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India Wind Power Market Segmented By Application (Residential, Commercial and Industrial), By Installation (Onshore and Offshore), By Turbine Capacity (100 KW, 100 KW to 500 KW, 500 KW to 1 MW, 1MW to 3 MW and Less than 3 MW), By Region, and By Competition, 2019-2029

https://marketpublishers.com/r/I673EF384038EN.html
Date: January 2024
Pages: 85
Price: US$ 3,500.00 (Single User License)
ID: I673EF384038EN

Abstracts

India Wind Power Market was valued at USD 6.11 billion in 2023 and is anticipated to project robust growth in the forecast period with a CAGR of 5.81% through 2029. India has set ambitious renewable energy targets to reduce its carbon emissions and increase the share of renewable energy in its energy mix. The government's commitment to achieving these goals creates a favorable environment for the growth of the wind power sector.

Key Market Drivers

Government Policy and Incentives

The Indian wind power market has experienced significant growth in recent years, driven in large part by government policies and incentives aimed at promoting renewable energy development. The Indian government has recognized the importance of wind energy in reducing greenhouse gas emissions, diversifying the energy mix, and ensuring energy security. To encourage the growth of the wind power sector, the government has implemented several key policies and incentives.

One of the most crucial policies is the Renewable Purchase Obligation (RPO), which mandates that a certain percentage of electricity generated in the country must come

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from renewable sources, including wind energy. This creates a reliable market for wind power producers, as utilities are obligated to purchase a specified amount of renewable energy. Additionally, the government offers various financial incentives, such as accelerated depreciation benefits, feed-in tariffs, and generation-based incentives, to attract investment in wind power projects.

Furthermore, the auction-based competitive bidding process for wind energy projects has helped reduce tariffs and made wind power more cost-competitive. The introduction of the competitive bidding mechanism has driven efficiency in project execution and played a significant role in lowering the cost of wind power generation.

The government's commitment to promoting wind power is also evident through initiatives like the National Wind-Solar Hybrid Policy, which encourages the integration of wind and solar energy generation. This policy promotes the efficient use of resources and infrastructure, further boosting the wind power market.

Overall, government policies and incentives have played a pivotal role in driving the growth of the Indian wind power market, providing a conducive environment for investment and development in the sector.

Technological Advancements and Innovation

Technological advancements and innovation have been instrumental in shaping the growth of the wind power market in India. Over the years, the industry has witnessed significant improvements in wind turbine technology, which have enhanced the efficiency, reliability, and cost-effectiveness of wind power generation.

One of the key technological advancements has been the development of larger and more efficient wind turbines. Larger turbines can capture more wind energy and generate electricity at lower costs. With advancements in materials and engineering, these turbines are not only more powerful but also more durable and longer-lasting.

Another important innovation in the Indian wind power market is the development of low-wind-speed turbines. India has a diverse wind profile with varying wind speeds across different regions. Low-wind-speed turbines are designed to harness energy from regions with lower wind speeds, making wind power viable in areas that were previously considered unsuitable for wind energy generation. This technology expansion has opened up new geographies for wind power development.

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Moreover, advancements in control systems, such as pitch and yaw control, have made wind turbines more responsive to changes in wind conditions, optimizing energy capture and grid integration. Additionally, innovations in energy storage technologies have helped address the issue of intermittency associated with wind power generation, making it more reliable and consistent.

Digitalization and the use of data analytics have also played a crucial role in improving the operation and maintenance of wind farms. Predictive maintenance based on data analysis helps reduce downtime, enhance asset performance, and maximize energy production.

These technological advancements and innovations have not only increased the capacity and efficiency of wind power projects but have also driven down the cost of energy, making wind power an attractive and competitive source of renewable energy in India.

Growing Environmental Awareness and Corporate Sustainability Initiatives

A growing environmental awareness and an increasing focus on corporate sustainability initiatives are driving the adoption of wind power in India. As concerns about climate change and environmental degradation continue to mount, both individuals and corporations are recognizing the importance of transitioning to cleaner sources of energy.

India has been grappling with severe air pollution and environmental degradation in many of its cities, and the need to reduce greenhouse gas emissions has become more urgent than ever. Wind power, as a clean and renewable energy source, is seen as a significant contributor to addressing these challenges. Individuals and communities are increasingly supporting the development of wind projects in their regions to reduce local pollution and combat climate change.

Additionally, a growing number of Indian companies are adopting sustainability goals and committing to using renewable energy. Many large corporations are setting ambitious targets to reduce their carbon footprint and are actively seeking renewable energy sources, including wind power, to meet these goals. The demand from the corporate sector for renewable energy has led to the growth of power purchase agreements (PPAs), where companies sign long-term contracts to purchase wind power, providing a stable revenue stream for wind project developers.

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Furthermore, international pressure and agreements like the Paris Agreement have pushed India to enhance its commitment to renewable energy and reduce its dependence on fossil fuels. The Indian government's pledge to achieve 175 GW of renewable energy capacity by 2023, including a significant portion from wind power, aligns with these global environmental objectives.

In conclusion, the increasing environmental consciousness and corporate sustainability initiatives in India are significant drivers of the wind power market. The transition to wind energy aligns with both individual and corporate efforts to reduce environmental impact and combat climate change, making wind power an increasingly important component of the country's energy landscape.

Key Market Challenges

Government Policy and Incentives

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Key Market Trends

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Offshore Wind Energy Development

One emerging trend in the Indian wind power market is the exploration of offshore wind energy projects. India's vast coastline, extending over 7,500 kilometers, presents a significant opportunity for harnessing wind energy from offshore wind farms. Offshore wind power is considered a game-changer for the renewable energy landscape in India, offering several advantages over onshore wind projects.

Offshore wind energy projects benefit from higher and more consistent wind speeds, resulting in increased energy production and capacity factors. Additionally, they have a smaller land footprint, reducing land acquisition and environmental impact issues. Offshore wind farms can also be located closer to major load centers and industrial hubs, reducing transmission losses and costs.

The Indian government has recognized the potential of offshore wind energy and initiated efforts to develop a favorable regulatory framework. The National Offshore Wind Energy Policy was introduced to provide guidelines and incentives for offshore wind project development. The policy framework includes provisions for competitive bidding, land allocation, and environmental clearances, streamlining the approval process for offshore projects.

Several states, such as Gujarat and Tamil Nadu, have already taken proactive steps to facilitate the development of offshore wind projects. They have identified potential sites and are working on creating the necessary infrastructure to support offshore wind farms. This trend is expected to gain momentum as offshore wind technology matures and investment in this sector increases.

Offshore wind power offers the Indian wind power market an opportunity to tap into a vast, untapped resource, which, if harnessed effectively, can significantly contribute to the country's renewable energy capacity and reduce its carbon footprint.

Hybrid Renewable Energy Systems

Another notable trend in the Indian wind power market is the integration of wind power with other renewable energy sources to create hybrid energy systems. Hybrid renewable energy systems combine the generation of wind power with solar photovoltaic (PV) energy, energy storage, and often other renewable sources like biomass or small hydro.

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The deployment of hybrid systems is driven by the need for grid stability and energy reliability. The variability of wind and solar resources can be complementary, with wind generation often peaking during different times of the day or year compared to solar generation. Combining these two resources in a single system can lead to a more stable and continuous energy supply.

Additionally, the incorporation of energy storage technologies, such as batteries, into hybrid systems enables the storage of excess energy during periods of high generation and its release during periods of low generation. This enhances the reliability of power supply and helps in meeting peak demand.

Several states in India, including Karnataka and Andhra Pradesh, have taken the lead in promoting hybrid renewable energy projects. They have implemented policies and incentives to encourage the development of such systems. The Indian government's National Wind-Solar Hybrid Policy further supports the growth of hybrid projects by offering regulatory and financial benefits to developers.

The adoption of hybrid renewable energy systems aligns with India's goal to achieve a more diversified and reliable energy mix while reducing carbon emissions. These systems have the potential to provide consistent power supply, reduce curtailment of renewable energy, and enhance the integration of clean energy into the grid.

As the technology and economics of hybrid systems continue to improve, this trend is expected to expand, further strengthening the position of wind power in India's renewable energy landscape. It offers a promising path toward a sustainable and resilient energy future for the country.

Segmental Insights

Application Insights

The Industrial segment emerged as the dominating segment in 2023. The industrial segment analysis of the India Wind Power Market is a critical component for understanding the specific use and impact of wind energy within the industrial sector. Wind power is increasingly being integrated into various industrial applications to meet energy demands, reduce operational costs, and enhance sustainability.

The steel industry is one of the most power-intensive sectors, and wind power is being adopted to reduce energy costs and environmental impact. Large steel manufacturing

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plants often have substantial energy requirements, and integrating wind power can help offset a portion of these needs. Wind turbines installed on-site or through power purchase agreements (PPAs) with nearby wind farms can provide a reliable source of green energy.

Similar to steel, cement production is energy-intensive. Wind power can be used to partially power cement manufacturing plants, helping reduce operational costs and greenhouse gas emissions. Wind energy's stability can enhance the overall energy mix, ensuring uninterrupted production.

India's textile and garment sector is a significant contributor to industrial production. Energy costs and environmental sustainability are of growing concern. Wind power is employed to meet a portion of the energy needs of textile factories, which often have continuous energy demands. Wind energy contributes to reducing the carbon footprint and energy expenses.

The chemical and pharmaceutical sectors require consistent and reliable energy sources for their manufacturing processes. Wind power can play a role in providing green energy to these industries. Wind turbines can be strategically located near chemical and pharmaceutical plants to offer a stable source of electricity.

Installation Insights

The Offshore segment is projected to experience rapid growth during the forecast period. India's vast coastline, spanning over 7,500 kilometers, provides significant potential for offshore wind power development. The country's offshore wind energy potential is estimated to be around 70 GW, offering a substantial source of clean energy. The Indian government has recognized the potential of offshore wind and is actively promoting its development through policies and incentives. The National Offshore Wind Energy Policy provides guidelines and regulatory support for offshore wind projects.

Coastal states such as Gujarat, Tamil Nadu, Maharashtra, Andhra Pradesh, and Karnataka are prime locations for offshore wind projects due to their proximity to the sea and favorable wind conditions. Offshore wind projects benefit from stronger and more consistent wind speeds, which lead to higher capacity factors compared to onshore projects. The steady sea breeze provides a more reliable source of energy.

Offshore wind turbine technology has advanced significantly, with the development of

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larger and more efficient turbines. These turbines are designed to withstand the challenging offshore conditions, such as high wind speeds and saltwater exposure. Floating offshore wind platforms have been gaining attention, allowing for the deployment of wind turbines in deeper waters where fixed foundations are not feasible. This technology expands the potential for offshore wind energy in India.

Offshore wind projects have a lower environmental impact compared to onshore projects. They do not require the extensive land use and do not disrupt terrestrial ecosystems. However, they do raise concerns related to marine ecosystems, migratory bird patterns, and underwater noise.- Proper environmental impact assessments (EIA) and mitigation measures are essential for responsible offshore wind development. The government is working on regulations to address these concerns.

Regional Insights

South India emerged as the dominating region in the India Wind Power Market in 2023. South India benefits from favorable wind resources due to its extensive coastline along the Bay of Bengal and the Arabian Sea, as well as hilly terrains. Coastal areas experience strong and consistent sea breeze, which is ideal for wind power generation. Tamil Nadu and Karnataka, in particular, have some of the most favorable wind conditions in the region, making them key players in India's wind power landscape.

Tamil Nadu, a state in South India, has historically been a leader in wind energy generation and has a significant installed wind power capacity. The state has attracted both domestic and international investments in wind power projects. Karnataka is another state in South India that has made substantial progress in wind power capacity addition, with several wind farms and wind energy projects in operation.

The presence of wind turbine manufacturing units and a robust supply chain in South India has facilitated the growth of the wind power sector. This has made it easier for project developers to source equipment and components locally.

South India's extensive coastline also presents an opportunity for offshore wind energy development. The region's proximity to the sea and strong offshore wind resources make it a suitable location for offshore wind farms. The Indian government's focus on offshore wind policies and regulations has encouraged the exploration of offshore wind projects in South India.

Grid integration is essential for utilizing wind power effectively. South India has made

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significant investments in grid infrastructure to accommodate the growing renewable energy capacity. Improvements in transmission lines and substations have enhanced the ability to transfer electricity from wind farms to demand centers.

South India's continued focus on wind power development, including onshore and offshore projects, positions the region as a significant contributor to India's renewable energy goals. The potential for further growth in the region remains high as technology advances, policies evolve, and the demand for clean energy continues to rise.

Key Market Players

Suzlon Energy

Vestas India

Gamesa

ReNew Power

Mytrah Energy

Inox Wind

Greenko Group

Adani Green Energy

CLP India

Hero Future Energies

Report Scope:

In this report, the India Wind Power Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

India Wind Power Market, By Application:

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Residential

Commercial

Industrial

India Wind Power Market, By Installation:

Onshore

Offshore

India Wind Power Market, By Turbine Capacity:

100 KW

100 KW to 500 KW

500 KW to 1 MW

1MW to 3 MW

Less than 3 MW

India Wind Power Market, By Region:

North India

South India

West India

East India

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the India Wind Power Market.

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Available Customizations:

India Wind Power Market report with the given market data, Tech Sci 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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10. WEST INDIA WIND POWER MARKET OUTLOOK

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