Gas Turbine Market Assessment, By Technology [Open Cycle, Combined Cycle], By Type [Turbojet, Turbofan, Turboprop, Afterburning Turbojet], By Rated Capacity [Below 40 MW, 40-120 MW, 120-300 MW, 300-500 MW, Above 500 MW], By Design [Heavy-duty, Aeroderivative], By End-user [Power Generation, Oil and Gas, Aerospace, Others], By Region, Opportunities and Forecast, 2017-2031F

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Report description:

Global gas turbine market is projected to witness a CAGR of 3.89% during the forecast period 2024-2031, growing from USD 16.66 billion in 2023 to USD 22.61 billion in 2031. The market is heavily influenced by the rising demand for efficient, clean, and reliable energy. Their versatility, high efficiency, and ability to integrate with renewable energy sources make gas turbines essential component of modern power systems. Gas turbines are transforming the future of energy production. The demand for sustainability is adding new elements to produce sustainable energy. Modern turbines are achieving thermal efficiencies of up to 60%. The wide range of industrial applications, along with aviation and marine, are propelling high demand for gas turbines. Development and technological innovations are influencing the market, enabling higher energy creation through advanced materials and manufacturing. Furthermore, digitalization and smart technologies, such as advanced sensors, data analytics, and artificial intelligence, are anticipated to enable real-time monitoring and predictive maintenance. The Internet of things (IoT) has influenced major industrial machines and techniques. Efficiency is a key factor in gas turbine performance, and ongoing innovations are leading to significant advancements.

The pursuit of greater efficiency has resulted in the creation of sophisticated blade designs, better aerodynamics, and enhanced cooling methods, in addition to the products that help gas turbines produce energy sustainably, influencing the market dynamics. For instance, in September 2023, Kawasaki Heavy Industries Ltd. launched the GPB17MMX, 1.8 MW class gas turbine cogeneration systems. Hydrogen fuel generator sets usually have technical issues, such as a notable rise in NOx, due to their faster combustion speed and greater combustion temperature compared to natural gas generator sets. By effectively creating a dry combustor that

runs entirely on hydrogen and makes use of a patented blend of supplemental combustion and Micromix Combustion 3, Kawasaki has overcome these shortcomings.

Energy Demand and Renewable Integration are Expected to Propel Market Growth

The increasing population and economies mean a growing energy demand. Gas turbines can cater to this demand as they have flexible response times to changes in energy demand, aligning with the increasing requirement for dependable, efficient, and adequate power. Renewable sources, such as wind and solar energy, rely on complementing technologies that provide flexible power generation. Gas turbines have ramp rates that are extremely fast and, thus, find applications in the smoothing of intermittency of various renewable sources. This feature is projected to be helpful in keeping the stability and reliability of the grid intact as more renewables come on the show.

Gas turbines can help service that shift by providing a reliable form of backup and being called upon to generate peak loads. Gas turbine generation emits fewer emissions per unit of energy than the traditional fired champ or sulfur dioxide, nitrogen oxides, and particulate matter. Fueled with natural gas, these plants release up to 50% less carbon dioxide than coal plants, resulting in cleaner air and a corresponding reduction in greenhouse gases.

For instance, in July 2024, GE Vernova Inc. (GE Vernova Group) launched an H-class gas turbine unit in Saudi Arabia. Saudi Arabia's first locally engineered H-class gas turbine unit is going to be powering the Jafurah Cogeneration Independent Steam and Power Plant (ISPP), which, once up and running, is expected to be the most efficient power plant in Saudi Arabia.

Integration with Carbon Capture Technologies and Hybrid Systems to Shape Market Dynamics

Carbon capture and storage (CCS) involves capturing carbon dioxide (CO?) emissions produced from industrial processes and power generation before they enter the atmosphere. Integration of CCS demands for modification in gas turbine cycles, including implementation of combined cycle systems. It enhances overall efficiency, allowing power generation while capturing CO?. Direct capture of CO? from flue gases can be achieved by using CCS technology in a gas turbine system. This might involve changes in the combustion process or the addition of equipment such as a CO? scrubber. It is likely to change the performance of the turbine, apart from modification to its emissions profile.

Gas turbines are increasingly being used in hybrid systems that combine renewable energy sources with gas generation. For instance, they can work alongside solar photovoltaic (PV) systems or wind farms, providing backup power when renewable generation is insufficient. This hybrid approach maximizes the use of cleaner energy while maintaining reliability. Companies are focusing on introducing advanced gas turbines that segregate their power supply through sustainable fuels.

For instance, in November 2023, Mitsubishi Heavy Industries, Ltd. operated an advanced class gas turbine with 30% hydrogen fuel co-firing at Grid-connected T-point 2. The company successfully executed hydrogen fuel blending from partial load to full load in a 1,650-degree Celsius class M501JAC gas turbine. In this process, the company verifies low NOx and stabilized combustion utilizing a Dry Low NOx (DLN) combustor with 30% hydrogen fuel mixed with natural gas.

Clean Energy Generation and Rising Power Demand to Fuel the Power Generation Segment

Based on the end-user industry, the power generation segment leads the market share due to energy transition and increased electricity demand. As a result of the global campaign to minimize greenhouse gases, gas turbines have become an efficient power generation solution. This is because they are accepted to produce fewer emissions than coal and oil, which corresponds to international standards and regulations that govern emission levels.

Furthermore, there are government policies in place that encourage a shift towards cleaner forms of energy that support this move. Gas turbines can use several fuels, such as natural gas, liquefied natural gas (LNG), diesel, and re-used biofuels. This flexibility in fuel use enables operators to adapt to the unavailability or price change of any one fuel without contravening any environmental requirement. Moreover, the blending of hydrogen with natural gas is being looked at as another means of cutting down carbon emissions.

For instance, in September 2023, CHIMEI corporation launched a gas turbine cogeneration plant in Taiwan, making 80% energy self-sufficient. With a 64MW installed capacity, the cogeneration facility reduces carbon emissions by an estimated 124,000 metric tons yearly while producing over 500 million kWh of electricity and over 160 metric tons of steam per hour. It will produce enough energy to meet the factory's 80% power needs.

Asia-Pacific to Dominate Gas Turbine Market Share

Based on region, Asia-Pacific holds a decent market share in terms of revenue as governments across the region invest in new

gas-fired combined cycle and large coal-fired plants for higher power generation. New cogeneration plants increase the role of gas turbines in the regions. As emerging economies, such as India and China, work on diversifying their power sources, the role of gas turbines is expected to increase. China and India are the primary fast-growing industrial nations in the world. They have a rapid pace of urbanization compared to other countries, and this has increased the demand for energy, creating increased opportunities for reliable and efficient power generation technologies, such as gas turbines. Reducing carbon emissions is currently a global phenomenon. Gas turbines are clean alternatives to coal-fired plants, although with higher efficiency and lower emissions. Most countries in the region are investing in natural gas as a transitional fuel in the process of shifting towards renewable energy. These countries focus on decarbonizing power generation.

For instance, in October 2022, India's National Thermal Power Corporation Limited (NTPC) and GE Power, part of GE Vernova Inc., signed a MoU for the demonstration of hydrogen co-firing in gas turbines for further decarbonization of power generation in the region. The MoU demonstrated hydrogen (H2) co-firing blended with natural gas in GE's 9E gas turbines installed at NTPC Kawas in the Combined Cycle Gas Power Plant in Gujarat, India.

Future Market Scenario (2024 ? 2031F)

?□Advanced materials and combined cycle innovations are expected to increase the gas turbine efficiency and gain greater thermal efficiency.

?□Integration with renewable and energy storage solutions is anticipated to enable the hybrid gas turbine.

?□Hydrogen utilization and carbon capture technologies are expected to decarbonize energy generation.

?□Flexible operations enabling load-following capabilities and advanced modular design in gas turbines are expected to shape the market dynamics in the forecast period.

Key Players Landscape and Outlook

Key players in the gas turbine market employ a variety of strategies to maintain competitive advantage and drive growth. Companies focus on innovation and technological advancements, investing heavily in research and development to improve efficiency, reduce emissions, and enhance reliability. Strategic partnerships and collaborations with energy companies, research institutions, and technology providers enable them to leverage complementary expertise and expand their market reach. Additionally, these companies often diversify their product offerings to include hybrid systems and solutions compatible with renewable energy sources, catering to the growing demand for cleaner energy alternatives. Market players emphasize customer-centric services, such as predictive maintenance and digital solutions, to enhance operational efficiency and strengthen client relationships. Furthermore, they are increasingly aligning their strategies with global sustainability goals, integrating carbon capture technologies and exploring hydrogen and biofuel applications to meet regulatory demands and public expectations. Companies tend to collaborate with government projects to receive tenders and projects.

For instance, in August 2024, Bharat Heavy Electricals Limited (BHEL) received the first-ever order for the demonstration of methanol firing in a Gas Turbine at the 350 MW Kayamkulam in Combined Cycle Power Plant (CCPP) of NTPC installed in Kerala, India.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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