Green Energy Growth Fuels Geothermal Turbines Market to $99.5 Billion by 2031

The market is set for strong growth due to its reliability, dual-use potential, and rising electricity demand from industrial and infrastructure expansion.

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WILMINGTON, DE, UNITED STATES, July 2, 2025 /EINPresswire.com/ -- According to a new report published by Allied Market Research, titled, “Geothermal Turbines Market," The geothermal turbines market size was valued at $67.5 billion in 2021, and is estimated to reach $99.5 billion by 2031, growing at a CAGR of 4.0% from 2022 to 2031.

The geothermal turbines market plays a crucial role in harnessing clean, sustainable energy from the Earth’s internal heat to generate electricity. Geothermal turbines are essential components of geothermal power plants, converting thermal energy from underground reservoirs into mechanical energy, which is then transformed into electricity via generators. These turbines operate in high-temperature and high-pressure environments and are specifically designed for dry steam, flash steam, or binary cycle systems, depending on the type and temperature of the geothermal resource.

> “Geothermal turbines are unlocking Earth’s heat to deliver clean, reliable, and continuous power—making them a cornerstone of the global renewable energy transition.”
>
> *Allied Market Research*

Rising global demand for renewable energy sources and the need to reduce carbon emissions are major factors driving the growth of the geothermal turbines market.

Countries with significant geothermal potential, such as the U.S., Indonesia, the Philippines, Kenya, and Iceland, are actively investing in expanding their geothermal capacity. Additionally, advancements in turbine technology, improved efficiency, and favorable government policies and incentives are creating lucrative opportunities for market players. As nations strive to diversify their energy mix and enhance energy security, geothermal turbines are expected to play an increasingly vital role in sustainable power generation.

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Market Dynamics
The geothermal turbines market is experiencing steady growth, primarily fueled by the global surge in energy demand, rising awareness about environmental sustainability, and the ongoing depletion of fossil fuel reserves. As countries aim to shift toward cleaner and more sustainable energy solutions, geothermal energy presents a reliable and continuous power source with minimal carbon emissions. Unlike solar or wind power, geothermal plants provide baseload electricity, which adds to their attractiveness in the global renewable energy mix. This long-term reliability makes geothermal turbines a crucial component in energy diversification strategies.

One of the major technological drivers of this market is the development of Enhanced Geothermal Systems (EGS). EGS allows energy to be extracted from deeper, hotter rock formations by injecting fluid into the Earth's crust to create artificial geothermal reservoirs. This advancement significantly expands the potential geographic reach of geothermal energy, even in areas without naturally occurring hydrothermal resources. For example, the U.S. Department of Energy committed up to $140 million in 2018 to support EGS research at the University of Utah's FORGE laboratory, showcasing government interest in scaling up geothermal innovation.

Government policies and financial support are further stimulating market growth. Many national and regional governments are offering incentives such as tax credits, grants, feed-in tariffs, and low-interest loans to encourage geothermal development. In addition, initiatives that promote decarbonization, energy independence, and climate change mitigation are accelerating investment in renewable energy infrastructure, including geothermal projects. These factors create a favorable environment for manufacturers and developers involved in turbine production and plant development.

However, the market faces challenges, particularly related to high capital costs and raw material expenses. The construction of geothermal power plants involves extensive drilling, specialized turbine systems, and robust steel-based infrastructure, which contributes to elevated upfront costs. Notably, steel prices—representing a significant portion of total project expenses—can affect the economic feasibility of new installations. These cost-related barriers often delay or restrict geothermal projects, especially in regions lacking strong policy or financial support.

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Despite these hurdles, the increasing global demand for electricity—driven by industrialization, urbanization, and population growth—is expected to sustain the expansion of the geothermal turbine market. With rising pollution levels and growing pressure to reduce greenhouse gas emissions, governments are prioritizing renewable solutions like geothermal energy. As innovations continue to improve the efficiency and accessibility of geothermal technology, the market is likely to benefit from long-term investment and broader adoption across both

developed and emerging economies.

Segment Overview

The geothermal turbine market analysis is segmented based on type, application, and region to provide a comprehensive understanding of its structure and dynamics. By type, the market includes dry steam, flash cycle, and binary cycle turbines. Dry steam systems are the oldest and simplest form of geothermal energy conversion, using steam directly from the reservoir to drive turbines. Flash cycle turbines operate with high-pressure hot water that rapidly "flashes" into steam upon pressure release, making them suitable for high-temperature geothermal resources. Binary cycle systems, ideal for lower-temperature resources, use a secondary fluid with a lower boiling point to generate vapor that spins the turbine—offering greater flexibility and broader applicability.

In terms of application, the market is classified into residential, industrial, agricultural, and others. Industrial usage dominates due to high and consistent power demands, especially in sectors like mining, manufacturing, and processing facilities. However, residential and agricultural segments are gaining attention with the rise in decentralized and off-grid power solutions, particularly in rural and remote areas. Regionally, the market is analyzed across North America, Europe, Asia-Pacific, and LAMEA (Latin America, Middle East, and Africa). Asia-Pacific leads the market in terms of geothermal capacity and expansion, driven by countries like Indonesia and the Philippines, while North America and Europe continue to invest in advanced geothermal technologies and sustainable infrastructure.

Regional Analysis

Asia-Pacific dominates the geothermal turbines market, driven by abundant geothermal resources and strong government support for renewable energy expansion. Countries such as Indonesia and the Philippines are global leaders in installed geothermal capacity, supported by favorable regulatory frameworks, public-private partnerships, and increased investment in sustainable energy infrastructure. Indonesia, in particular, has ambitious goals to become the world’s top geothermal producer, with several large-scale projects underway to tap into its vast volcanic geothermal potential. Japan is also investing in geothermal development as part of its strategy to diversify energy sources post-Fukushima. The region's rapid industrialization and growing electricity demand further accelerate market growth for geothermal turbines.

In North America and Europe, the geothermal turbines market is propelled by well-established energy infrastructures and strong commitments to decarbonization. The United States remains one of the top geothermal electricity producers, with major development activity in states like California and Nevada. Federal and state-level incentives, along with R&D investments in Enhanced Geothermal Systems (EGS), are helping expand geothermal potential beyond traditional hotspots. In Europe, countries such as Iceland and Italy have long leveraged geothermal energy for both power and heating, and newer players like Turkey are making significant progress. The European Union’s climate goals and funding mechanisms, such as the Green Deal, continue to support geothermal innovation, offering promising prospects for turbine

manufacturers and project developers across the region.

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Competitive Analysis
The geothermal turbines market is moderately consolidated, with a mix of established global manufacturers and regional players competing on the basis of technology, efficiency, and project scale. Key players such as Ansaldo Energia, Calpine, Enel Spa, Exergy International Srl, ElectraTherm Inc., Fuji Electric Co., Ltd., General Electric, Halliburton, Mitsubishi Electric Corporation, Ormat Technologies Inc., Toshiba Corporation and Turboden S.p.A. dominate the landscape. These companies leverage advanced turbine designs, high-efficiency conversion systems, and long-term service contracts to maintain a competitive edge. Many are also investing in innovations tailored for high- and low-temperature geothermal systems, including binary cycle and flash steam technologies, to cater to a broader spectrum of geothermal resources.

In addition to large corporations, regional manufacturers and engineering firms are gaining traction by offering customized turbine solutions for small-scale and decentralized geothermal applications. These players often collaborate with local governments or energy utilities to develop cost-effective, scalable systems, especially in emerging markets across Asia-Pacific and Africa. Competitive differentiation increasingly depends on technological advancements, cost optimization, and adaptability to Enhanced Geothermal Systems (EGS) and hybrid installations. As the demand for clean, base-load energy continues to rise, competition is expected to intensify, with a growing focus on efficiency, durability, and integration with digital monitoring and smart grid platforms.

Key Findings of the Study:
- Asia-Pacific Leads Global Demand: Countries like Indonesia and the Philippines are driving significant market growth due to abundant geothermal resources and strong government support.
- Flash Steam Turbines Dominate: Among turbine types, flash steam turbines hold the largest share owing to their suitability for high-temperature geothermal resources.
- Rising Investments in EGS: Enhanced Geothermal Systems (EGS) are expanding the potential of geothermal energy in non-traditional areas, boosting demand for advanced turbine technologies.
- Industrial Sector is the Major End User: The industrial application segment holds the highest market share due to its consistent and large-scale power consumption needs.
- High Capital Costs Remain a Barrier: Despite growing interest, high initial investment and material costs, particularly for drilling and steel components, challenge large-scale adoption.

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