recent years, the Global Solar Equipment Market has witnessed a remarkable surge in technological advancements, fueling its growth and evolution. These advancements span across various segments of the solar equipment industry, including solar panels, inverters, mounting systems, and energy storage solutions. As technology continues to improve, the efficiency, reliability, and cost-effectiveness of solar power systems have significantly increased, thereby driving adoption rates worldwide.



One notable trend in solar panel technology is the development of high-efficiency photovoltaic (PV) cells. Manufacturers are continually striving to enhance the efficiency of solar panels, allowing them to capture more sunlight and convert it into electricity. Innovations such as PERC (Passivated Emitter Rear Cell) technology and bifacial solar panels have significantly boosted energy output and performance, making solar energy more competitive with traditional sources of electricity.

advancements in solar inverter technology have led to the emergence of more efficient and intelligent inverters. Grid-tied inverters with features such as maximum power point tracking (MPPT) and advanced monitoring capabilities optimize energy production and enable seamless integration with the electrical grid. Additionally, the integration of digitalization and IoT (Internet of Things) technologies in inverters allows for remote monitoring, maintenance, and troubleshooting, enhancing overall system reliability and performance.

the development of innovative mounting systems has simplified the installation process and improved the aesthetics of solar arrays. Technologies such as tracking systems, which adjust the orientation of solar panels to maximize sunlight exposure throughout the day, have become increasingly popular, especially in utility-scale solar projects. These advancements not only increase energy generation but also contribute to the overall cost-effectiveness of solar power systems.

In the realm of energy storage, advancements in battery technology have unlocked new possibilities for solar energy storage solutions. Lithium-ion batteries, in particular, have seen significant improvements in energy density, cycle life, and cost reduction, making them increasingly viable for storing solar energy for later use. This trend towards solar-plus-storage solutions enables greater flexibility and resilience in energy management, allowing consumers to harness solar power even when the sun is not shining.

Segmental Insights

### **Equipment Insights**

The Solar Panels segment held the largest market share in 2023. Solar panels, also known as photovoltaic (PV) panels, are at the heart of solar energy systems. They directly capture sunlight and convert it into electricity using the photovoltaic effect. This fundamental role makes solar panels an essential component of virtually all solar installations, from residential rooftops to utility-scale solar farms. Solar panels are



versatile and can be used in a wide range of applications, making them suitable for various consumer and industrial needs. They can be installed on residential buildings, commercial structures, and open spaces, providing a scalable solution for energy generation. Over the years, significant advancements in solar panel technology have improved their efficiency and performance. Research and development efforts have led to the development of more efficient solar cell materials, better designs, and improved manufacturing processes. These innovations have made solar panels more attractive by increasing their electricity generation capacity. The declining cost of solar panels has been a pivotal factor in their dominance. Solar panel prices have dropped substantially due to economies of scale, improved manufacturing efficiency, and increased competition among manufacturers. This cost reduction has made solar energy more accessible and financially appealing to a broader range of consumers. Solar panels can be easily scaled up or down to meet various energy needs. This scalability makes them suitable for a wide spectrum of projects, from small residential installations to massive utility-scale solar farms. Their adaptability to diverse project sizes further solidifies their dominance. Solar panels are well-standardized and widely available from numerous manufacturers worldwide. This standardization ensures compatibility with various system components and simplifies the procurement and installation process. Governments in many countries have implemented incentives and policies that specifically target solar panel installations. These incentives include tax credits, rebates, feed-in tariffs, and renewable energy mandates. Such policies encourage individuals, businesses, and utilities to invest in solar panels, further propelling their dominance. Solar panels offer significant environmental benefits by producing electricity without emitting greenhouse gases or harmful pollutants. This aligns with global efforts to reduce carbon emissions and combat climate change, making solar panels an attractive choice for environmentally conscious consumers and organizations.

### Regional Insights

Asia Pacific held the largest market share in 2023. The Asia Pacific (APAC) region has emerged as a dominant force in the global solar equipment market due to several key factors that contribute to its robust growth and leadership position in this industry.

One of the primary drivers of the Asia Pacific region's dominance in the global solar equipment market is the presence of supportive government policies and incentives. Many countries in the region, including China, India, Japan, and South Korea, have implemented ambitious renewable energy targets and generous subsidies to promote the adoption of solar power. These policies create a conducive environment for investment in solar infrastructure and incentivize both residential and commercial



consumers to install solar panels.

The Asia Pacific region is home to some of the world's leading manufacturers of solar equipment. Countries like China, in particular, have rapidly developed their manufacturing capabilities and achieved economies of scale, driving down the cost of solar panels and related components. Additionally, continuous investments in research and development have led to technological advancements, making solar energy more efficient and affordable. As a result, the region has become a global hub for the production and export of solar equipment, further strengthening its dominance in the market.

With rapid economic growth and urbanization, many countries in the Asia Pacific region are facing increasing energy demand and environmental challenges. Solar power presents a sustainable solution to meet growing energy needs while reducing greenhouse gas emissions and dependence on fossil fuels. As governments and businesses in the region prioritize clean energy initiatives to address these concerns, the demand for solar equipment continues to surge, driving market growth and dominance.

Countries in the Asia Pacific region are making strategic investments in solar infrastructure to enhance energy security and promote economic development. Large-scale solar projects, including solar parks and utility-scale installations, are being implemented across the region to harness its abundant sunlight resources. Moreover, initiatives such as the Belt and Road Initiative (BRI) led by China aim to promote international cooperation in renewable energy development, further expanding the market reach of APAC-based solar equipment manufacturers.

Key Market Players

Jinko Solar Holding Co. Ltd.

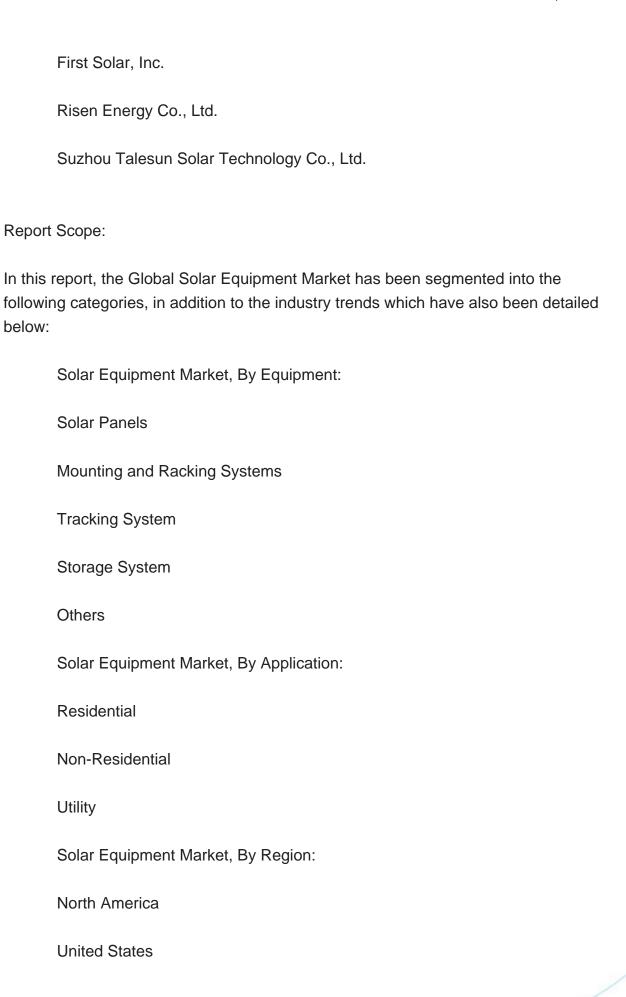
JA Solar Technology Co., Ltd.

Trina Solar Co., Ltd.

LONGi Green Energy Technology Co., Ltd.

Canadian Solar Inc.







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Italy
Germany
Spain
Asia-Pacific
China
India
Japan
Australia
South Korea
South America
Brazil
Argentina
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Competitive Landscape
Company Profiles: Detailed analysis of the major companies present in the Global Solar Equipment Market.
Available Customizations:
Global Solar Equipment market report with the given market data, TechSci Research offers customizations according to a company's specific needs. The following customization options are available for the report:
Company Information
Detailed analysis and profiling of additional market players (up to five).



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