

Contribution of renewables expected to continue to rise

The worldwide energy landscape is undergoing rapid transformation amid the shifting focus towards renewable sources, propelled by the imperative of climate objectives and the necessity for sustainable energy transitions. According to the World Energy Outlook 2023 report, the proportion of fossil fuels in the global energy mix is likely to diminish, from approximately 80% over the last two decades to 73% by 2030, as a result of the shift towards renewable energy sources. By 2050, the contribution of renewables to the global power generation mix could expand to 45-50%, up from 25-30% in 2030.

GLOBAL POWER SECTOR

Undergoing a shift towards cleaner energy sources

The Power sector is vital to the global economy, supplying electricity essential for lighting and appliances across the world. It is responsible for the generation and distribution of electricity sourced from a diverse range of inputs, including renewables such as biomass, wind and solar, as well as fossil fuels, nuclear energy, among others.

With the escalating demand for energy and the need to curb carbon emissions, the Power sector is undergoing a profound shift towards cleaner and greener energy sources. This transition is poised to gain momentum in the coming years, as nations and corporations strive to fulfil their climate objectives and forge a path towards a more sustainable future.

INDIAN ENERGY DEMAND AND INDIAN POWER SECTOR

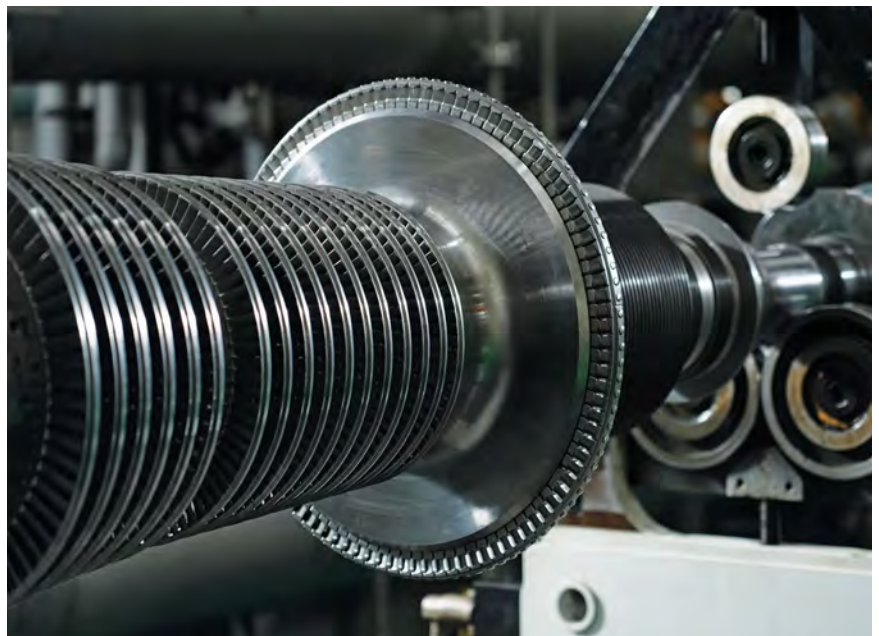
Demand continues to surge with a focus on sustainability

Recent years have witnessed a considerable surge in India's energy demand, driven by the rapid economic expansion, industrial growth, and urban development. At the same time, the country's Power sector has seen significant shifts, in line with the global scenario. This has been marked by enhanced focus on sustainable power development and increased emphasis on addressing climate change concerns through eco-friendly policies. There is a growing expectation that the sector will experience a greater shift towards eco-friendly "Green Power" solutions in the future.

According to the Council on Energy, Environment and Water (CEEW), the peak power demand in the country continued to rise in FY 24. It reached a new high of 240 GW in Q2 FY 23 and consistently surpassed the 200 GW mark in all quarters. In energy terms, the average monthly electricity demand (met) saw an uptick of 7.9% in FY 24 (versus FY 23).

In FY 24, the total installed power generation capacity reached 442 GW, of which 143.6 GW (32.5%) came from renewable energy (RE) and 46.9 GW (10.6%) from hydro. Coal capacity in the installed capacity mix dropped below 50% (217.6 GW, 49.2%) in FY 24.

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✓ The Industrial sector accounts for energy consumption in manufacturing plants, such as refineries, mining operations, and other industrial processes that involve the use of energy for machinery operation, heating, cooling, and various industrial operations.



INTRODUCTION TO TRIVENI TURBINES AND THE OPPORTUNITIES FOR STEAM TURBINES

A market-leading corporation, having core competency in the area of industrial heat & power solutions and decentralised steam-based renewable turbines up to 100 MW size

Over the last 50+ years, Triveni Turbines has manufactured and assembled engineered steam turbine solutions for meeting the heat and power requirements of industrial customers across the globe. The Company is a focussed, growing and market-leading corporation, having core competency in the area of industrial heat & power solutions as well as decentralised steam-based renewable turbines up to 100 MW size. Among the Company's customers are end-user industries like Sugar, Distillery, Cement, Steel, Food Processing, Pulp & Paper, Pharmaceuticals, Petroleum Refineries, Chemicals, Petrochemicals and Fertilisers etc.

Steam turbines play a critical role in meeting the global energy requirements, and are widely used to generate electricity from steam. They are considered to be one of the most efficient ways to convert heat energy into mechanical energy, which can be further converted into electrical energy.

The Company's customers' also include decentralised renewable energy providers, particularly in areas where there is a lack of access to the main power grid or unreliable power supply. In such areas, steam turbines are used in conjunction with renewable energy sources, such as solar or geothermal, to provide reliable and clean energy to users. Decentralised

power generation refers to the production of electricity closer to the point of consumption, which can help to increase energy efficiency and reliability, reduce transmission losses and costs, and promote energy security. By using steam turbines in combination with solar, geothermal, or waste-to-energy sources, communities can generate clean and reliable energy, while reducing their dependence on fossil fuels and increasing their energy security and resilience.

INDIAN MANUFACTURING SECTOR – SIGNIFICANCE OF CAPTIVE POWER GENERATION

Escalating electricity demand from energy-intensive industries – key driver for captive power generation

The Industrial sector accounts for energy consumption in manufacturing plants, such as refineries, mining operations, and other industrial processes that involve the use of energy for machinery operation, heating, cooling, and various industrial operations. Triveni Turbines specialises in industrial heating and cooling.

The relatively lower penetration of renewables in the Industrial sector underscores the demand potential to design, develop and deliver robust steam turbine generator solutions. The sector is rapidly emerging as one of the high-growth areas, propelled by the Government's 'Make in India' initiative that aims to position the country as a significant player in the global manufacturing arena. Increasing input costs, particularly energy expenses and electricity prices, along

with stringent Government regulations, are anticipated to incentivise investments in the establishment of captive power plants. These investments will ensure uninterrupted power supply, fostering sustainable industrial operations.

Captive power generation is becoming increasingly indispensable for many manufacturing firms, particularly those vulnerable to disruptions in grid-supplied power. Factors such as improved coal supply, growing awareness of renewable energy options, and implementation of eco-friendly power generation policies are poised to boost the captive power additions in the country.

The Industrial sector constitutes the largest market for captive power generation, driven primarily by the escalating electricity demand from energy-intensive industries, such as Cement, Steel, Petroleum Refineries, and Chemicals. Captive power generation units are equipped with the flexibility to utilise both fossil fuel and renewable fuel sources. Renewable fuel sources encompass non-thermal options, such as hydro, solar photovoltaic (PV) and wind energy, as well as thermal sources like bio-power, waste-to-energy (WtE), waste heat, concentrated solar power, and geothermal power. The significance of captive power generation in India's manufacturing sector is getting accentuated, mainly on account of the high industrial power costs, driving a projected increase in captive power generation capacity of 31 GW during the period 2021 to 2026.

Notably, the cumulative installed renewable energy capacity in India (as on March 2024) is around 11 GW, which is majorly contributed by biomass (bagasse based) cogeneration, followed by biomass (non-bagasse based) cogeneration, waste-to-energy, and waste-to-energy (off-grid).

ADVANTAGES OF TRIVENI TURBINES' STEAM TURBINES IN COMBINED HEAT AND POWER APPLICATIONS (CHP)

Steam turbines have an edge in terms of combined heat and power requirements

Triveni Turbines provides steam turbine solutions that use low pressure steam, generated through extraction turbine for heating applications by producing both heat and electric power. The cost of power generated through this process is 14-15% lower as against the power generated through IPPs (Independent Power Producers).

While solar renewable energy is used as a utility power plant only during the day, power produced through CHP/cogeneration benefits the plant throughout the day by addressing its combined heat and power requirements. This gives the latter a strong edge. As a result, the ongoing rapid increase in electricity consumption, coupled with the growing focus on electricity generation through biomass energy sources, thermal treatment of waste and recovery of waste heat, is expected to unleash sustainable power generation through the cost-effective approach of combining both heat and power.

Strategic global presence

Reinforcing its customer-centric business approach, the Company has strategically located its service offices across India, along with international offices in Europe, West Asia, Southeast Asia, and Africa. Its association and presence in South Africa have been significantly strengthened with the renewal of an existing contract in the region through a new multi-year rate contract from the strategic services contract for utility turbines, complemented by the collaboration of its team and local talent. The Company is in the process of establishing an office and workshop in the USA, with its team already deputed and engaged in hiring local talents to bolster its presence in the region for all products and services of the Company.

By providing prompt service support in different time zones, the Company is earning the trust of customers in global markets. It is trying to collaborate and forge robust relationships with various stakeholders to advance its offerings in the market, including engaging in discussions and initiatives to cater to other products in terms of manufacturing and servicing for the Oil & Natural Gas and Petrochemical industries.

GLOBAL STEAM TURBINE MARKET OVERVIEW

Global steam turbine market grew 2% y-o-y in 2023

The global steam turbine market has witnessed a decline of 4% per annum, from 120 GW in 2013 to 81 GW in 2023. This is largely attributable to a 5% per annum decline during the period 2013-2023 in the >100 MW market category (utility turbines – accounting for 90% of the overall market). This category decline is attributable to the fast-paced transition to renewable and clean energy technologies from coal-based power technologies in countries across the globe.