

High-Voltage Direct Current Market Forecasts To 2034 – Global Analysis By Component (HVDC Cables, Overhead Transmission Lines, Converter Transformers, Thyristor Valves, IGBT-Based Valves, Smoothing Reactors, Harmonic Filters, DC Switchgear, Control and Protection Systems and Other Components), Project Configuration, Transmission Medium, Voltage Level, Power Rating, Technology, Application, End User and By Geography

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Abstracts

According to Statistics MRC, the Global High-Voltage Direct Current Market is accounted for \$16.1 billion in 2026 and is expected to reach \$31.4 billion by 2034 growing at a CAGR of 8.7% during the forecast period. The High-Voltage Direct Current market is witnessing growth due to increasing demand for efficient electricity transmission, renewable energy connectivity, and modernized power networks. HVDC systems provide advantages such as reduced transmission losses, enhanced control over electricity flows, and dependable connections between grids operating at different frequencies. Rising deployment of offshore wind, utility-scale solar, international power links, and advanced grid infrastructure is creating new opportunities for HVDC solutions. Innovations in converter technology, high-voltage cables, and voltage-source converters are enhancing operational performance and adaptability. The global transition toward electrification, expansion of renewable power generation, and growing requirements for grid reliability are expected to drive HVDC adoption.

Market Dynamics:

Driver:**Increasing Demand for Long-Distance Power Transmission**

Rising demand for efficient electricity transportation across extended distances is contributing strongly to HVDC market development. Power generation facilities are increasingly being established away from densely populated cities, whereas electricity demand continues to grow in urban and industrial areas. HVDC technology enables bulk electricity to be transmitted efficiently between distant locations while helping reduce energy losses and infrastructure requirements. It is especially valuable for transferring power from remote renewable and conventional generation projects to major consumption centers. Increasing electricity usage, development of interconnected grids, and modernization of aging transmission infrastructure are motivating utilities and governments to invest in HVDC networks, supporting continued expansion of the global market.

Restraint:**High Initial Capital Investment**

The considerable upfront cost associated with HVDC infrastructure can restrict market expansion. Developing an HVDC network requires major investments in converter stations, specialized cables, substations, control equipment, and related transmission facilities. Engineering complexity and construction requirements can further raise expenses, especially for projects involving long transmission distances or underwater cables. Utilities and governments with constrained budgets may experience difficulties securing sufficient financing for such large-scale developments. While HVDC technology can deliver operational and efficiency advantages over its lifetime, the substantial initial expenditure and lengthy investment recovery period can discourage immediate adoption. These economic considerations may particularly affect HVDC deployment in developing and financially constrained electricity markets.

Opportunity:**Expansion of Offshore Wind Power Projects**

Growing deployment of offshore wind farms creates strong opportunities for HVDC technology providers. Offshore renewable facilities are commonly situated considerable distances from shore, making dependable and efficient electricity transmission essential. HVDC systems can transport substantial power through extended underwater cable routes while maintaining comparatively low transmission losses, making them

suitable for large offshore developments. Future offshore energy hubs and interconnected transmission networks could generate additional requirements for HVDC converters, cables, and grid-control systems. Increasing government support, private-sector investment, and decarbonization initiatives are encouraging offshore wind development across various regions. This expansion provides HVDC manufacturers and infrastructure developers with significant opportunities to secure new projects and expand their market presence.

Threat:

Environmental and Community Opposition

Environmental issues and resistance from local communities can create significant obstacles for HVDC infrastructure development. Transmission corridors may require substantial land, construction activities, and supporting facilities that could affect ecosystems, farmland, residential areas, and coastal environments. Underwater HVDC cables may also attract environmental scrutiny because of potential impacts on marine ecosystems. Community objections can result in legal proceedings, additional environmental assessments, permitting complications, and construction delays. Such challenges can increase development expenses and create uncertainty for project developers. Despite HVDC technology's benefits for renewable integration and efficient power transmission, concerns involving land requirements, environmental disruption, visual effects, and local interests may hinder approvals and slow infrastructure deployment.

Covid-19 Impact:

COVID-19 created considerable challenges for the High-Voltage Direct Current market through interruptions in power demand, project construction, equipment manufacturing, logistics, and infrastructure spending. Lockdown measures reduced electricity consumption from industrial and commercial sectors, while workforce restrictions and limited site access slowed transmission construction. Disruptions across international supply networks affected the availability and transportation of specialized HVDC equipment, including transformers, cables, and converter-related components. Financial difficulties among utilities and energy companies further contributed to project delays and investment uncertainty. In India, pandemic restrictions affected transmission and renewable energy development, demonstrating weaknesses in supply-chain resilience and project execution. At the same time, the crisis strengthened attention toward reliable and resilient power infrastructure.

The HVDC Cables segment is expected to be the largest during the forecast period

The HVDC Cables segment is expected to account for the largest market share during the forecast period, supported by rising investments in long-distance and underwater power transmission infrastructure. These cables enable efficient transfer of substantial electricity volumes from remote generation sources to major demand centers. Demand is being reinforced by expanding offshore wind developments, international grid connections, and renewable energy facilities situated away from established transmission networks. Continuous improvements in insulation technologies, cable durability, power-handling capabilities, and installation methods are enhancing their performance. Furthermore, expanding grid modernization initiatives and increasing renewable electricity deployment are creating favorable conditions for greater adoption of HVDC cable systems across global transmission networks.

The Voltage Source Converter (VSC) segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the Voltage Source Converter (VSC) segment is predicted to witness the highest growth rate, driven by rising demand for renewable energy connections, offshore wind transmission, and flexible electricity networks. VSC-based HVDC technology offers precise power management, black-start functionality, and reliable operation with weak or isolated electrical grids. Its ability to support submarine connections for offshore renewable facilities is expanding its application potential. The technology can independently manage active and reactive power, contributing to improved grid stability and greater operational flexibility. Continuous developments in power semiconductors, converter designs, efficiency, and digital control technologies are strengthening VSC performance. These capabilities are expected to accelerate VSC adoption across modern transmission infrastructure worldwide.

Region with largest share:

During the forecast period, the North America region is expected to hold the largest market share, driven by increasing spending on transmission upgrades, renewable energy connections, and modern grid infrastructure. The region's extensive electricity network requires modernization to enhance reliability, operational flexibility, and efficient power transfer across long distances. Expansion of offshore wind, utility-scale solar, and other renewable generation facilities is creating additional requirements for

advanced transmission technologies. Development of regional power connections and initiatives focused on improving grid resilience are further encouraging HVDC deployment. Ongoing technological innovation, utility modernization programs, and favorable energy policies are strengthening North America's position in the global HVDC market.

Region with highest CAGR:

Over the forecast period, the Asia Pacific region is anticipated to exhibit the highest CAGR, driven by rising electricity consumption, growing renewable generation, and significant development of power transmission infrastructure. The region is witnessing increasing construction of large solar farms, wind installations, hydropower facilities, and offshore renewable projects that require dependable long-distance transmission solutions. Rapid urban development and industrial expansion are further increasing the need for efficient and stable electricity networks. Development of regional interconnections and upgrades to existing grids are creating additional opportunities for HVDC systems. Supportive government policies targeting renewable energy expansion, grid modernization, and energy security are also accelerating regional HVDC adoption.

Key players in the market

Some of the key players in High-Voltage Direct Current Market include Hitachi Energy Ltd., Siemens Energy AG, GE Vernova Inc., Mitsubishi Electric Corporation, Toshiba Energy Systems & Solutions Corporation, Bharat Heavy Electricals Limited (BHEL), NR Electric Co., Ltd., TBEA Co., Ltd., Hyosung Heavy Industries Corporation, LS ELECTRIC Co., Ltd., Prysmian S.p.A., Nexans S.A., NKT A/S, Sumitomo Electric Industries, Ltd., LS Cable & System Ltd., Hengtong Group, Taihan Cable & Solution Co., Ltd. and Jiangsu Zhongtian Technology Co., Ltd. (ZTT).

Key Developments:

In August 2026, GE Vernova announced an agreement with LS Electric to establish a joint venture focused on strengthening their competitiveness in the VSC-HVDC business.

In June 2026, Terna and STEG awarded Hitachi Energy a major contract for the converter stations of the Elmed electricity interconnection between Italy and Tunisia. The partnership involves delivery of the HVDC converter-station solution for the first direct-current interconnection between Europe and North Africa, supporting cross-

border electricity transmission and regional grid integration.

In April 2026, Hitachi Energy and Samsung C&T expanded their strategic collaboration to accelerate global grid infrastructure development. The agreement builds on their existing cooperation across major projects, particularly in the HVDC market, and establishes a framework for jointly pursuing opportunities and developing a shared market roadmap

Components Covered:

HVDC Cables

Overhead Transmission Lines

Converter Transformers

Thyristor Valves

IGBT-Based Valves

Smoothing Reactors

Harmonic Filters

DC Switchgear

Control and Protection Systems

Other Components

Project Configurations Covered:

Point-to-Point HVDC

Back-to-Back HVDC

Multi-Terminal HVDC

HVDC Grids

Transmission Mediums Covered:

Overhead Transmission

Submarine Transmission

Underground Transmission

Hybrid Transmission

Voltage Levels Covered:

±100–200 kV

±201–400 kV

±401–600 kV

±601–800 kV

Above ±800 kV

Power Ratings Covered:

Up to 500 MW

501–1,000 MW

1,001–2,000 MW

2,001–5,000 MW

Above 5,000 MW

Technologies Covered:

Line-Commutated Converter (LCC)

Voltage Source Converter (VSC)

Capacitor-Commutated Converter (CCC)

Other HVDC Technologies

Applications Covered:

Long-Distance Bulk Power Transmission

Renewable Energy Integration

Offshore Renewable Energy Transmission

Power Grid Interconnection

Remote Power Supply

Urban Power Transmission

Grid Stabilization and Power Flow Control

Other Applications

End Users Covered:

Transmission System Operators

Electric Utilities

Renewable Energy Developers

Independent Power Producers

Industrial Power Consumers

Government and Public Infrastructure 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

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Note: Tables for North America, Europe, APAC, South America, and Rest of the World

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