

# **Solar Photovoltaic Backsheet Market – Global Industry Size, Share, Trends, Opportunity, and Forecast Segmented by Product (TPT-Primed, TPE, PET, PVDF, PEN), By Thickness ( 500 Micrometer), By Material (Fluoride, Non-Fluoride), By Technology (Crystalline, Thin Film, Ultra-Thin Film) By Region, By Competition 2018-2028.**

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## **Abstracts**

Global Solar Photovoltaic Backsheet Market was valued at USD 9.8 Billion in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 8.40% through 2028. solar projects, especially off-grid projects, are expected to provide a significant opportunity to the market, as consumers in the developing and underdeveloped countries are likely to provide off-grid facilities to power remote places and islands with solar power. Increasing demand for photovoltaic back sheet in the industry, technical advancement, and ongoing development of the photovoltaic industry, reasonable regulatory schemes, and initiatives, condensed production price, effective administration policies are expected to drive the global market. Rising global solar PV set-up and modern policy support and initiatives from the governments to aid the implementation of renewable technologies, along with the growing need and requirement to lessen carbon emissions is expected to boom the global solar back sheet market. Furthermore, a high cost of material is limiting the growth in the global market.

### **Key Market Drivers**

**Rising Solar Energy Adoption:** One of the primary drivers of the global solar PV backsheet market is the increasing adoption of solar energy worldwide. As governments

and industries seek sustainable energy solutions to reduce carbon emissions and combat climate change, solar PV has emerged as a viable and cost-effective renewable energy source. This surge in solar installations directly translates to a growing demand for PV backsheets.

**Falling Solar Panel Costs:** Over the past decade, the cost of solar panels and associated components has significantly decreased. Technological advancements, economies of scale, and increased competition in the solar industry have led to more affordable solar PV systems. Lower solar panel costs make solar energy more accessible to consumers and businesses, further boosting the demand for PV backsheets.

**Stringent Environmental Regulations:** Environmental concerns and regulations aimed at reducing greenhouse gas emissions have prompted governments worldwide to incentivize renewable energy adoption. These policies include subsidies, tax credits, and renewable energy targets, which create a favorable environment for solar PV installations and, consequently, drive the demand for high-quality backsheets that ensure the longevity of solar panels. Continuous research and development efforts have led to innovations in backsheet materials and designs. Modern backsheets are engineered to withstand harsh environmental conditions, including extreme temperatures, humidity, and UV exposure. They also provide excellent electrical insulation and reduce the risk of module degradation. These technological advancements enhance the overall performance and durability of solar PV systems.

### Growing Market for Bifacial Solar Panels

Bifacial solar panels, which can capture sunlight from both sides, have gained popularity in the solar industry. These panels require specialized backsheets that allow light to pass through the rear side, enhancing energy generation. As the demand for bifacial panels grows, so does the demand for backsheets optimized for these applications. Sustainability is a major driver across industries, including the solar sector. Consumers and businesses are increasingly inclined to invest in environmentally friendly products and technologies. Sustainable backsheets, made from recyclable materials and manufactured with minimal environmental impact, are in high demand, aligning with the global shift towards greener energy solutions.

**Expanding Solar Installations in Emerging Markets:** Emerging economies are witnessing significant growth in solar PV installations. Countries in Asia, Africa, and Latin America are investing in solar energy infrastructure to meet their rising electricity demands and

reduce reliance on fossil fuels. This expansion in emerging markets creates new opportunities for the solar PV backsheet industry.

**Resilience Against Natural Disasters:** Solar PV systems are seen as resilient sources of electricity during natural disasters and grid outages. The ability of solar panels to continue generating power when traditional power sources fail is a strong motivator for homeowners and businesses to invest in solar PV installations. High-quality backsheets contribute to the durability and resilience of these systems. Emerging technologies, such as transparent solar cells and solar-integrated building materials, are driving the need for specialized backsheets. Transparent backsheets, for instance, are used in building-integrated photovoltaics (BIPV) to create aesthetically pleasing and energy-efficient building designs.

The solar PV backsheet market is influenced by supply chain dynamics, including the availability of raw materials and manufacturing capabilities. Efforts to diversify supply chains and ensure a stable supply of critical materials, such as polymers and films, impact the industry's growth and stability.

In conclusion, the global solar PV backsheet market is experiencing robust growth due to a combination of factors. The increasing adoption of solar energy, falling solar panel costs, environmental regulations, technological advancements, and the growing popularity of bifacial panels are among the primary drivers. Additionally, sustainability concerns, the expansion of solar installations in emerging markets, and the resilience of solar PV systems during natural disasters contribute to the market's growth. As the solar industry continues to evolve and innovate, the demand for high-quality PV backsheets is expected to remain strong, making it a pivotal component of the global shift toward renewable energy sources.

## Key Market Challenges

### Environmental Stressors

Solar PV modules are exposed to a wide range of environmental stressors throughout their operational lifespan. These include intense sunlight, temperature fluctuations, moisture, and extreme weather conditions. The backsheet acts as a protective barrier, shielding the sensitive solar cells from these stressors. However, if the backsheet material degrades or fails prematurely, it can lead to the deterioration of the entire solar module, reducing energy output and potentially causing safety issues. Backsheets also serve as electrical insulators, preventing current leakage and ensuring the safe

operation of solar panels. If the electrical insulation properties of the backsheet deteriorate, it can lead to electrical faults, reduced efficiency, and safety risks. This is particularly crucial in grid-connected solar installations, where safety and reliability are paramount.

### Warranty and Performance Guarantees

Solar panel manufacturers typically offer warranties and performance guarantees to customers, assuring them of a certain level of energy generation over the panel's lifespan. Backsheet failure can result in warranty claims and increased maintenance costs for manufacturers, eroding their profit margins and reputation. Ensuring the long-term reliability of backsheets is, therefore, essential for manufacturers to honor their commitments. The perception of solar energy's reliability and durability is crucial for its continued adoption. If instances of premature backsheet failures become prevalent, it can erode consumer confidence in solar PV technology. This could hinder the growth of the solar industry and impact the investment decisions of individuals, businesses, and governments.

### Risks to Investment

Large-scale solar projects, whether utility-scale solar farms or commercial installations, require significant investments. Investors and financial institutions assess the risks associated with these projects before committing capital. Backsheet reliability is a critical factor in evaluating the long-term performance and return on investment (ROI) of solar projects. Uncertainties regarding backsheet durability can deter potential investors. The disposal of failed or degraded backsheet materials can pose environmental challenges. Many backsheet materials are not easily recyclable, and improper disposal can lead to environmental pollution. Sustainable and recyclable backsheet options are being explored, but widespread adoption remains a challenge.

### Implications of the Challenge:

The challenge of ensuring the durability and long-term reliability of solar PV backsheets has several significant implications: Backsheet degradation can lead to reduced energy output from solar panels, negatively affecting the financial returns on solar investments. This can be particularly problematic for solar projects with fixed power purchase agreements (PPAs) or feed-in tariffs, where a drop in energy production directly impacts revenue. Backsheet failures may necessitate costly maintenance and replacements. For large-scale solar installations, this can translate into substantial operational expenses.

Maintenance downtime can also result in revenue losses.

### Risk of Safety Issues

Electrical faults due to backsheet degradation pose safety risks, not only to maintenance personnel but also to nearby structures and equipment. Ensuring the long-term electrical insulation properties of backsheets is essential to mitigate these risks. Backsheet failures can damage the reputation of solar panel manufacturers, installers, and the industry as a whole. Negative publicity and customer dissatisfaction can deter potential customers from adopting solar PV technology.

### Impact on Market Growth

The solar PV industry's growth trajectory relies on factors like reliability and durability. If backsheet failures become widespread, it can slow down the pace of solar adoption, which is critical for achieving global renewable energy targets and mitigating climate change. advanced Materials: Research and development efforts should focus on developing advanced backsheet materials that are more resistant to environmental stressors. This includes materials that can withstand UV radiation, extreme temperatures, moisture, and mechanical stress. Innovations in polymer chemistry and material science are crucial in this regard. Stringent testing and certification standards should be established and enforced to ensure the quality and durability of backsheet materials. Manufacturers should adhere to these standards, and independent testing organizations should verify compliance.

### Improved Manufacturing Processes

Manufacturers should invest in state-of-the-art manufacturing processes that ensure the uniformity and quality of backsheet production. Quality control measures should be implemented throughout the manufacturing process to minimize defects. Solar panel owners and operators should implement monitoring systems to detect early signs of backsheet degradation. Regular maintenance and inspection can help identify and address issues before they lead to failures.

### Recyclable Materials

The development of recyclable backsheet materials can reduce the environmental impact of disposal and contribute to sustainability goals. Manufacturers should explore eco-friendly alternatives and recycling programs. Raising awareness about the

importance of backsheet reliability and proper maintenance practices can help end-users make informed decisions and ensure the longevity of their solar installations.

In conclusion, the main challenge in the global solar PV backsheet market is ensuring the durability and long-term reliability of backsheet materials and designs. Addressing this challenge is critical to maintaining the growth and sustainability of the solar industry, safeguarding investments, and building consumer confidence in solar PV technology. Through continued research, innovation, and adherence to stringent quality standards, the industry can overcome this challenge and continue to thrive as a key player in the global transition to renewable energy sources.

## Key Market Trends

### Technological Advancements in Backsheet Materials

One of the prominent trends in the global solar PV backsheet market is continuous technological advancements in backsheet materials. Manufacturers are increasingly investing in research and development to create materials that are more durable, efficient, and sustainable. This trend is driven by the need to enhance the longevity and performance of solar panels in various environmental conditions.

#### Explanation

New materials with improved resistance to UV radiation, temperature fluctuations, humidity, and mechanical stress are being developed. For example, advanced polymer composites and coatings are being used to increase the lifespan of backsheet materials. Nano-coatings and surface treatments are being employed to improve the self-cleaning properties of backsheets, reducing maintenance requirements. Sustainable materials, such as recyclable polymers and bio-based plastics, are gaining traction, aligning with the growing emphasis on environmental responsibility.

### Bifacial Solar Panels and Backsheets

The adoption of bifacial solar panels is on the rise, and this trend has a direct impact on the design and choice of backsheet materials. Bifacial panels can capture sunlight from both the front and rear sides, increasing energy generation. Consequently, specialized backsheets that allow light penetration are in demand to optimize bifacial panel performance. Bifacial panels require backsheets with enhanced transparency to enable light penetration from the rear side. This has led to the development of innovative

backsheets designed specifically for bifacial applications.

Backsheet manufacturers are conducting research to improve the optical properties of backsheets to maximize light transmission while maintaining durability.

### Sustainable and Eco-Friendly Backsheets

Environmental sustainability is a growing concern, and this trend is influencing the solar PV backsheet market. Manufacturers and consumers are increasingly looking for eco-friendly backsheet options that have minimal environmental impact throughout their lifecycle, from production to disposal.

Recyclable backsheet materials are gaining popularity, allowing for easier and more responsible end-of-life disposal. Bio-based and biodegradable backsheet materials are being developed to reduce the reliance on petroleum-based plastics and decrease the carbon footprint of solar panels. Manufacturers are implementing sustainable practices in their production processes, such as reducing waste and energy consumption.

### Thin-Film Backsheets

While traditional crystalline silicon solar panels dominate the market, there is a growing interest in thin-film solar technologies. Thin-film panels are lighter, flexible, and can be integrated into various applications, such as building-integrated photovoltaics (BIPV) and portable devices. These panels often require specialized backsheets to match their unique characteristics.

Thin-film backsheets are designed to accommodate the flexibility and form factor of thin-film solar panels, allowing for greater versatility in installations.

Advances in thin-film materials, such as CIGS (copper indium gallium selenide) and CdTe (cadmium telluride), are driving the development of backsheets tailored to these technologies.

### Increased Demand in Emerging Markets

Emerging economies in Asia, Africa, and Latin America are witnessing significant growth in solar PV installations. This trend is driven by a combination of factors, including energy demand, government incentives, and the declining cost of solar panels. As these markets expand, the demand for solar PV backsheets is also on the

rise. The growth of solar installations in emerging markets presents opportunities for backsheet manufacturers to expand their global reach and tap into new customer bases.

Tailoring backsheets to meet the specific needs of these markets, such as resistance to high humidity or extreme temperatures, is becoming increasingly important.

### Digitalization and Smart Backsheets

Digitalization and the Internet of Things (IoT) are influencing various industries, including solar energy. Smart backsheets equipped with sensors and monitoring capabilities are emerging as a trend. These backsheets can provide real-time data on the performance and health of solar panels, enabling proactive maintenance and optimization.

Smart backsheets can monitor parameters like temperature, humidity, and electrical performance, allowing for early detection of issues and reducing downtime.

Data from smart backsheets can be integrated into solar energy management systems, improving the overall efficiency and reliability of solar installations.

### Stringent Quality Standards and Certification

As the solar industry matures, there is a growing emphasis on quality control and assurance in backsheet manufacturing. Stringent standards and certification processes are being established to ensure the reliability and durability of backsheet materials.

Independent testing organizations and certification bodies are verifying compliance with quality and safety standards, giving consumers and businesses confidence in the performance of backsheet products.

Stringent quality standards help prevent substandard or low-quality backsheets from entering the market, reducing the risk of premature failures.

### Integration of Backsheets into Building Materials

Building-integrated photovoltaics (BIPV) is gaining momentum as a way to seamlessly integrate solar panels into architectural designs. This trend requires backsheets that can be integrated directly into building materials, such as glass, roof tiles, or facades.



Backsheets designed for BIPV applications are engineered to provide structural support, weather resistance, and electrical insulation while seamlessly blending with the aesthetics of buildings.

The integration of backsheets into building materials allows for the creation of energy-efficient and visually appealing structures that generate electricity.

In conclusion, the global solar PV backsheet market is evolving in response to various trends, including technological advancements, the adoption of bifacial panels, sustainability concerns, the rise of thin-film technologies, growth in emerging markets, the emergence of smart backsheets, stringent quality standards, and the integration of backsheets into building materials. These trends collectively shape the industry's future and contribute to the development of more efficient, durable, and environmentally responsible backsheet solutions. As the solar industry continues to grow and innovate, the role of backsheets in enhancing the performance and longevity of solar panels remains pivotal.

## Segmental Insights

### Material Insights

Fluoride solar backsheet consists of three layers: inner, middle, and outer layer, which is attached to the outermost layer of a solar panel. The inner and outer layer of the solar backsheet is primarily made of polyvinyl fluoride (PVF) or polyvinylidene fluoride (PVDF). In contrast, the middle layer consists of polyethylene terephthalate (PET or polyester). In 2020, fluoropolymer backsheet had a majority of the market share. The fluoropolymer backsheet is costlier than non-fluoropolymer due to its additional safety features like proven hydrolytic stability and excellent resistance to weathering effects in various conditions with PVF or PVDF layer.

According to SolarPower Europe, over the past decade, between 2011 and 2020, solar power increased rapidly from 30.13 GW in 2011 to 138.2 GW in 2020, primarily aided by utility-scale projects and the fluoropolymer solar backsheet market.

In 2021, Bharat Electricronics Limites, an Indian state-owned company, invited companies for a 2.86 MW of grid-connected solar power projects in Amravati and Akola in Maharashtra. In addition, as per the tender document, the solar backsheet should have three-layered structures. The inner layer of fluoropolymer should be a UV-resistant

polymer, the middle layer should be polyester-based, and the outer layer should be fluoropolymer.

## Regional Insights

Asia Pacific plays a significant role in the global Solar Photovoltaic Backsheet market, Asia-Pacific is expected to dominate the market. According to the British Petroleum Statistical Review of World Energy 2021, Asia-Pacific generated the majority of solar power compared to all regions.

China is estimated to be the major country in the region, with approximately 175 GW of solar PV installations. It is expected to double its installation capacity by 2025, which is expected to boost the backsheet market during the forecast period.

Tengger Desert Solar Park, China (1,547MW), Yanchi Ningxia Solar Park, China (1,000MW), Datong Solar Power Top Runner Base, China (1,070MW), Kurnool Ultra Mega Solar Park, India (1,000MW), Longyangxia Dam Solar Park, China (850MW), and Kamuthi Solar Power Station, India (648MW) are the major existing key projects in the region with high uses of backsheet.

## Key Market Players

DuPont de Nemours Inc.

Solvay SA

Arkema SA

Covestro AG

3M Company

Toyo Seikan Group Holdings Co., Ltd.

Jiangsu Shunfeng Photovoltaic Technology Co., Ltd.

AISOLAR Technology Co., Ltd.

Wuxi Suntech Power Co., Ltd. ORS International Ltd

## Report Scope:

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

### Global Solar Photovoltaic Backsheet Market, By Thickness:

100 Micrometer

100 To 500 Micrometer

\$\$\$ 500 Micrometer

### Global Solar Photovoltaic Backsheet Market, By Material:

Fluoride

Non-Fluoride

### Global Solar Photovoltaic Backsheet Market, By Technology:

Crystalline

Thin Film

Ultra-Thin Film

### Global Solar Photovoltaic Backsheet Market, By Product:

TPT-Primed

TPE

PET

PVDF

PEN

Global Solar Photovoltaic Backsheet Market, By Region:

North America

United States

Canada

Mexico

Asia-Pacific

China

India

Japan

South Korea

Indonesia

Europe

Germany

United Kingdom

France

Russia

Spain

South America

Brazil

Argentina

Middle East & Africa

Saudi Arabia

South Africa

Egypt

UAE

Israel

### Competitive Landscape

Company Profiles: Detailed analysis of the major companies presents in the Global Solar Photovoltaic Backsheet Market.

### Available Customizations:

Global Solar Photovoltaic Backsheet 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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