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Building Integrated Photovoltaics (BIPV) Market Assessment, By Technology [Crystalline Silicon-Based (C-Si) Solar Cells, Thin film], By Applications [Roofs, Externally Integrated Systems, Facades, Others], By End-user [Residential, Commercial, Industrial], By Region, Opportunities and Forecast, 2017-2031F

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Abstracts

Global BIPV market is projected to witness a CAGR of 15.6% during the forecast period 2024-2031, growing from USD 13.8 billion in 2023 to USD 44.01 billion in 2031. The market has experienced significant growth in recent years and is expected to maintain a strong pace of expansion in the coming years.

BIPV inculcates several benefits, such as contributing to sustainability by reducing a building’s carbon footprint via on-site generation of clean, renewable energy, thus reducing its dependence on traditional energy sources. Moreover, BIPV can lead to long-term cost savings by offsetting energy prices and increasing energy efficacy. Factors influencing the market growth include the continuously increasing demand for clean energy, rising consumer disposable income, growth of the construction sector, etc.

The construction sector's growth has accelerated the growth of BIPV due to several factors. These include the increasing demand for sustainable buildings, technological advancements, and government support for renewable energy projects. Additionally, the integration of energy storage and transparent solar panels has become a trend, shaping the market's development.

For example, in October 2023, RMIT University of Australia developed a new software

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tool called BIPV Enabler, which integrates product, regulation, technical, economic, and construction data. This software, funded by RMIT and the Australian Renewable Energy Agency, is designed to help architects and engineers estimate the cost of BIPV during the conceptual design phase. The tool's features include maps, a 3D shape library, solar visualizations, hourly weather data, and pricing information for materials and feed-in tariffs. By making BIPV design more accessible, the software promotes sustainable development and low-carbon architecture.

Rapid Technological Advancements are Proliferating the Market Growth

Rapid technological advancements in BIPV are accelerating the market's growth, driven by improved efficiency, reduced costs, and seamless integration with architectural elements. As a result, BIPV systems are becoming more attractive for building integration, contributing to energy efficiency, sustainability, and overall market growth.

For example, in March 2023, LONGi supplied a new 3.88MW BIPV solution for the 2023 Annual Conference of the Boao Forum for Asia, where over 2000 representatives from 50 countries and regions witnessed the 'Green Boao' achievements. This marked the first experience of sustainable accomplishments at the event. The BIPV solution showcased LONGi's commitment to advancing solar energy development and contributing to the 'Green Boao' initiative.

Externally Integrated Systems are Fueling the BIPV Market

Externally integrated systems are fueling the BIPV market's growth, driven by technological advancements, rising awareness about environmental conservation, and the need for energy-efficient buildings. The integration of BIPV systems with external elements such as facades, roofs, and windows is becoming more seamless, contributing to the market's expansion. Additionally, government support for renewable energy projects and the growing demand for clean energy sources further drive the market's growth.

For example, in August 2023, Korean scientists developed a grid-type LED facade that can be combined with BIPV with minimal power loss from shading. This LED display can serve as a media facade in buildings, enhancing the aesthetic appeal of PV power generation. The innovation aims to make BIPV more visually attractive and integrate it seamlessly with building design, potentially expanding its adoption in the market.

Government Initiatives Acting as Catalyst

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Government initiatives are crucial for the widespread adoption of BIPVs. These initiatives can help address challenges related to regulations, permitting, and stakeholder engagement, thus increasing the demand for BIPV. Additionally, financial incentives, tax credits, and government energy policies can significantly offset the initial installation costs, promote energy independence, lower environmental impact, and make BIPV more economically viable and attractive to businesses and consumers.

For example, in January 2024, the United States Department of Energy (DOE) announced a total funding of USD 70 million to support BIPV research projects to strengthen the nation's energy systems, including renewable energy generation sources like solar. DOE also announced that this initiative, open to public and private sector stakeholders, universities, and the DOE's National Laboratories, will help advance next-generation innovations, potentially benefiting BIPV technology and its integration into the energy sectors.

Facades are Accelerating the Market Growth Extensively

The increasing emphasis on facades as a key application area is facilitating the market growth of BIPV. This trend is driven by technological innovation, changing consumer preferences, and the integration of BIPV into building facades, which is expected to contribute significantly to the market's expansion. BIPV facades offer economic benefits, reduce energy costs, and provide a reliable backup during power outages. They also contribute to the reduction of carbon emissions, enhancing building aesthetics, and increasing property value.

For example, in November 2023, AGC, a global manufacturer of glass, chemicals, and high-tech materials, announced that SunEwat, a BIPV glass, has been installed on 'The Greenhouse,' Singapore's first net-zero international school building. The seven-story building, designed by DP Architects and DP Sustainable Design, features extensive on-site renewable energy installations, including SunEwat's BIPV vertical energy-harvesting facades. SunEwat has been installed on the complex's skylights and facades, generating the equivalent of about 40% of its total energy consumption. The use of renewable energy on campus has earned the College a Platinum Zero Energy certification under the Building and Construction Authority of Singapore's Green Mark program.

Europe Comprehensively Dominates BIPV Market

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Europe has significantly led the market and is expected to do so over the upcoming years due to its highly favorable environmental conditions, rising awareness of BIPVs, increasing urbanization, etc. Additionally, Europe’s emphasis on sustainability has led to the development of diverse BIPV product portfolios, including modules with colored cells, BIPV roof tiles, and facade elements. Moreover, the European Commission has also implemented a plethora of initiatives to address BIPV barriers and standards, thereby promoting its growth and adoption.

For example, in December 2023, a European research consortium, formed by a group of companies and research institutes, initiated a project aimed at overcoming barriers to the adoption of BIPV. The project, launched in November, seeks to enhance the global penetration of BIPV in the solar market by developing tools and software to facilitate BIPV design and address existing hurdles. This initiative reflects the ongoing efforts to promote BIPV and its integration into the built environment, aligning with the European Commission's focus on the BIPV market and stakeholder analysis.

Future Market Scenario (2024 – 2031F)

The market is expected to witness continued growth, driven by increasing demand for clean energy, favourable government policies, and technological advancements.

Factors such as rising awareness about environmental conservation, the rising need for energy-efficient buildings, and increasing government support for renewable energy projects are expected to contribute to the market's expansion.

Rise in investments in research and development (R&D) have led to the creation of promising BIPV materials and elements, which in turn, is expected to augment the market growth extensively in future.

Key Players Landscape and Outlook

Key participants in the BIPV market include Mitrex, Tesla, Inc., Canadian Solar Inc., Belectric OPV GmbH, and Ertex Solartechnik Gmbh. These companies are investing in R&D to manufacture highly advanced BIPV modules, thereby driving the market's optimistic outlook. Moreover, the market is characterized by a higher degree of fragmentation, with various other companies vying for market share. However, some organizations are sheer-focused on larger commercial BIPV products, thereby leaving a

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gap for smaller-scale BIPV solutions. Furthermore, various collaborations and developing technologies are projected to increase the competition in this fast-paced market.

In December 2023, AGC, a world-leading manufacturer of glass, chemicals, and high-tech materials, announced that Sunjoule, a BIPV glass, was adopted for the roof of the bicycle parking lot at the Shizuoka Station North Exit Square. The roof was installed by TOKAI Cable Network Corporation and generated solar power with a maximum output of 3.7kW from Sunjoule. This integration of solar technology into the bicycle sharing station demonstrated a sustainable and innovative approach to powering urban infrastructure.

In May 2023, Mitrex, a prominent Canadian manufacturer of solar products and sustainable building materials with 20 years of experience in construction materials, collaborated with geoLAGOON and announced that it was chosen as the exclusive supplier of BIPV solutions for the innovative geoLAGOON project. Mitrex's selection for the geoLAGOON project highlighted its commitment to advancing the adoption of sustainable, energy-generating structures through integrated solar technologies.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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