

Solar Panels Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Technology (Solar PV and Concentrated Solar Power), By Module Type (Thin Film and Crystalline), By Grid Connectivity (On-Grid and Off-Grid), By Application (Residential, Commercial and Industrial), By Region, By Competition, 2019-2029F

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Abstracts

Global Solar Panels Market was valued at USD 163.08 billion in 2023 and is anticipated to project robust growth in the forecast period with a CAGR of 27.19% through 2029. The solar panels market refers to the dynamic and rapidly evolving sector within the broader renewable energy industry that focuses on the production, distribution, and utilization of solar photovoltaic (PV) panels. These panels are designed to capture sunlight and convert it into electricity, offering a clean and sustainable alternative to conventional energy sources. The market encompasses a wide range of components, including solar cells, modules, inverters, mounting systems, and associated technologies.

Driven by increasing global awareness of climate change and a growing commitment to reduce carbon emissions, the solar panels market plays a pivotal role in the transition towards cleaner energy solutions. Governments, businesses, and individuals are actively participating in the adoption of solar panels, spurred by supportive policies, technological advancements, and a continuous decrease in the cost of solar power.

As an important aspect in the renewable energy landscape, the solar panels market contributes to environmental sustainability, energy independence, and the diversification of the global energy mix. It represents a critical component of the broader effort to

harness the abundant and inexhaustible power of the sun for the generation of electricity on a large scale.

Key Market Drivers

Increasing Focus on Renewable Energy Sources:

The global solar panels market is being driven by a growing emphasis on renewable energy sources as a sustainable alternative to traditional fossil fuels. With escalating concerns about climate change and the need to reduce greenhouse gas emissions, governments, businesses, and consumers are turning to solar energy as a clean and abundant resource. Solar panels, which harness sunlight to generate electricity, play a pivotal role in this transition.

As nations strive to meet their climate goals outlined in international agreements, the demand for solar panels has surged. Governments worldwide are implementing policies and incentives to encourage the adoption of solar energy, including subsidies, tax credits, and favorable regulatory frameworks. This has created a conducive environment for the expansion of the solar panels market, attracting investments and driving technological advancements to improve efficiency and reduce costs.

Advancements in Photovoltaic Technology:

The continual advancements in photovoltaic (PV) technology have significantly contributed to the growth of the global solar panels market. Researchers and manufacturers are consistently working on enhancing the efficiency of solar cells, making them more cost-effective and capable of capturing more sunlight to produce electricity. Innovations such as thin-film solar cells, multi-junction solar cells, and tandem solar cells are pushing the boundaries of solar panel performance.

Improved manufacturing processes, such as the use of new materials and innovative cell designs, are boosting the overall efficiency and durability of solar panels. These technological breakthroughs not only make solar energy more competitive with traditional energy sources but also open up new possibilities for diverse applications, including solar-integrated building materials and flexible solar panels for unique installations.

Declining Costs of Solar Power:

A significant driver for the global solar panels market is the continuous decline in the cost of solar power. Over the past decade, there has been a remarkable reduction in the cost of manufacturing, installing, and maintaining solar panels. This cost reduction is attributed to economies of scale, improved manufacturing processes, increased competition among solar panel manufacturers, and advancements in technology.

As solar power becomes more affordable, it becomes a viable option for a broader range of consumers and businesses. The decreasing cost of solar energy has made it competitive with conventional energy sources in many regions, without the need for substantial subsidies. This cost parity is a compelling factor attracting investors, utilities, and individuals to embrace solar energy, driving the global market forward.

Rising Energy Demand and Grid Decentralization:

The increasing global demand for energy, coupled with the desire for energy independence and resilience, is fueling the adoption of solar panels. As urbanization and industrialization continue to rise, so does the demand for electricity. Solar panels offer a decentralized energy solution, allowing for power generation at or near the point of consumption.

This decentralization of power generation reduces the strain on traditional centralized energy grids and enhances overall energy security. Businesses and homeowners are increasingly installing solar panels to generate their own electricity, reducing their reliance on the grid and contributing to a more resilient and sustainable energy infrastructure.

Global Commitment to Sustainable Development:

The global push towards sustainable development and the achievement of the United Nations Sustainable Development Goals (SDGs) is a powerful driver for the solar panels market. Governments and organizations worldwide are aligning their policies and initiatives with sustainability objectives, and solar energy is a key component of this agenda.

Solar panels offer an environmentally friendly and sustainable energy solution, aligning with the goals of reducing carbon emissions, mitigating climate change, and promoting cleaner energy sources. International commitments to sustainability, along with increasing awareness and consciousness about environmental issues, are propelling the adoption of solar panels on a global scale.

Investment and Financing Initiatives:

The availability of investment and financing initiatives is a crucial driver for the global solar panels market. Governments, financial institutions, and private investors are actively supporting solar projects through grants, subsidies, tax incentives, and favorable financing options. These initiatives reduce the financial barriers associated with the initial investment in solar panels and make them more accessible to a broader range of consumers.

The emergence of innovative financing models, such as solar leasing and power purchase agreements (PPAs), has facilitated the adoption of solar panels in commercial and residential sectors. These models allow consumers to install solar panels with minimal upfront costs, promoting widespread adoption and contributing to the overall growth of the global solar panels market.

The global solar panels market is being propelled by a combination of environmental concerns, technological advancements, cost reductions, changing energy dynamics, sustainability goals, and supportive financial initiatives. These drivers are shaping a future where solar energy plays a central role in the global energy landscape, providing a clean, renewable, and economically viable source of power.

Government Policies are Likely to Propel the Market

Feed-in Tariffs: Fostering Solar Energy Growth through Incentives

Feed-in tariffs (FiTs) are instrumental government policies designed to accelerate the adoption of solar panels and promote renewable energy development. This policy mechanism involves guaranteeing a fixed payment rate for solar electricity generated over a specified period, providing a predictable and attractive return on investment for solar power producers.

Governments implement feed-in tariffs to incentivize the deployment of solar panels by ensuring that renewable energy producers receive a fair price for the electricity they generate. This not only encourages the development of solar projects but also attracts investments, driving innovation and cost reduction in the solar industry.

Feed-in tariffs are often structured to degress over time, reflecting the decreasing costs of solar technology. By doing so, governments stimulate early adoption and gradually

transition towards grid parity, where solar power becomes competitive with conventional energy sources without the need for subsidies.

Renewable Portfolio Standards (RPS): Mandating Solar Inclusion in Energy Mix

Renewable Portfolio Standards (RPS) are government policies that mandate a certain percentage of a country's or a region's total energy production to come from renewable sources, including solar power. Governments set these standards to diversify their energy mix, reduce dependence on fossil fuels, and achieve environmental sustainability goals.

Under RPS, utilities and energy providers are required to generate or purchase a specified percentage of their energy from renewable sources, such as solar, by a certain deadline. Non-compliance can result in penalties, creating a strong incentive for entities to invest in solar infrastructure.

Renewable Portfolio Standards play a pivotal role in driving the growth of the global solar panels market by creating a guaranteed market for solar energy. This policy not only stimulates demand but also provides long-term visibility for investors, fostering a conducive environment for the expansion of solar projects.

Investment Tax Credits (ITC): Stimulating Solar Investment through Tax Incentives

Governments worldwide leverage Investment Tax Credits (ITC) as a powerful tool to encourage private investment in solar energy projects. This policy provides tax incentives to individuals and businesses that invest in solar panels, allowing them to deduct a percentage of their solar project costs from their tax liability.

By reducing the financial burden on investors, Investment Tax Credits make solar projects more economically attractive and accelerate the payback period. This, in turn, stimulates higher levels of private investment in the solar industry, fostering its growth and contributing to the overall expansion of the solar panels market.

Governments often structure ITC to gradually phase out over time, reflecting the decreasing costs of solar technology and encouraging early adoption. This policy mechanism has proven effective in countries like the United States, where the Solar Investment Tax Credit has played a crucial role in boosting solar capacity.

Net Metering: Empowering Consumers and Promoting Self-Consumption

Net metering is a government policy that enables solar panel owners to feed excess electricity they generate back into the grid in exchange for credits on their utility bills. This policy empowers consumers to become prosumers, producing and consuming their own solar-generated electricity while maintaining a connection to the grid as a backup.

Net metering not only encourages the adoption of solar panels among residential and commercial consumers but also promotes energy self-sufficiency and grid stability. It provides a fair compensation mechanism for surplus solar power and eliminates barriers to the widespread adoption of distributed solar energy systems.

Governments implementing net metering policies send a clear signal to consumers that they can benefit financially from investing in solar panels, thereby driving the demand for residential and commercial solar installations.

Green Energy Certificates: Certifying and Promoting Solar Power Generation

Green Energy Certificates (also known as Renewable Energy Certificates or Guarantees of Origin) are government policies aimed at certifying the renewable origin of electricity generated from sources such as solar power. These certificates create a market-based mechanism where renewable energy producers can sell certificates to entities seeking to offset their carbon footprint or meet renewable energy targets.

By certifying solar power generation, Green Energy Certificates provide transparency and traceability in the renewable energy market. This not only assures consumers and businesses of the environmental benefits of their energy choices but also creates an additional revenue stream for solar project developers.

Governments implement Green Energy Certificates as part of broader efforts to encourage the growth of renewable energy and meet sustainability goals. This policy enhances market confidence in solar energy, attracting investments and fostering a supportive ecosystem for the global solar panels market.

Public Procurement and Subsidies: Catalyzing Solar Adoption in Public Sector

Public procurement policies and subsidies are essential government tools for promoting solar panels in the public sector. Governments leverage their purchasing power to buy solar energy systems for public buildings and infrastructure, creating a visible demonstration of their commitment to renewable energy.

Subsidies, in the form of direct financial support or reduced tax burdens, further stimulate solar adoption by making solar projects economically viable for public entities. These incentives reduce the financial barriers associated with solar investments, encouraging government agencies to integrate solar panels into their energy portfolios.

Public procurement and subsidies not only drive demand for solar panels but also serve as a powerful example for private entities and individuals, catalyzing broader adoption. As governments lead by example, these policies contribute to the overall growth and normalization of solar energy in the global energy landscape.

Key Market Challenges

Intermittency and Energy Storage Challenges:

Significant challenges facing the global solar panels market is the intermittency of solar energy generation and the associated difficulties in effective energy storage. Solar power production is inherently dependent on sunlight, which is subject to variations due to weather conditions, seasonal changes, and the day-night cycle. This intermittent nature poses challenges in maintaining a consistent and reliable power supply, especially during periods of low sunlight.

The variability in solar energy production requires the integration of effective energy storage solutions to address periods when sunlight is insufficient. Currently, the most common energy storage technology for solar power is batteries, but challenges persist in terms of cost, efficiency, and scalability. Battery technologies are evolving, but their effectiveness in storing large amounts of energy for extended periods remains a hurdle.

The environmental impact of manufacturing and disposing of batteries raises concerns about the overall sustainability of energy storage solutions. As the solar panels market continues to grow, addressing these challenges becomes crucial for ensuring a stable and reliable renewable energy supply.

Efforts are underway to develop advanced energy storage technologies, such as flow batteries and thermal storage systems, to overcome the limitations of conventional batteries. However, widespread implementation and affordability of these technologies remain significant obstacles.

Governments, researchers, and industry stakeholders need to collaborate to incentivize

research and development in energy storage, create supportive policies, and invest in infrastructure that enables the seamless integration of solar power into the existing energy grid. Overcoming intermittency and improving energy storage capabilities are pivotal steps in ensuring the long-term viability and competitiveness of solar energy in the global energy landscape.

Costs and Economic Viability:

While significant strides have been made in reducing the costs of solar panels over the past decade, economic viability remains a substantial challenge for the widespread adoption of solar energy. The upfront costs associated with the installation of solar panels, including photovoltaic modules, inverters, and mounting systems, can be a deterrent for individuals, businesses, and governments considering solar projects.

Despite the decreasing cost of solar technology, the initial investment required for large-scale solar installations can still be substantial. This is particularly true in regions where government incentives and subsidies are limited. The economic viability of solar projects is also affected by the duration of the payback period, which is influenced by factors such as local electricity prices, solar panel efficiency, and available sunlight.

While solar energy offers long-term cost savings on electricity bills, the financial benefits may not be immediately apparent to potential investors. This perception hurdle poses a challenge in convincing stakeholders to prioritize solar investments over more traditional and familiar energy sources.

Addressing the cost challenge requires a multi-faceted approach. Governments can play a pivotal role by implementing and extending financial incentives, tax credits, and subsidies to make solar projects more financially attractive. Additionally, financial institutions and investors need to develop innovative financing models that reduce the financial burden on consumers and businesses, making solar energy accessible to a broader market.

Continued advancements in solar technology, leading to increased efficiency and reduced manufacturing costs, are essential to improving the economic viability of solar energy. Research and development initiatives, supported by public and private sector collaboration, are necessary to drive innovation and push the solar industry towards grid parity—the point at which solar power becomes cost-competitive with conventional energy sources without subsidies.

Overcoming the economic challenges associated with solar energy requires a holistic and collaborative approach involving governments, financial institutions, and the private sector. By addressing cost concerns and promoting economic viability, the global solar panels market can unlock its full potential as a sustainable and economically competitive source of energy.

Key Market Trends

Rapid Expansion of Solar Energy Capacity:

The global solar panels market is witnessing a significant trend towards the rapid expansion of solar energy capacity. This growth is driven by several factors, including technological advancements, declining costs of solar panels, supportive government policies, and increasing environmental awareness.

Technological Advancements: Continuous advancements in solar panel technology have significantly improved efficiency and reduced costs, making solar energy increasingly competitive with traditional energy sources. Innovations such as higher efficiency photovoltaic cells, bifacial solar panels, and advanced tracking systems have enhanced the performance and reliability of solar installations.

Declining Costs: The cost of solar panels has been steadily declining over the past decade, primarily due to economies of scale, technological advancements, and increased competition among manufacturers. This cost reduction has made solar energy more accessible and attractive to a broader range of consumers, including residential, commercial, and utility-scale projects.

Supportive Government Policies: Governments worldwide are implementing supportive policies and incentives to promote the adoption of solar energy. These include feed-in tariffs, tax credits, rebates, net metering programs, and renewable energy targets. Such policies help reduce the upfront costs of solar installations and provide financial incentives for investment in solar energy systems.

Environmental Awareness: Growing concerns about climate change and environmental sustainability have prompted individuals, businesses, and governments to embrace renewable energy sources like solar power. Solar energy offers a clean and sustainable alternative to fossil fuels, significantly reducing greenhouse gas emissions and mitigating the adverse impacts of climate change.

As a result of these factors, the global solar panels market is experiencing rapid expansion, with installed solar capacity increasing year-on-year across various regions. This trend is expected to continue as solar energy becomes increasingly cost-competitive and essential in the transition towards a low-carbon economy.

Segmental Insights

Technology Insights

The Solar PV segment held the largest Market share in 2023. Solar PV systems are highly versatile and can be deployed in various settings, from small residential rooftop installations to large utility-scale solar farms. This adaptability makes PV technology suitable for a wide range of applications and contributes to its widespread adoption.

Over the years, there has been a significant reduction in the manufacturing costs of solar PV panels. Technological advancements, increased production volumes, and economies of scale have contributed to making solar PV more cost-effective. As a result, the levelized cost of electricity (LCOE) from solar PV has become competitive with or even lower than conventional energy sources in many regions.

Solar PV technology has undergone continuous advancements, leading to improvements in efficiency and performance. Researchers and manufacturers focus on innovations such as new materials, enhanced cell designs, and improved manufacturing processes. These innovations contribute to higher energy conversion efficiency, making solar PV more attractive to consumers and investors.

Solar PV systems can be deployed relatively quickly, and their modular nature allows for incremental installations. This rapid deployment is crucial for meeting energy needs on shorter timescales and aligns well with the urgent global push for renewable energy adoption.

Solar PV systems have a lower environmental impact compared to some other energy sources. The manufacturing process has become more sustainable, and the operational phase produces electricity without emitting greenhouse gases. This aligns with the growing emphasis on environmentally friendly energy solutions.

The potential for rooftop solar installations is significant, especially in urban areas. Solar PV can be integrated into existing infrastructure, utilizing available roof space on residential, commercial, and industrial buildings. This decentralized approach to power

generation is appealing for reducing transmission and distribution losses.

Solar PV technology has gained widespread acceptance among consumers, businesses, and governments. The visibility of solar panels on rooftops and the positive public perception of solar energy contribute to growing consumer demand. This, in turn, encourages further investments and advancements in the solar PV sector.

Many governments around the world have implemented financial incentives, tax credits, and supportive policies to encourage the adoption of solar PV. These measures make solar PV projects more financially attractive for businesses and individuals, driving market growth.

Regional Insights

Asia Pacific

The Asia Pacific held the largest market share in 2023. One of the primary factors driving Asia Pacific's dominance in the global solar panels market is its abundance of solar resources. The region encompasses countries with vast landmasses and favorable solar conditions, including abundant sunlight throughout the year. Countries like China, India, Japan, and Australia possess extensive areas with high solar irradiance levels, making them ideal locations for solar energy generation. This abundance of solar resources provides a strong foundation for the proliferation of solar panel installations across the region.

Government support and conducive policies play a pivotal role in fostering the growth of the solar panels market in Asia Pacific. Many countries in the region have implemented favorable regulatory frameworks, incentives, and subsidies to promote renewable energy adoption, including solar power. For instance, China has rolled out ambitious renewable energy targets and substantial financial incentives to encourage solar panel deployment. Similarly, India's National Solar Mission aims to achieve significant solar capacity additions, supported by various policies such as feed-in tariffs, tax incentives, and renewable purchase obligations. These proactive measures create a conducive environment for solar panel manufacturers and investors, driving market growth in the region.

Asia Pacific's status as a manufacturing powerhouse significantly contributes to its dominance in the global solar panels market. The region hosts some of the world's largest solar panel manufacturers, benefitting from economies of scale, advanced

technology, and efficient production processes. China, in particular, leads the global solar panel manufacturing industry, with a vast network of production facilities and a robust supply chain ecosystem. The presence of these manufacturing giants enables Asia Pacific to meet the escalating demand for solar panels worldwide efficiently. Moreover, the competitive pricing of solar panels manufactured in the region further enhances its appeal to consumers and businesses worldwide.

The rapid pace of urbanization and the burgeoning energy demand in Asia Pacific drive the adoption of solar panels as a sustainable energy solution. Many countries in the region are experiencing rapid urban expansion, accompanied by growing energy needs for residential, commercial, and industrial sectors. Solar panels offer a viable solution to meet this escalating energy demand while reducing reliance on fossil fuels and mitigating environmental impact. Additionally, the decentralization of energy generation facilitated by solar panels aligns with the needs of burgeoning urban centers, where grid infrastructure may be strained. As a result, Asia Pacific emerges as a key market for solar panels to cater to the energy requirements of its burgeoning urban population.

Asia Pacific's dominance in the global solar panels market is underpinned by abundant solar resources, supportive government policies, manufacturing prowess, and escalating energy demand driven by rapid urbanization. These factors collectively position the region as a frontrunner in the adoption and production of solar panels, shaping the trajectory of

Key Market Players

LONGi Green Energy Technology Co. Ltd

JinkoSolar Holding Co., Ltd.

First Solar, Inc.

Canadian Solar Inc.

Trina Solar Co. Ltd.

JA Solar Holdings Co., Ltd.

Hanwha Q CELLS Co., Ltd.

SunPower Corporation

GCL Technology Holdings Ltd.

Renhe Commercial Holdings Co., Ltd.

Report Scope:

In this report, the Global Solar Panels Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Solar Panels Market, By Technology:

Solar PV

Concentrated Solar Power

Solar Panels Market, By Module Type:

Thin Film

Crystalline

Solar Panels Market, By Grid Connectivity:

On-Grid

Off-Grid

Solar Panels Market, By Application:

Residential

Commercial

Industrial

Solar Panels Market, By Region:

North America

United States

Canada

Mexico

Europe

France

United Kingdom

Italy

Germany

Spain

Asia Pacific

China

India

Japan

Australia

South Korea

South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Kuwait

Turkey

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Solar Panels Market.

Available Customizations:

Global Solar Panels Market report with the given Market data, Tech Sci 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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