Management Discussion **and Analysis**

Indian Economy

India's economic growth outlook is still robust and it is projected to remain the fastest growing major economy in the world. According to International Monetary Fund (IMF), India's GDP touched 6.8% in FY 19, compared to 7.2% in FY 18. It is expected to grow at 7.3% in FY 20 and 7.5% in FY 21. Strong domestic demand, investment growth, fading transitory effects of demonetisation and implementation of the revised national Goods & Services Tax (GST) will contribute to the growth of the economy in the near future.

Global Power Industry

The energy generation mix is changing - from conventional sources to renewable sources, due to increased focus on sustainable power development, as well as to address concerns related to climate change through eco-friendly policies etc. The future is moving towards "Green Power" solutions that are environment-friendly, cost-effective and integrated through digitisation of power assets.

Indian Power Industry

The country's need for energy is increasing rapidly due to economic growth and modernisation over the past few years, taking the gross electricity consumption from 1,122 kWh per capita in FY 17 to 1,149 kWh per capita in FY 18, according to Central Electricity Authority (CEA).

India's total installed power generation capacity is at 356.1 GW, as of March 2019, compared to 344.0 GW in March 2018. This includes 78.3 GW of capacity from Renewable Energy Sources as of March 2019, of which 9.8 GW is from Biomass (Bagasse and Non-Bagasse) compared to 8.7 GW as in March 2018.

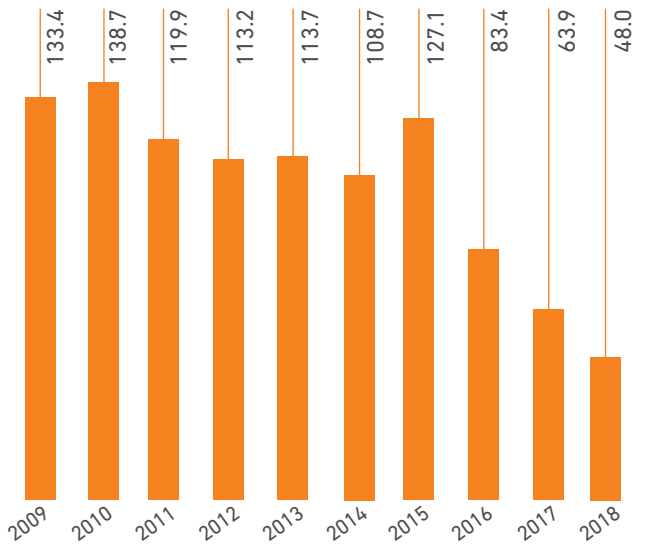
Industry Analysis

Global Steam Turbine Market

The global steam turbines market fell in 2018 to its lowest in the past two decades. From a high of 127 GW in 2015, there has been a steady decline in the market over the last three years. In 2018, the market was at 48 GW - a decline of 62% from 2015. This steep decline was due to reduction in fossil fuel driven steam turbines, which constituted 73% of the total 2015 market at 93 GW, and had come down to 48% of the total steam turbine market in 2018 at around 23 GW. However, there has been a steady improvement in the market for thermal renewables based steam turbines from a share of 5% of the total market in 2015 to 14% in 2018, and in MW terms it has grown from 5.76 GW in 2015 to 6.65 GW in 2018.

Global Steam Turbines Market

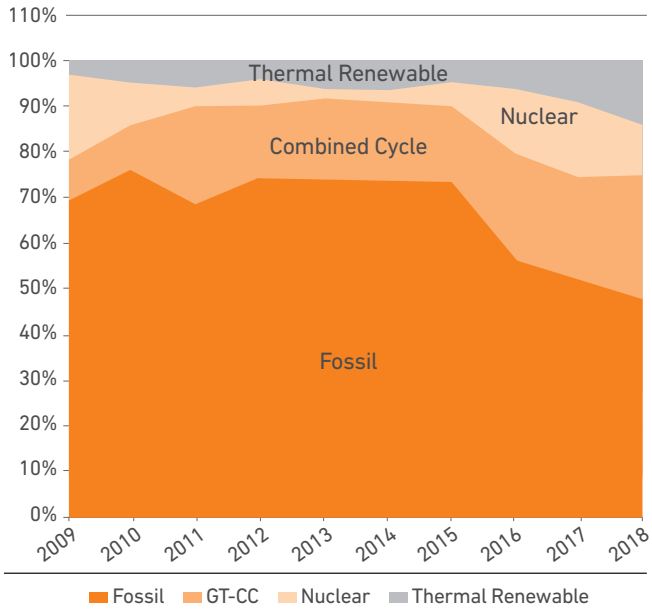
(GW)



Source: McCoy Power Reports (Steam Turbines, 2018 Report)

Global Steam Turbines Market

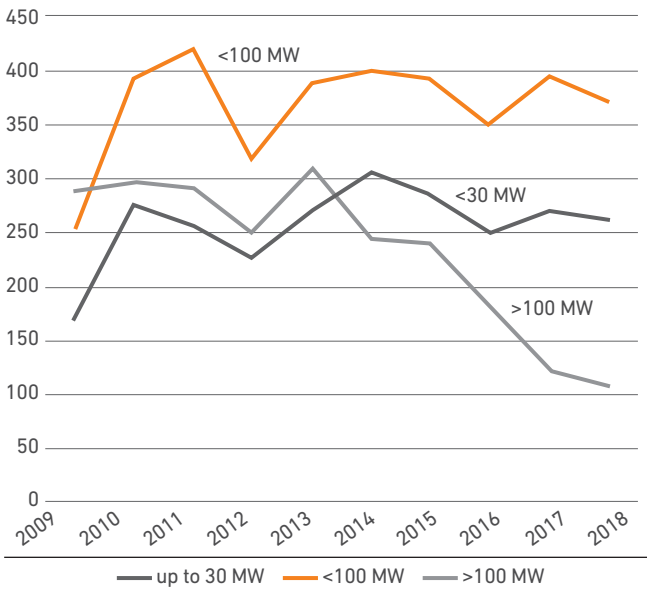
(Fuel-based in MW)



In terms of the number of units sold in the above 100 MW range, there has been a decline of 62% in 2018 in comparison to 2009, while in the up to 30 MW range, there has been an increase of 24%.

Steam Turbines Market

(Units)



Source: McCoy Power Reports (Steam Turbines, 2018 Report)

In 2009, the ratio between >100 MW and < 100 MW in terms of number of units sold was 53% to 47%, which came down to 22% to 78% in 2018. Further, in the sub-100 MW category, the growth in the sub-30 MW has also shown significant gain and it contributed 56% of the total sub 100 MW market in 2018.

In the sub-30 MW range, in terms of number of units sold, Triveni Turbines has been the second-largest player with a market share of 19% over the last five years, while in 2018, Triveni Turbines took the top spot with 26% market share followed by the previous year's largest player at 24%.

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Overall, the steam turbines market, globally, has been showing a decline over the past few years, with the fossil fuel based steam turbines particularly impacted. This has adversely affected the larger segment, both in terms of number of units and MW sold. However, in the smaller segment (industrial segment up to 100 MW), the market has been quite sturdy in terms of MW, while the number of units sold has gone up significantly. This has been driven by the steady performance of sub-30 MW range – both in terms of number of units and MW. This is driven primarily by shift in fuel type from fossil fuel to thermal renewables comprising biomass, waste-to-energy, waste heat recovery, geothermal, solar etc.

Renewable Energy

Independent Power Producers (IPPs) play a major role in generating power for sale to the grid or to specific customers. In renewable energy industry, a Feed-in tariff (FiT) or Power Purchase Agreement (PPA) provides long-term price guarantee for majority of IPPs. Increasing focus towards replacement of existing coal-fired power plants with clean fuel generation, in order to cut carbon footprint, will further augment the renewable power generation business in the future.

The global renewable power capacity in 2017 was estimated at 1,081 GW (excluding hydro). In India, the Government has set a target to achieve renewable power capacity of 175 GW by FY 22 (including 10 GW from biomass power), and further expand it to 275 GW by FY 27, from 78 GW in FY 19. The increase in demand for biomass renewable energy will create opportunity for installation of steam turbines in the future.

Captive Power Generation

Globally, the Captive Power Generation is expected to grow, owing to increasing demand for power from emerging economies such as China, India, and Middle East due to the presence of subsidised rate per unit cost of power generation. In India, the captive power generation capacity has risen to more than 26% through 2018 to 51.5 GW.

Investment in Captive Power Plants (CPPs) is likely to continue in the future considering stronger growth in GDP and investments in the manufacturing sector. For instance, the Steel industry (comprising ferrous and non-ferrous - aluminium and copper), followed by Chemical, Paper industries etc., has immense power requirements which can be met by CPP. Thus, the captive power generation capacity in India is expected to witness growth to the tune of 5% over the next 5 years to touch 66 GW by 2023, driving the demand for steam turbines.

The Combined Heat and Power (CHP) technology uses both Gas and Steam turbines and is dominating the captive power generation industry. In order to reduce operating costs, hot exhaust gas is being utilised from production lines in a more

efficient way. The heat from the hot stream is recovered using Heat Recovery Steam Generators (HRSG), in order to generate superheated steam that can be used in the process (co-generation) or to drive a steam turbine (combined cycle).

Combined Heat and Power (CHP)

At Triveni, we include CHP as renewable under waste heat recovery. In terms of technology, the CHP system generates electricity or mechanical power with lower emissions compared to conventional power generation system. Efficiency level for co-generation systems can reach up to 80% against separate generation of heat and electricity, which provides combined efficiency of 40-50%.

As per industry estimates, the global CHP market is estimated to increase its installed capacity from 755 GW in 2016 to 972 GW by 2025, at a Compound Annual Growth Rate (CAGR) of 2.8%.

Rising demand for district heating in cold climate regions will propel the growth of CHP market in Europe. In Denmark, about 70% of the district heating is produced by CHP systems. The Government of United Kingdom introduced various schemes, including Renewable Heat Incentive (RHI) and Renewable Obligation (RO), to support the development of clean energy technology and, thereby, reduce carbon footprints.

CHP system for data centre is gaining momentum when used as a source of power, leading to energy efficiency and substantial cost reduction benefits. Regions with high electricity cost are readily adopting the CHP system, primarily to save on their energy cost, for base load power and to provide absorption cooling for the facility. Moreover, the Government initiatives are encouraging customers to instal CHP systems in data centre facilities due to low CO_2 emission, and due to low economic life of data centre IT equipment (2-3 years), resulting in the adoption of CHP systems (having a lifetime of 10-15 years) for data centres. This is expected to increase the penetration of the CHP system globally.

The CHP from Sugarcane (biomass) generates power that is sustainable, utilises domestic resources, and is capable of addressing climate change as well as other environmental goals in a cost-effective way.

Waste-to-Energy (WtE)

WtE is another source of input for power generation. Residual waste from the disposal of Municipal Solid Waste (MSW) is treated with various WtE technologies for electricity generation.

Rapid increase in energy consumption, along with growing focus on electricity generation through renewable energy sources, is likely to drive the market for WtE in the future. However, high initial cost of investment required to build a WtE plant is one of the key factors hampering the growth of this market.

Europe is one of the largest markets for WtE technologies. Rapidly increasing industrial waste, coupled with stringent EU-wide waste legislation, have been the key drivers for the growth of WtE technology in the European market. The Asia-Pacific market is expanding rapidly and is estimated to grow at a CAGR of 7.5% due to increasing waste generation, higher focus of investment by Government organisation in China and India and higher technology penetration in Japan.

WtE Potential and its implications in India

Currently, around 1.5 lakh tonnes of municipal solid waste (MSW) is generated per day in Urban India. Of this, only about 25% is processed (i.e. recycled, composted or converted into biogas or electricity). The MSW generation in India is estimated to reach 4.5 lakh tonnes per day in 2030.

About 14 WtE plants (138 MW capacities) have been installed in the country during the past 30+ years. Of these, seven plants with capacity of 66 MW were closed and the remaining seven plants are operational. It is observed that half of the WtE plants constructed have closed down due to increasing cost of operations, lower electricity tariffs rates, environmental and health impacts. According to sources, Municipal Solid Waste (MSW) plant is likely to take more time to offer financial benefits.

Bioenergy

Higher acceptance level of Bioenergy will increase the investment for biomass power plants globally; thereby increasing the demand for steam turbines.

According to an International research paper, globally, around 565 million tonnes of bagasse is produced annually by yielding of sugar. Many sugarcane producing countries, such as Australia, Guatemala, Kenya, Uganda, Vietnam and the Philippines, are already generating electricity from bagasse. The global power generation potential from bagasse-based co-generation process is estimated at around 135,029 GWh per year.

More than 50% of the global industrial use of bio-heat continues to be dominated by three countries, namely Brazil, India and the United States. Brazil has gained recognition as the largest user of Bioenergy for industrial heat production in CHP applications due to a) usage of bagasse in the sugar industry, b) usage of residues in the pulp and paper industry, and c) usage of charcoal in the iron and steel industry. Bagasse is used for meeting the energy requirement of the sugar mills, and the additional resources can be used to generate power for sale to the grid.

Industrial use of Bioenergy, particularly from sugar and palm oil, is conducive to producing power from biomass. Southeast Asia's (SEA's) current biomass generation capacity of around 7.4 GW is expected to increase to almost 19 GW by 2040. The Bioenergy potential in India has been estimated at 25 GW and

the Government of India (GoI) has been consistently promoting the Biomass Power and Bagasse co-generation programme.

Various policy measures have been initiated by the GoI, including provision of financial support to various schemes being implemented by the Ministry of New and Renewable Energy (MNRE).

Industry Outlook

The largest market for captive power generation globally is the Industrial sector. Increasing demand for electricity from energy-intensive industries, such as Cement, Chemicals, Iron & Steel etc., are driving the growth of steam turbines globally. It is estimated that the 3-100 MW steam turbine market will grow by over 8% by 2024, mainly due to increase in investment towards energy efficiency in process industries such as Sugar, Distilleries, Pulp and Paper.

In the Sugar industry, for example, approx. 1,000 tonnes of Cane Crushed per Day (TCD) requires 4.3 MW of co-generation power. In India, the total cane crushing capacity from 525 operational sugar plants is around 2.3 million TCD, which account for approx. 10,000 MW or 10 GW of bagasse-based co-generation power capacity. It is observed that the overall cane crushing capacity is expected to go up significantly, leading to higher utilisation of bagasse-based co-generation capacity in the future, which is expected to clock 22 GW in 2022 and 35 GW in 2027, and will drive the demand for steam turbines in India.

The Government's focus on clean fuel has opened up potential for Distilleries in India which require captive power generation. With the launch of the new National Biofuels Policy in the country and incentives offered by the Government (such as soft loans) for setting up of new distilleries and expansion of old distilleries, huge investments are being made by the sugar companies in Greenfield and Brownfield expansions.

As per Industry sources, the Indian paper industry accounts for about 3.7% of the world's total paper production, and the estimated turnover of the industry was ₹ 600 billion with approx. 750 paper mills operating in the country. The Indian paper industry is expanding at a rate of 6-7% and expected to touch 18.5 million tonnes in 2018-19. The Pulp and Paper industry is always focussed on improving energy efficiency in order to deliver energy savings, improved productivity, and reduced environmental pollution. Energy efficiency can be attained through heat recovery, increased use of biomass-based power generation, and efficient usage of steam.

The Indian Chemical industry contributes 3.4-3.5% to the global Chemical industry and is expected to grow at the rate of 9% per annum to reach USD 211 billion by 2020-21 and USD 298 billion by 2024-25. This should lead to fresh capacity creation – both in terms of Greenfield and Brownfield.

India is the 2nd largest Cement producer in the world with production totalling 297.56 million tonnes in 2017-18. According to industry estimates, the cement production capacity as of 2018 was 502 million tonnes per annum (MTPA) and is estimated to touch 550 million tonnes by 2020. In the Cement segment, the demand for steam turbines could accrue both from captive power generation as well as by utilisation of waste heat resulting from the operations to generate power, thereby bringing down the energy cost for manufacturing.

India is the 2nd largest Steel producer in the world, as of 2018. India's steel production is expected to touch 128 MT by 2020-21 from 105 million tonnes in 2017-18. The hot exhaust gas from steel-making and cement production through Waste Heat Recovery Power Generation (WHRPG) system is capable of efficiently recovering thermal energy and transforming it into electric power through installation of steam turbines.

Market Analysis (5-30 MW)

The Indian Steam turbine market in 2018 held steady, with Fossil fuel applications followed by Biomass, Waste Heat and Waste-to-Energy. Majority of the steam turbines requirement in 2018 was in captive power generation and energy intensive segments like Steel and Process co-generation segments such as Cement, Sugar, Pulp & Paper, Chemicals and Fertiliser industries etc. With the manufacturing sector on the rise and industries like Steel, Cement, Sugar and Pulp & Paper expected to increase production, the demand for steam turbines should remain robust in the future. In the international market, the demand emanated from Waste-to-Energy, Waste Heat and other renewable-based power generation facilities.

Business Review

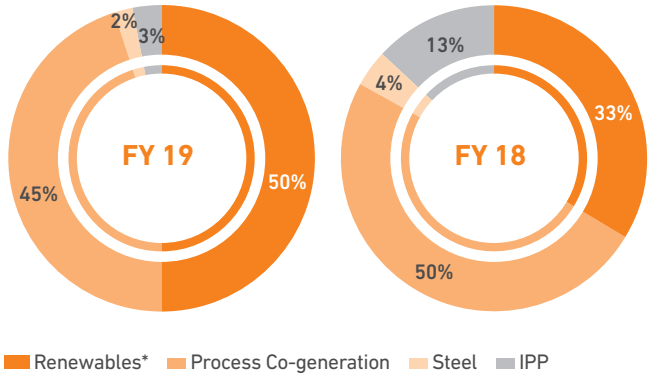
Triveni has consistently strengthened its position in the industrial sector by meeting the captive power requirements of its customers in various Greenfield and Brownfield projects. It has done this by establishing strong global footprint through its network of offices, offering wide range of state-of-the-art steam turbines, coupled with excellent aftermarket portfolio to meet the needs of our customers round-the-clock.

Domestic Business

In terms of value, the FY 19 domestic order booking showed a growth of 7% compared to FY 18. Due to stiff competition in the market, there has been a pricing pressure but the Company is exploring all options to maintain its margins through value engineering and cost rationalisation. The enquiries from domestic market during FY 19 increased by 3.8% over FY 18 and were spread over multiple user segments such as Sugar, Cement, Steel, Pulp & Paper and other Process industries. The total order booking for products in the domestic market for FY 19 has gone up by 13% at ₹ 3.1 billion.

Segment-wise Order Booking

(in % Share)



**Includes Biomass and Sugar co-generation*