

# **EV Solar Modules Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented, By Solar Panel Type (Monocrystalline and Polycrystalline), By Grid Type (Off-grid Module, On-grid Module, and Hybrid Module), By Application (Passenger Vehicles and Commercial Vehicles), By Region & Competition, 2021-2031F**

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## **Abstracts**

The Global EV Solar Modules Market is projected to experience substantial growth, expanding from a valuation of USD 6.81 Billion in 2025 to USD 22.48 Billion by 2031, driven by a Compound Annual Growth Rate (CAGR) of 22.02%. This market focuses on the Vehicle-Integrated Photovoltaics (VIPV) sector, where solar panels are seamlessly embedded into the bodywork of electric vehicles, including roofs and hoods, to generate auxiliary power and extend driving range. Major drivers underpinning this industry include the urgent need to alleviate range anxiety, the necessity to decrease reliance on stationary charging networks, and the implementation of strict carbon emission regulations. These elements act as fundamental structural propellers rather than temporary trends, necessitating the technological convergence of renewable energy generation with automotive mobility.

According to the International Energy Agency, global electric car sales are expected to surpass 20 million units in 2025, accounting for over one-quarter of all vehicles sold worldwide and creating a significant addressable market for solar module integration. Despite this opportunity, the sector faces a major challenge in the high production costs required to develop durable, curved, and aesthetically integrated modules that maintain high energy efficiency under variable shading conditions. This economic hurdle impedes broader market expansion, as manufacturers struggle to balance the expense of these

specialized, high-performance units with the need for competitive vehicle pricing.

### **Market Driver**

The growing consumer desire for extended electric vehicle driving ranges serves as a primary catalyst for the adoption of solar modules, fueled by the imperative to reduce charging frequency and improve off-grid mobility. This demand drives manufacturers to embed photovoltaic cells directly into vehicle surfaces, providing users with a practical 'charge-as-you-go' benefit that effectively lowers range anxiety and dependence on fixed infrastructure. The pursuit of energy independence is resulting in measurable performance gains; according to Aptera Motors' 'CES 2025 Press Release' in January 2025, their production-ready solar electric vehicle features an integrated array capable of generating up to 40 miles of daily driving range purely from sunlight.

Simultaneously, breakthroughs in lightweight and high-efficiency photovoltaic technologies are enhancing the technical feasibility of Vehicle-Integrated Photovoltaics (VIPV) by enabling seamless adaptation to curved automotive designs without sacrificing aerodynamics. These innovations allow for the deployment of onboard generation systems that were previously hindered by the rigidity and weight of conventional panels. For example, according to a Nissan release in October 2025 regarding the Japan Mobility Show, the company's 'Ao-Solar Extender' prototype uses a deployable roof system to generate up to 500 watts of auxiliary power. This technological progress is further supported by general improvements in cell performance; according to Fraunhofer ISE, commercial crystalline silicon modules reached a weighted average efficiency of 22.0% in 2025, setting a strong benchmark for mass-market solar integration.

### **Market Challenge**

The expansion of the Global EV Solar Modules Market is significantly hindered by the high production costs involved in developing durable and curved solar modules. Manufacturing these specialized units necessitates complex fabrication processes to ensure they fit seamless body contours while withstanding the vibrations and impacts typical of road travel. These stringent technical requirements demand distinct production lines and advanced materials, which drive up unit costs substantially compared to standard photovoltaic panels. Consequently, this increased expense creates a barrier for automotive manufacturers attempting to integrate the technology into mass-market vehicles without raising consumer prices to uncompetitive levels.

This economic friction largely restricts the technology to prototype or luxury segments, preventing the volume necessary to reduce costs. According to the Photovoltaic Power Systems Programme in 2024, the cost of vehicle-integrated photovoltaic systems remains elevated, with specific module costs estimated at approximately 3.50 US dollars per watt peak, a figure significantly higher than that of conventional stationary modules. Such a cost premium limits the ability of manufacturers to achieve the economies of scale required to facilitate widespread adoption across broader vehicle fleets.

## Market Trends

The market is witnessing an accelerated uptake of solar integration within heavy-duty logistics and commercial fleets, shifting the focus from passenger vehicle novelty to tangible returns on investment for business operations. Fleet operators are increasingly adopting integrated body panels and retrofit solar kits to power auxiliary systems such as HVAC units, lift gates, and refrigeration, effectively lowering diesel consumption and extending battery life for electric trucks. This operational transition is being validated by new regulatory certifications confirming the safety and reliability of add-on photovoltaic systems; for instance, according to StockTitan in January 2025, in the article 'Sono Motors Makes History: First German Approval for Solar Bus Kit Technology', Sono Group announced that its subsidiary became the first company in Germany to receive National Type Approval (TTG) for its vehicle-integrated photovoltaic Solar Bus Kit, establishing a critical compliance benchmark for widespread commercial adoption.

Concurrently, the adoption of Perovskite and Tandem photovoltaic technologies is gaining momentum as manufacturers seek to overcome the surface area constraints of vehicle bodies by utilizing materials with superior energy density. These next-generation architectures offer theoretical efficiencies significantly higher than traditional silicon cells, allowing for greater power generation without requiring additional physical space on the vehicle hood or roof. The rapid maturation of this technology is driving it from laboratory research toward commercial viability, providing the high-yield performance necessary to make solar charging a primary rather than supplementary energy source. This technological leap is highlighted by recent breakthroughs; according to pv magazine in January 2026, in the report 'China's Hefei BOE Solar Technology claims 27.37% efficiency for perovskite solar cell', the company achieved a certified conversion efficiency of 27.37%, setting a new performance standard that enhances the feasibility of integrating high-output modules into automotive surfaces.

## Key Market Players

Maxeon Solar Technologies, Ltd.

Volkswagen Group

JinkoSolar Holding Co., Ltd.

Trina Solar Co. Ltd.

JA Solar Holdings Co., Ltd.

Canadian Solar Inc,

LG Electronics Inc.

SunPower Corporation

Hanwha Corporation

LONGi Green Energy Technology Co., Ltd.

## Report Scope

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

EV Solar Modules Market, By Solar Panel Type

Monocrystalline and Polycrystalline

EV Solar Modules Market, By Grid Type

Off-grid Module

On-grid Module

and Hybrid Module

EV Solar Modules Market, By Application

Passenger Vehicles and Commercial Vehicles

EV Solar Modules 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

## Competitive Landscape

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

## Available Customizations:

Global EV Solar Modules 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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