

# **Distributed Energy Generation Systems Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented By Technology (Micro-Turbines, Combustion Turbines, Micro-Hydropower, Reciprocating Engines, Fuel Cells, Wind Turbines, Solar PV), By End User (Residential, Commercial, Industrial), By Region & Competition, 2021-2031F**

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## **Abstracts**

The Global Distributed Energy Generation Systems Market is projected to expand from USD 309.43 Billion in 2025 to USD 663.96 Billion by 2031, achieving a compound annual growth rate of 13.57%. These systems are defined by decentralized technologies that generate electricity in close proximity to the point of use, offering an alternative to large-scale centralized facilities. Growth in this sector is primarily fueled by the urgent need for improved grid resilience against power outages and strict global mandates aimed at cutting carbon emissions. Additionally, the escalating costs associated with centralized utility power are driving industrial and residential consumers to adopt localized generation methods to secure greater financial savings and operational autonomy.

Despite these favorable drivers, the industry faces significant hurdles regarding the effective integration of variable renewable assets into established power infrastructures. Technical limitations and extended timelines for interconnection often delay project execution and inflate capital expenditures. Highlighting the scale of this challenge, the International Energy Agency reported that in 2024, distributed solar photovoltaic applications accounted for nearly 40 percent of the total global solar capacity expansion. This figure emphasizes the massive volume of decentralized installations that grid operators must successfully accommodate to maintain the market's growth

momentum.

## **Market Driver**

The pursuit of decarbonization and the reduction of greenhouse gas emissions act as primary catalysts for the adoption of distributed energy generation systems. Governments and corporations are aggressively chasing net-zero targets, necessitating the rapid rollout of low-carbon technologies like rooftop solar and small-scale wind turbines. These efforts are frequently supported by regulatory frameworks designed to encourage a transition away from fossil-fuel-dependent centralized grids. For instance, the China Photovoltaic Industry Association noted in February 2024 that the nation installed approximately 216.9 GW of new photovoltaic capacity in 2023, a surge largely driven by ambitious national climate objectives that compel industries to integrate on-site generation for environmental compliance.

Concurrently, advancements in energy storage and battery integration are significantly improving the viability of distributed systems by resolving the intermittency issues inherent to renewable sources. Storing excess energy produced during peak hours for later use guarantees a stable power supply and reduces reliance on the main grid during outages or high-demand periods. According to the International Energy Agency's April 2024 report on batteries, lithium-ion battery prices fell by 14 percent in 2023, a cost reduction that directly accelerates the economic feasibility of combined solar-plus-storage projects. To support this evolution, the International Energy Agency also projects that global grid investment will reach USD 400 billion in 2024, reflecting the priority placed on modernizing networks for decentralized assets.

## **Market Challenge**

The primary obstacle hindering the growth of the Global Distributed Energy Generation Systems Market is the difficulty of integrating variable renewable assets into existing power infrastructure, particularly regarding technical constraints and prolonged interconnection timelines. Aging grid networks, often not designed for bidirectional power flows or the intermittent nature of renewables, struggle to accommodate these decentralized assets. These technical limitations force grid operators to mandate rigorous impact studies and infrastructure upgrades, resulting in extensive interconnection backlogs. Consequently, developers face increased capital costs and delays in commercialization, which erode financial returns and lead to high attrition rates for proposed projects due to approval uncertainty.

This bottleneck severely restricts market expansion in key regions by stalling the deployment of shovel-ready initiatives. According to Eurelectric, in 2024, insufficient investment in modernizing distribution grids threatened to jeopardize 74 percent of prospective connections for low-carbon technologies, including decentralized generation units. Such delays not only impede the rollout of viable projects but also create significant barriers to entry, preventing the market from fully capitalizing on the growing global demand for decarbonization and energy resilience.

## **Market Trends**

The emergence of Virtual Power Plant (VPP) aggregation models is transforming distributed energy assets from passive standalone units into active, dispatchable grid resources. By utilizing advanced software to bundle and control decentralized systems such as battery storage and rooftop solar, aggregators can bid capacity into wholesale markets, effectively replacing fossil-fuel peaker plants while enhancing grid flexibility. This shift represents a move toward intelligent orchestration that maximizes the economic value of distributed generation for both utility operators and asset owners. According to the RMI 'Power Shift' report from October 2024, existing virtual power plant programs in the United States already contribute between 30 GW and 60 GW of peak-coincident capacity, highlighting the substantial scale of these networks.

In parallel, the market is witnessing an increasing shift toward sodium-ion battery chemistries to diversify supply chains and reduce reliance on lithium for stationary energy storage. Unlike lithium-ion alternatives, sodium-based solutions offer superior safety profiles and abundant raw material availability, making them particularly suitable for the cost-sensitive, long-duration storage needs of residential and industrial microgrids. This technological pivot addresses material scarcity concerns and lowers the capital intensity of coupling storage with decentralized power. As per the International Energy Agency's April 2024 report, sodium-ion batteries are projected to be 30 percent cheaper than lithium iron phosphate (LFP) batteries, positioning them as a highly competitive option for stationary storage deployment.

## **Key Market Players**

Siemens AG

General Electric Company

NextEra Energy, Inc.

Vestas Wind Systems A/S

Ormat Technologies, Inc.

SMA Solar Technology AG

Enphase Energy, Inc.

First Solar, Inc.

Plug Power Inc.

Ballard Power Systems Inc.

## **Report Scope**

In this report, the Global Distributed Energy Generation Systems Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

### Distributed Energy Generation Systems Market, By Technology

Micro-Turbines

Combustion Turbines

Micro-Hydropower

Reciprocating Engines

Fuel Cells

Wind Turbines

Solar PV

### Distributed Energy Generation Systems Market, By End User

Residential

Commercial

Industrial

## Distributed Energy Generation Systems 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 Distributed Energy Generation Systems Market.

## **Available Customizations:**

Global Distributed Energy Generation Systems 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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