

Modular Multilevel Converter (MMC) Market Forecasts to 2034 – Global Analysis By Converter Type (Half-Bridge MMC, Full-Bridge MMC and Hybrid MMC), Voltage Class, Power Rating, Application, End User and By Geography

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Abstracts

According to Statistics MRC, the Global Modular Multilevel Converter (MMC) Market is accounted for \$9.0 billion in 2026 and is expected to reach \$18.4 billion by 2034 growing at a CAGR of 9.4% during the forecast period. Modular Multilevel Converter (MMC) is a modern converter architecture used in HVDC and high-power applications. It consists of many identical submodules arranged in series within each phase, allowing flexible voltage scaling and excellent output waveform quality. Compared to traditional converter systems, MMC significantly reduces harmonic content and minimizes the need for extensive filtering, while achieving high efficiency. It is well suited for integrating renewable energy sources and enabling efficient long-distance power transfer and grid interconnection. Its modular design improves system reliability, simplifies maintenance, and provides operational flexibility, making it a preferred technology in advanced power transmission networks worldwide globally adopted.

According to CIGR? (International Council on Large Electric Systems), Modular Multilevel Converters (MMCs) have become the dominant technology for new HVDC transmission projects, representing over 70% of installations due to their scalability and efficiency.

Market Dynamics:

Driver:

Rising demand for efficient high-voltage power transmission

Rising global requirements for efficient long-distance and high-voltage electricity transmission are significantly boosting the Modular Multilevel Converter (MMC) market. MMC systems ensure stable and low-loss power transfer, making them ideal for modern and expanding grid infrastructures. With increasing cross-border grid connectivity and rapid deployment of renewable energy sources, the demand for advanced conversion technologies is accelerating. MMC provides excellent voltage regulation, reduced harmonic distortion, and high operational efficiency, strengthening its adoption across utilities. Additionally, accelerating urban development and industrial expansion are encouraging investments in advanced HVDC transmission networks, further driving the deployment of MMC-based solutions worldwide across energy infrastructure projects globally.

Restraint:

High initial capital investment

A major limiting factor for the Modular Multilevel Converter (MMC) market is its very high upfront investment requirement. MMC installations rely on sophisticated power electronic components, numerous modular units, and advanced control mechanisms, all of which significantly increase project costs. Compared with traditional converter systems, the initial capital needed for MMC-based HVDC infrastructure is much higher, making it less attractive for cost-sensitive utilities and emerging economies. Moreover, expenses related to specialized engineering, system design, and rigorous testing further elevate total project costs. Even though MMC provides long-term efficiency benefits, its expensive initial deployment continues to restrict broader market adoption globally.

Opportunity:

Expansion of renewable energy integration

The growing integration of renewable energy sources worldwide is creating major opportunities for the Modular Multilevel Converter (MMC) market. Utility-scale solar plants and offshore wind farms often require efficient long-distance transmission solutions to deliver power to consumption hubs. MMC systems provide high efficiency, scalability, and strong compatibility with modern grids, making them highly suitable for renewable applications. With increasing global emphasis on carbon reduction and clean energy transitions, investments in HVDC networks are accelerating. This trend is driving

greater adoption of MMC technology, which supports stable power transfer and strengthens renewable energy infrastructure across global transmission networks and regional power systems.

Threat:

Competition from alternative converter technologies

A major threat to the Modular Multilevel Converter (MMC) market comes from competing converter technologies. Established systems like line-commutated converters (LCC) and newer voltage source converter (VSC) solutions continue to challenge MMC adoption in HVDC applications. These alternatives are often preferred due to their lower upfront costs, simpler architecture, or proven operational track records. Continuous improvements in competing technologies are also narrowing the performance advantages traditionally held by MMC systems. As a result, MMC may face reduced adoption in projects where budget constraints or simplicity are prioritized, thereby limiting its overall market share in certain regions and application segments globally.

Covid-19 Impact:

The COVID-19 pandemic significantly affected the Modular Multilevel Converter (MMC) market by disrupting supply chains and delaying major HVDC and power transmission projects. Lockdowns forced temporary shutdowns of manufacturing facilities, resulting in shortages of essential semiconductor components used in MMC systems. Restrictions on movement and workforce availability further slowed installation, commissioning, and maintenance operations. Despite these challenges, the crisis emphasized the need for reliable and efficient power infrastructure, indirectly supporting future demand for MMC technology. Post-pandemic recovery efforts, along with increased focus on renewable energy expansion and grid modernization, have helped restore market growth and improve long-term prospects for MMC adoption globally.

The half-bridge MMC segment is expected to be the largest during the forecast period

The half-bridge MMC segment is expected to account for the largest market share during the forecast period. Its popularity is driven by a relatively simple architecture, reduced installation costs, and strong efficiency in transmitting electricity over long distances. This configuration is widely applied in renewable energy integration and large-scale grid connectivity projects that require dependable and efficient performance. The

modular nature of the system supports easy expansion and straightforward maintenance, making it highly practical for utility operators. Although it has certain limitations in fault tolerance compared to other designs, its affordability and operational efficiency ensure its leading market position globally.

The transportation operators segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the transportation operators segment is predicted to witness the highest growth rate, driven by increasing electrification across railways, ships, and other transport systems. MMC technology is widely used in electric propulsion and high-voltage conversion applications due to its efficiency, compact design, and reliable performance. The shift toward sustainable mobility solutions and efforts to reduce carbon emissions are boosting its adoption. Moreover, supportive government policies and investments in electric transportation infrastructure are further strengthening demand. These factors collectively position the transportation sector as the fastest-growing segment for MMC technology in global power electronics applications.

Region with largest share:

During the forecast period, the Europe region is expected to hold the largest market share owing to its extensive renewable energy integration and ongoing modernization of power grid infrastructure. The region has a well-developed HVDC network and is heavily investing in cross-border transmission projects to enhance energy reliability and efficiency. Leading countries such as Germany, the United Kingdom, and Nordic regions are rapidly expanding offshore wind capacity, which fuels demand for MMC systems. Strong governmental support for clean energy transition and carbon reduction goals further accelerates adoption. In addition, the presence of key power electronics manufacturers and continuous innovation reinforces Europe's leading position in the global MMC market.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR, driven by rapid industrial growth, urban expansion, and increasing development of power infrastructure. Major economies such as China, India, Japan, and South Korea are actively investing in HVDC transmission systems to support rising electricity demand and renewable energy integration. Ongoing efforts toward grid modernization and improved cross-border power connectivity further boost MMC adoption. In addition,

strong government policies supporting clean energy development and large-scale renewable projects are accelerating market growth. Expanding manufacturing base and cost-efficient production also enhance the region's strong growth momentum globally.

Key players in the market

Some of the key players in Modular Multilevel Converter (MMC) Market include Siemens Energy, Hitachi Energy, GE Vernova, NARI Technology, Toshiba, Rongxin Huiko Electric, XJ Electric, Hyosung Heavy Industries, Innomotics, XD Electric, TBEA, Sifang Automation, Mitsubishi Electric, ABB Ltd, Schneider Electric SE, Eaton Corporation plc, TMEIC Corporation and Danfoss A/S.

Key Developments:

In December 2025, GE Vernova has signed an agreement with Greenvolt Power to supply onshore wind turbines for the Gurbanesti wind farm in C?l?ra?i county, Romania. The contractual scope covers the supply, installation, and commissioning of 42 units of 6.1MW, 158m rotor turbines. This marks the second major onshore wind agreement for GE Vernova Romania within two months, following an earlier announcement to deliver another 42 turbines for the Ialomi?a wind farm in the country.

In November 2025, Siemens Energy has signed a contract to design and deliver the power conversion system for Oklo's Aurora powerhouse reactors. The contract will see Siemens Energy conduct detailed engineering and layout activities for a condensing SST-600 steam turbine, an SGen-100A industrial generator, and associated auxiliaries to support Oklo's first advanced reactor, the Aurora powerhouse at Idaho National Laboratory.

In November 2025, Hitachi Energy India and Bharat Heavy Electricals Ltd (BHEL) have executed a novation agreement that transfers contractual rights and obligations for the Rajasthan HVDC project from Rajasthan Part I Power Transmission Ltd (RPPTL) to an Adani Group entity. The agreement, completed, formalises the replacement of RPPTL with AESL Projects Ltd (APL) as the contracting party.

Converter Types Covered:

Half-Bridge MMC

Full-Bridge MMC

Hybrid MMC

Voltage Classes Covered:

Low Voltage (300 kV)

Power Ratings Covered:

Up to 500 MW

500 MW - 1,000 MW

Above 1,000 MW

Applications Covered:

HVDC Transmission

FACTS (Flexible AC Transmission Systems)

Renewable Integration

Industrial Drives

Rail Traction Systems

End Users Covered:

Utilities

Industrial Sector

Transportation Operators

Regions Covered:

North America

United States

Canada

Mexico

Europe

United Kingdom

Germany

France

Italy

Spain

Netherlands

Belgium

Sweden

Switzerland

Poland

Rest of Europe

Asia Pacific

China

Japan

India

South Korea

Australia

Indonesia

Thailand

Malaysia

Singapore

Vietnam

Rest of Asia Pacific

South America

Brazil

Argentina

Colombia

Chile

Peru

Rest of South America

Rest of the World (RoW)

Middle East

Saudi Arabia

United Arab Emirates

Qatar

Israel

Rest of Middle East

Africa

South Africa

Egypt

Morocco

Rest of Africa

What our report offers:

Market share assessments for the regional and country-level segments

Strategic recommendations for the new entrants

Covers Market data for the years 2023, 2024, 2025, 2026, 2027, 2028, 2030, 2032 and 2034

Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)

Strategic recommendations in key business segments based on the market estimations

Competitive landscaping mapping the key common trends

Company profiling with detailed strategies, financials, and recent developments

Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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