



Indian Energy Sector

Macroeconomic Overview & Impact of Covid-19



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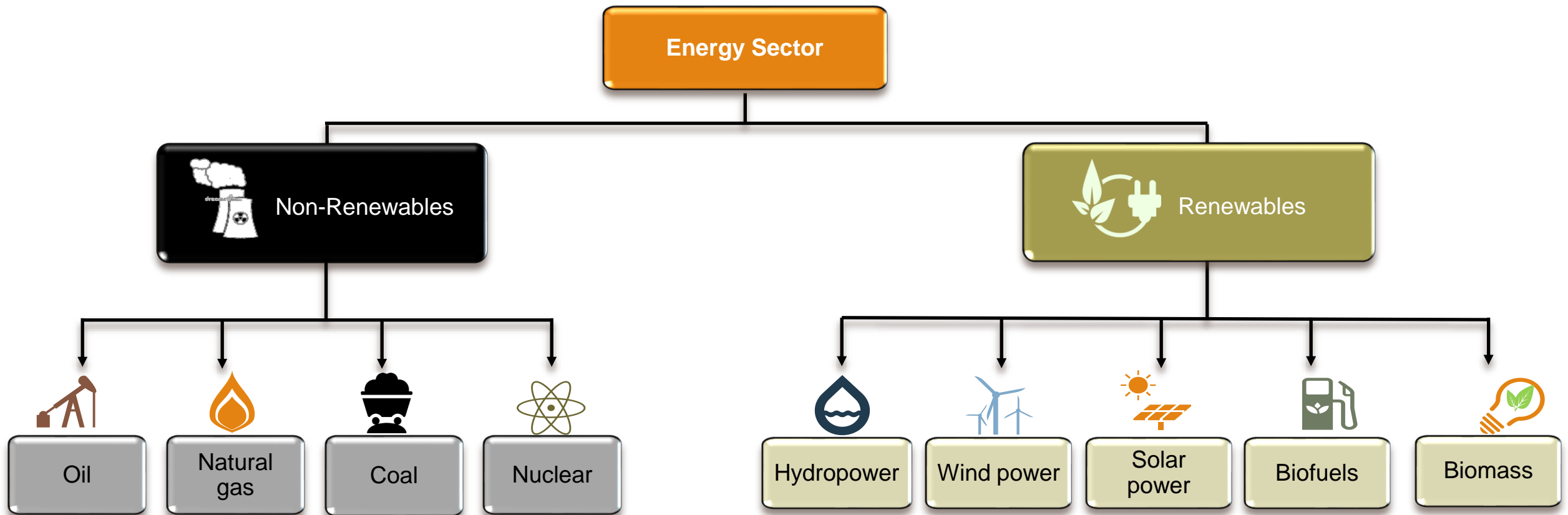


Global Energy Sector Overview

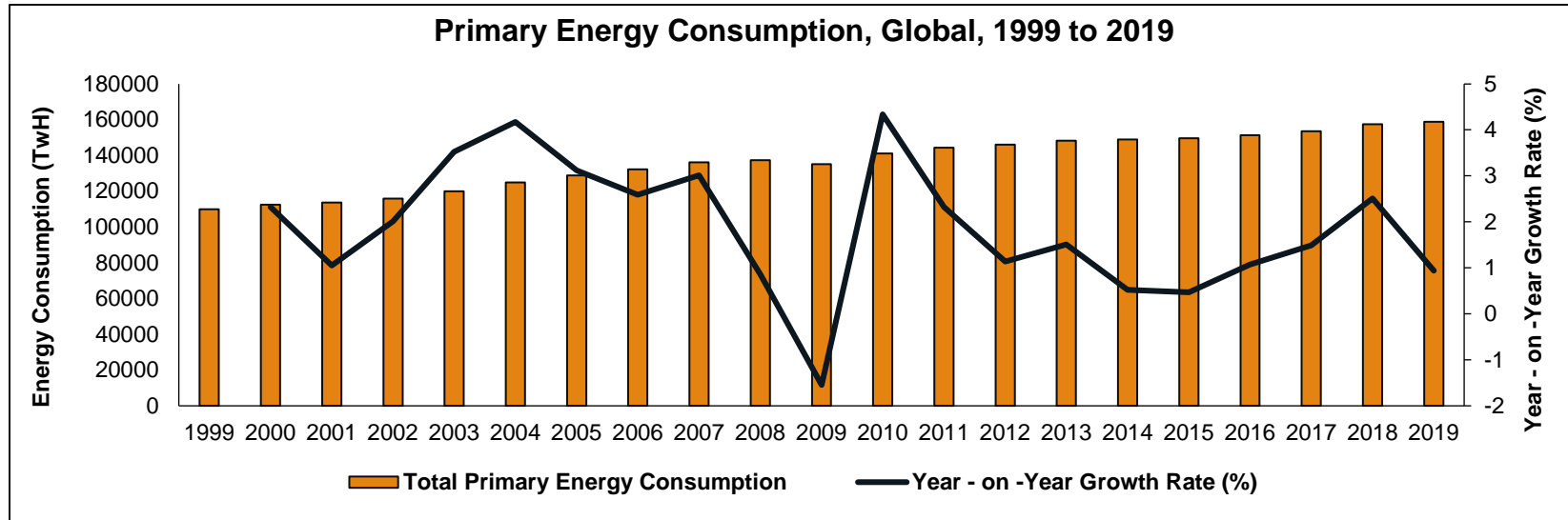


Breakdown of Energy Sector

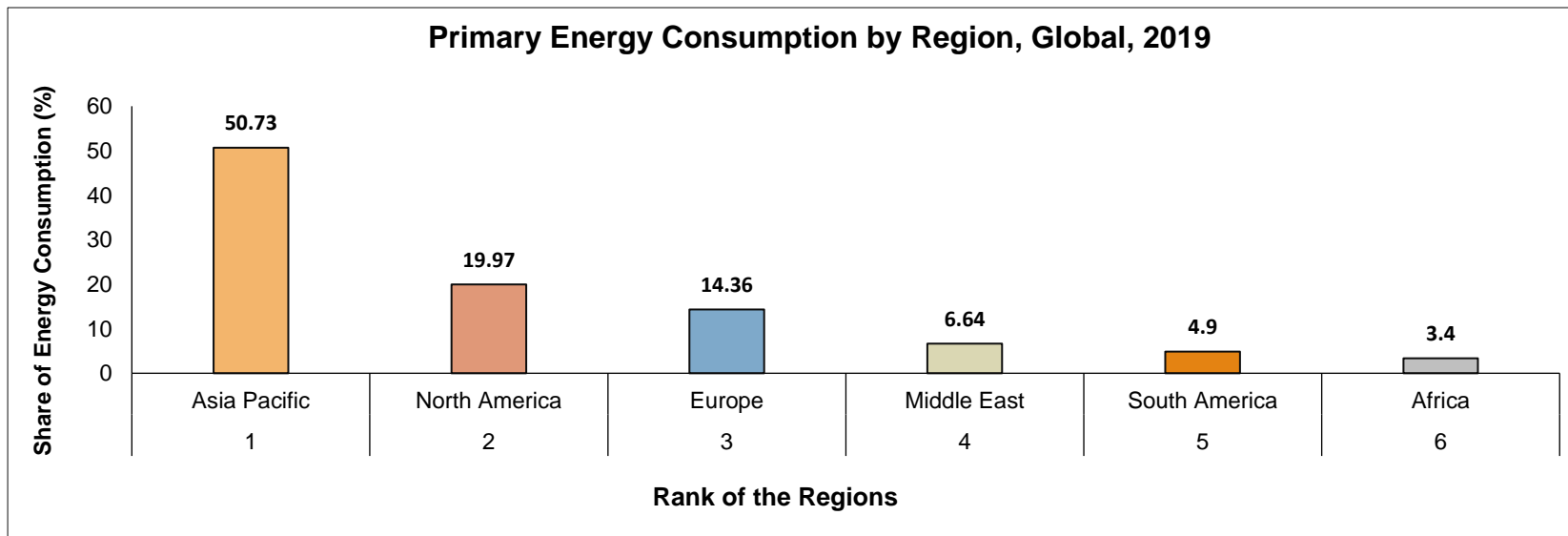
- ✓ The energy sector is responsible for producing or supplying energy.
- ✓ The procedures of exploration, drilling and refining of gas and oil from their respective reserves are controlled by the industry.
- ✓ The power utility companies which generate energy or electricity from coal and renewable sources are also integral parts of this industry.
- ✓ The breakdown of the entire energy sector can be understood as follows:



Global Consumption of Energy



Note: TWh or Terawatt-Hour is a unit of energy equal to outputting one trillion watts for one hour.

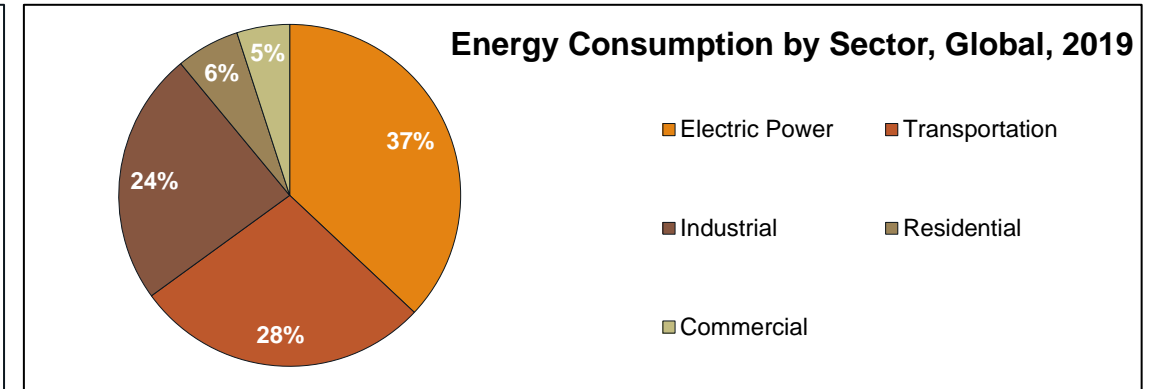
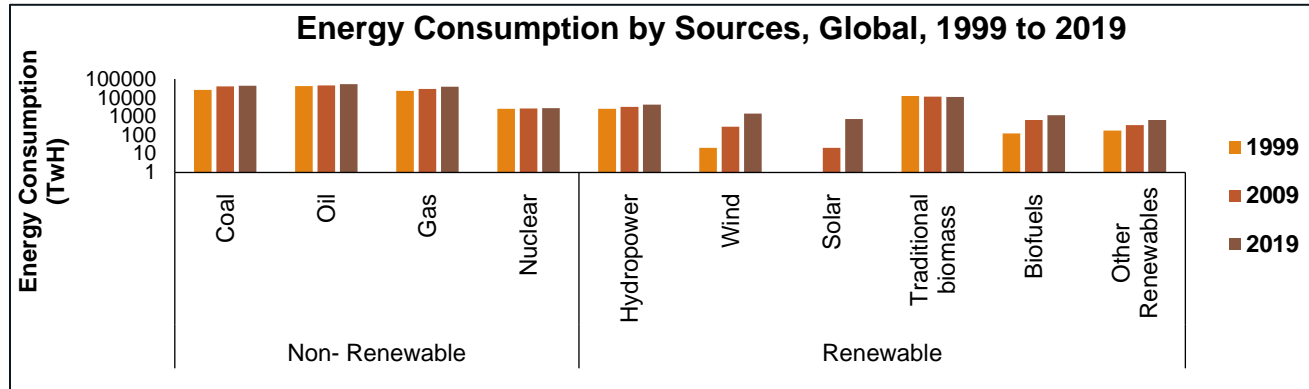


Source: Statista, Our World in Data, LSI Research

- Globally, the energy consumption had increased at the CAGR of **1.86%** between 1999 to 2019.
- Between this 20 years, the Year-on-Year (Y-o-Y) growth rate of energy consumption was maximum in 2010 with **4.34%**. In the last few years, the global energy usage has been reduced and in 2019, the Y-o-Y growth rate was only **0.94%**.
- Between 1999 to 2019, the share of energy consumption had decreased maximum in the North America (from **31.42%** to **21.38%**) and increased the most in the Asia Pacific region (from **30.72%** to **47.24%**).
- Moreover, the Asia – Pacific region also witnessed the maximum growth rate where the energy consumption had increased at the CAGR of **4.41%** between 1999 to 2019.
- Europe witnessed the lowest consumption of energy, where usage had reduced at the CAGR of **0.16%** within the same time-frame.



Global Energy Consumption by Sources and Sectors

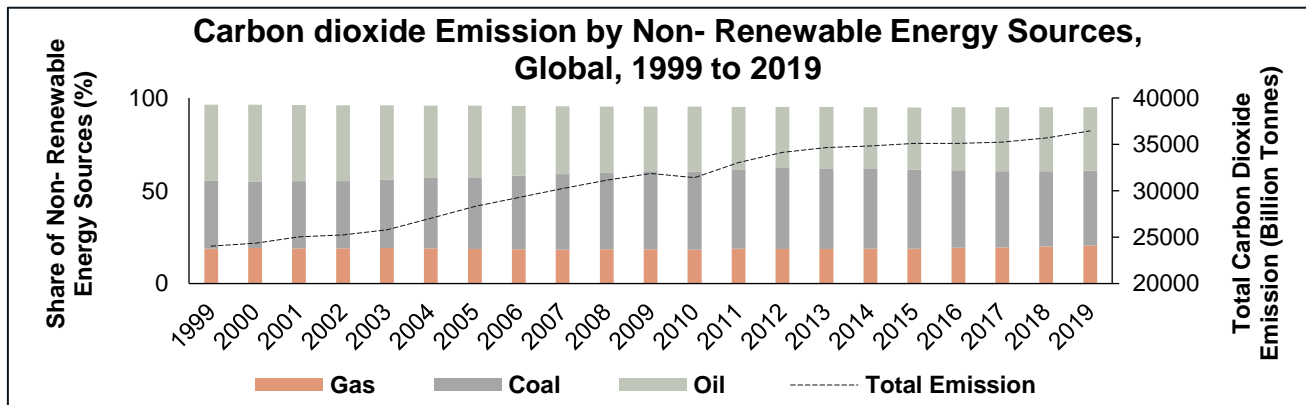
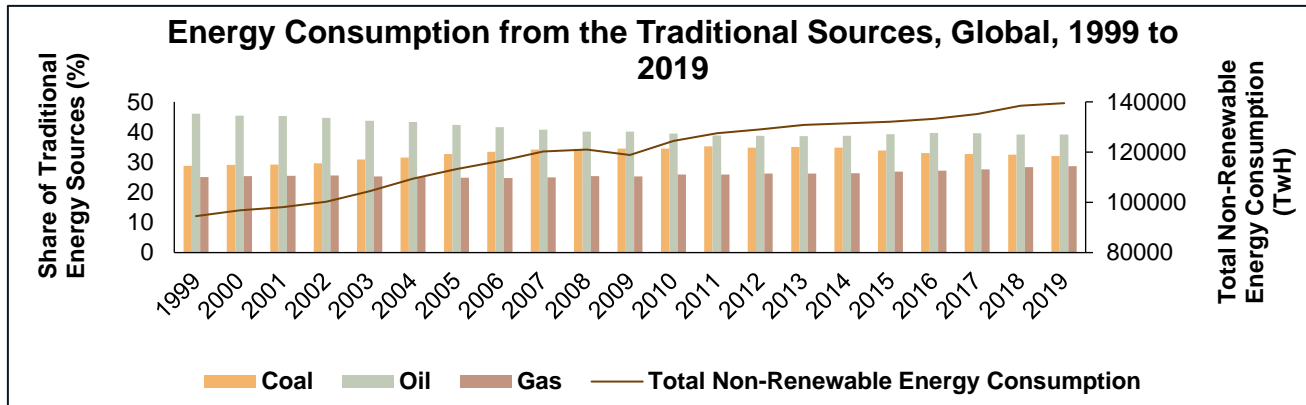
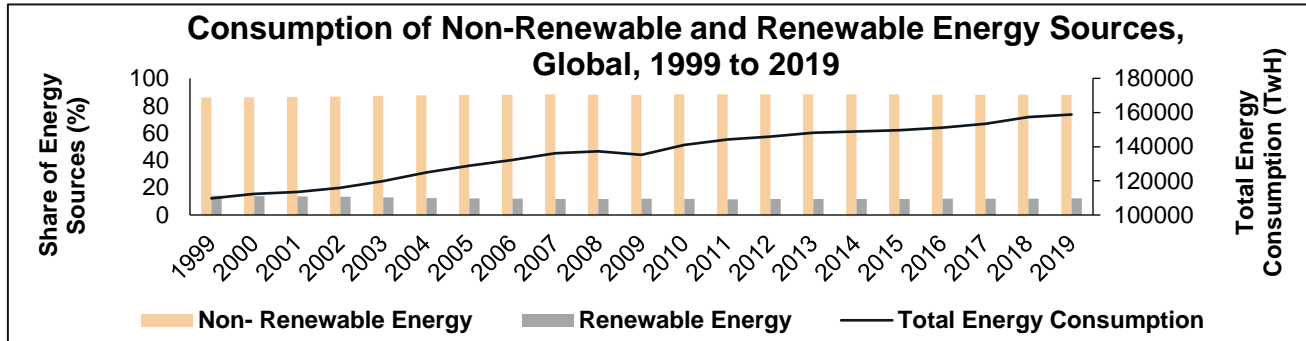


- In 2019, Oil has been the most used source of energy with **33.76%** followed by coal and gas with **27.61%** and **25%** respectively in total energy consumption.
- The share of oil in energy consumption basket has always been maximum in almost all nations for the purpose of industrialization since the 1950s. Reserves, exchange and trade of the crude oil have always been a critical issue for the global economy.
- In 2019, energy was mainly used to generate electricity followed by transportation and industrialisation throughout the world.
- However, due to the environmental degradation, the use of such non-renewable energy sources also started to get reduced in many of the countries in the recent years.
- According to the Paris Agreement signed in 2015 among the UNFCCC (United Nations Framework Convention on Climate Change) member nations, the global average temperature needs to be reduced to well below 2°C above pre-industrial levels for mitigating the risks and impacts of climate change. This is why in the recent past, the increased use of renewable energy sources like solar, wind, hydro can be seen in many countries.
- Between 2009 to 2019, the global consumption of solar, wind and hydropower had increased at the CAGR of **42.48%**, **17.88%** and **2.64%** respectively.

Source: Our World in Data, LSI Research



Traditional Structure of the Global Energy Sector

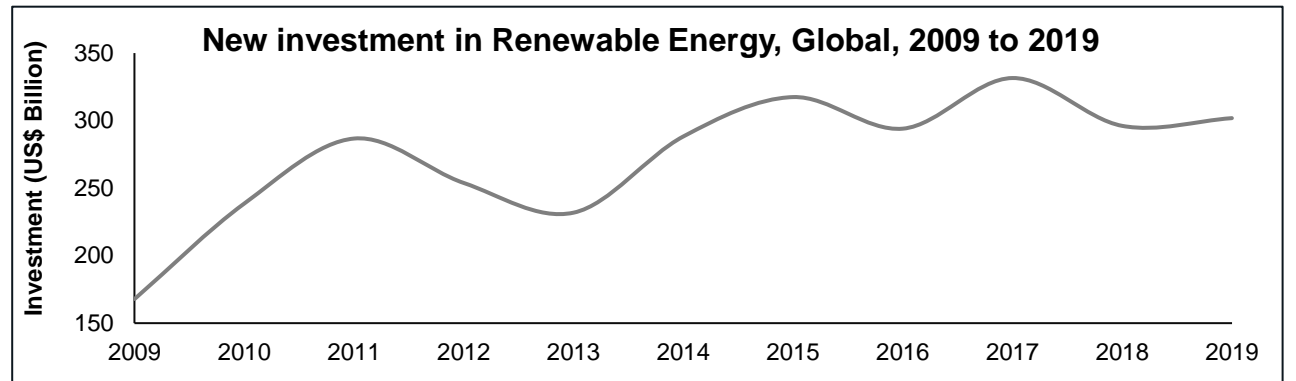
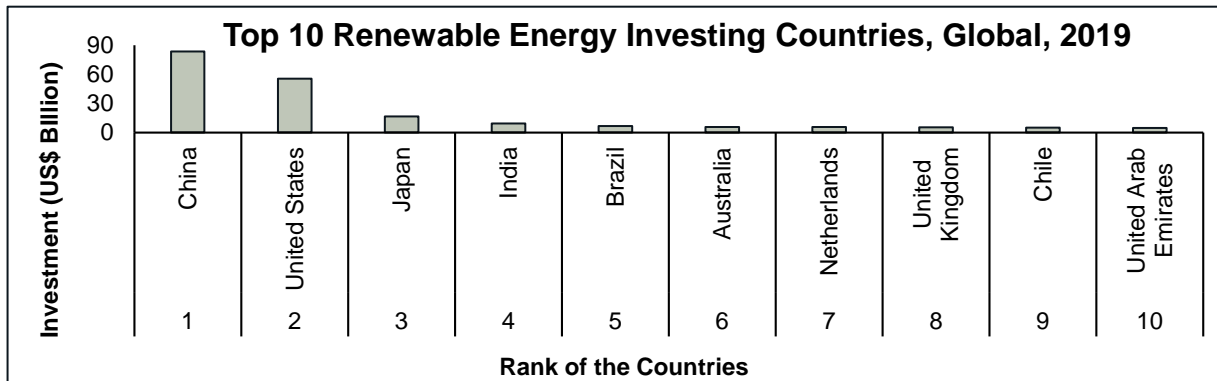
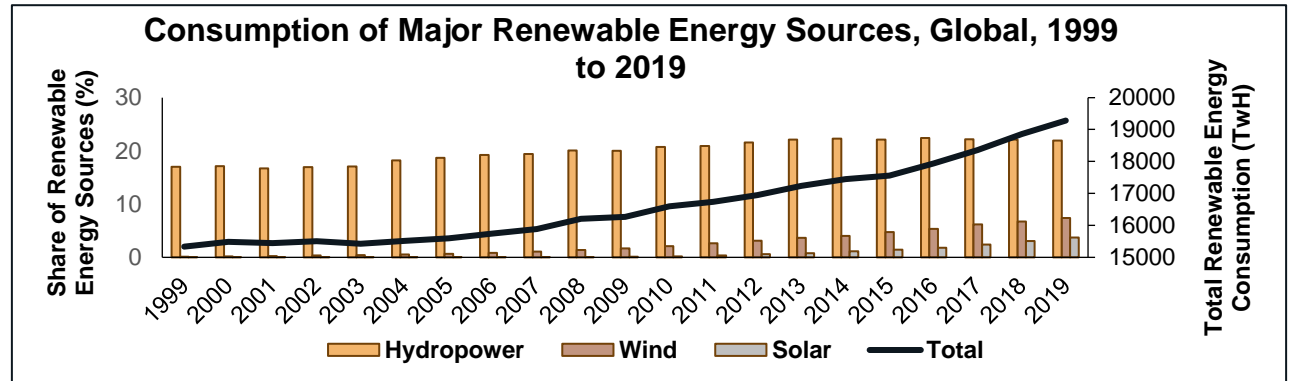
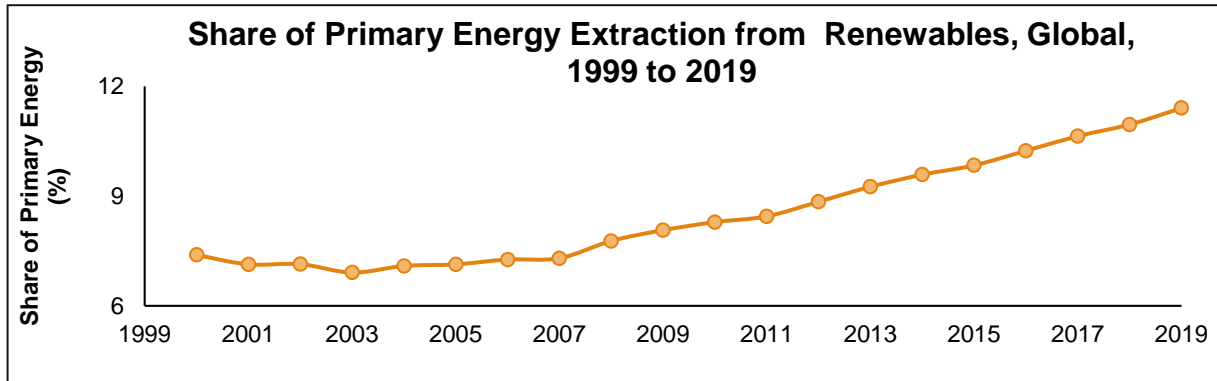


- Between 1999 to 2019, the consumption of non-renewable energy sources had increased at the CAGR of **1.97%**. Moreover, the share of these sources in the overall energy consumption also grew from **86.03%** to **87.86%** between the same time period.
- The global energy sector has always been depending upon the non-renewable energy sources which are mainly dominated by the fossil fuels like coal, oil and gas. The share of these three energy sources among the overall non-renewable energy consumption increased from **97.33%** to **98%** between 1999 to 2019. Besides, the consumption of coal, oil and gas had increased at the CAGR of **2.55%**, **1.18%** and **2.7%** respectively during that same time frame.
- However, burning such kind of fuels release Carbon Dioxide (CO₂) in the atmosphere leading to pollution and rising global temperature. Between 1999 to 2019, the CO₂ emission had increased at the CAGR of **2.11%**. Among all the non-renewable energy sources, coal, oil and gas had the shares of **40.29%**, **34.10%** and **20.54%** respectively in the overall global CO₂ emission.
- This is why, a slow but steady movement towards the consumption of the renewable energy sources can be witnessed in the different parts of the world.

Source: Our World in Data, LSI Research



How the Pattern of Energy Usage has Changed Globally over the Years?



- Renewable energy is known as the clean energy as it is obtained from the natural resources like wind, water (hydro), sun (solar) etc. These sources are considered to be endless and emit low level or almost no CO₂ while generating power.
- Despite being a comparatively new concept, renewables have become the fastest growing energy sources in the world. Developing countries like China, India, Brazil have rapidly expanded their markets for renewable energy.
- Between 1999 to 2019, the share of primary energy extraction from renewables had increased from **7.41%** to **11.41%**.
- The consumption of renewables had increased at the CAGR of **1.15%** between 1999 to 2019. Moreover, the hydro, wind and solar power generation had increased at the CAGR of **2.44%**, **23.5%** and **38.99%** respectively during the same time frame.
- Between 2009 to 2019, the new investment in the renewables had increased at the CAGR of **6.04%**.

Source: Statista , Our World in Data, LSI Research



Key Takeaways

- The global energy system has been solely dependent on the non-renewable energy sources for years. These energy sources thrived because of ease in accessibility and cheap power generating methods.
- However, after using the non-renewables as the only source of energy generation for years, the following have been observed:
 - The availability of non-renewable resources is limited. Though huge amount of fossil fuels has been stored underground for millions of years but these are also being used up faster since the time of industrial revolution.
 - Energy is generated from these sources by burning the fuels which release carbon dioxide and other harmful particles in the atmosphere leading to hampered carbon balance in the environment, severe pollution and rising global temperature.
 - Moreover, many a times, much lesser amount of energy is received after burning significant amount of fuel. This is why these sources can not be always fully utilized.
- The reliance on non-renewables has changed in the recent years with the growing usage of renewable energy sources worldwide.
- Renewable energies are part of nature, and are available abundantly. This form of energy will play a key role in the decarbonization of our energy systems in the coming decades.
- Currently the global energy system is on the transition mode where slowly the fossil fuels usage is being replaced by the renewables. This phase of transformation can be faster with proper adoption of technology, appropriate execution of governance, suitable financial assistance and investment in the new technological research etc.



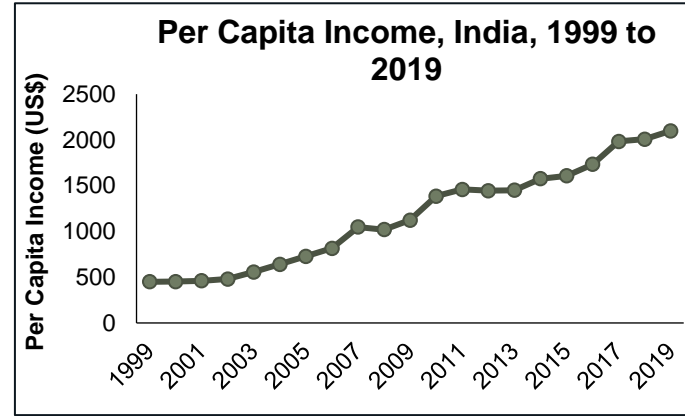
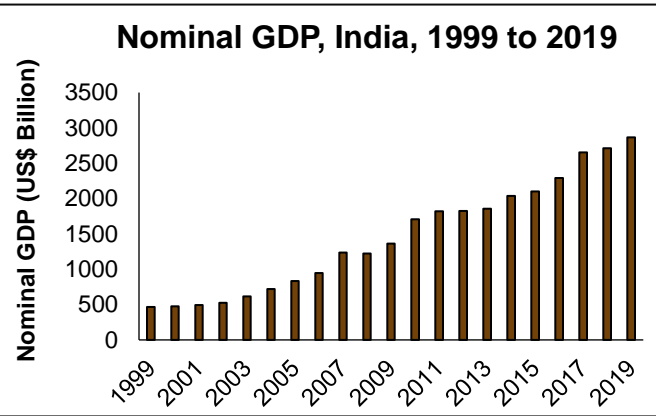


India's Energy Landscape



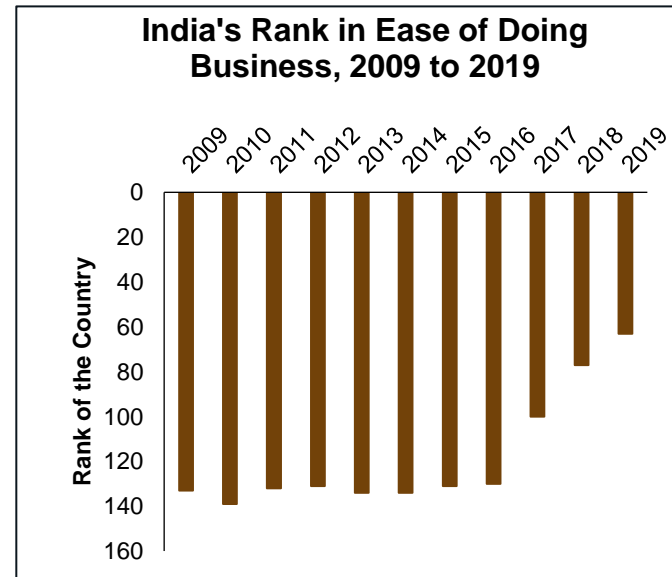
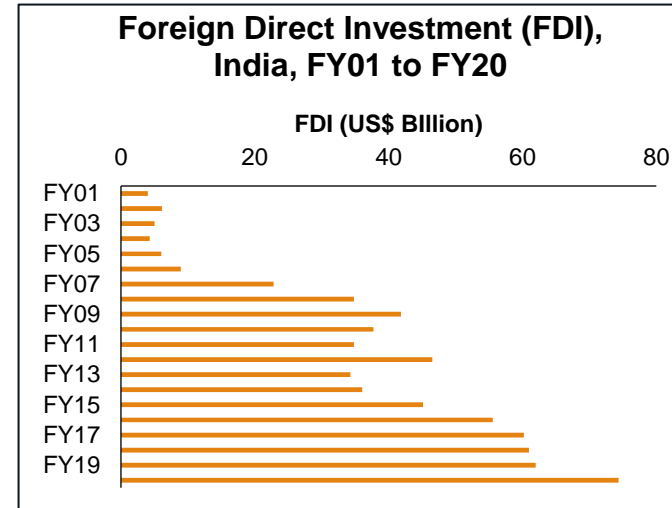
The Economic Overview of India

Economy



- The Nominal GDP of India had grown at the CAGR of **9.5%** between 1999 to 2019.
- However, change in consumer preferences, purchasing power, flow of credit, multiple policies and initiatives of the government, foreign trade and declining performance of key industries have affected the performance of GDP in the recent years. Moreover, outbreak of Covid-19 has made the situation worsened.
- The per capita income of the country had risen at the CAGR of **8%** between 1999 to 2019.
- The growth of income among all wage groups and in both the rural and urban areas has helped the population to improve their standard of living and to consume more energy to satisfy their daily needs.

Investment and Business Environment

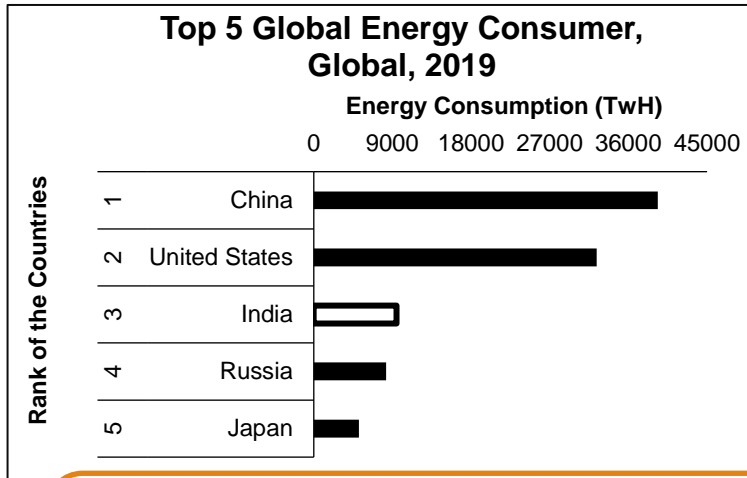


- The FDI inflows into India had grown at the CAGR of **16.59%** between FY01 to FY20.
- FDI inflows boost the development process of any country since significant amount get invested for expansion of businesses.
- Besides, the improving position of the country in the “Ease of Doing” ranking system established by the World Bank also indicates the better and simpler regulations for businesses and stronger protections of property rights.

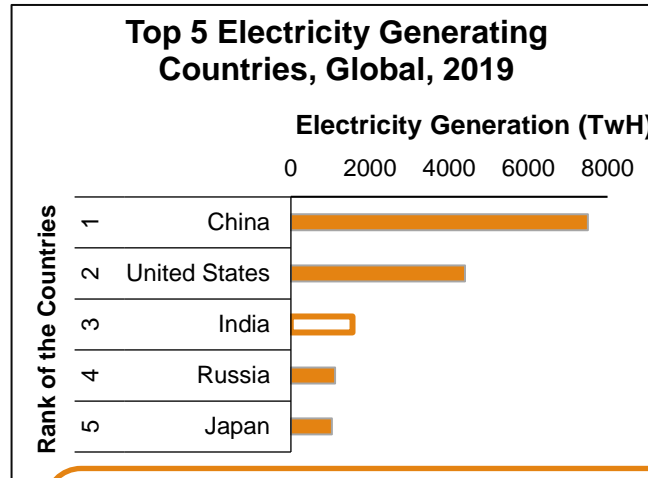
Source: International Monetary Fund, Department for Promotion of Industry and Internal Trade, World Bank, LSI Research



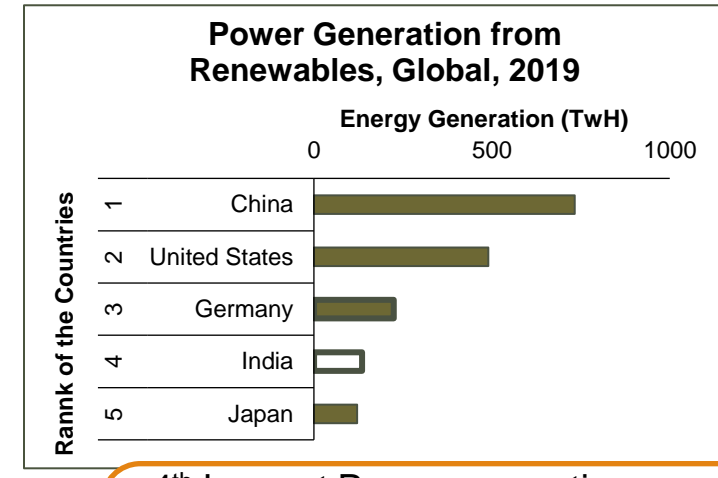
India's Energy Sector in the Global Platform in 2019



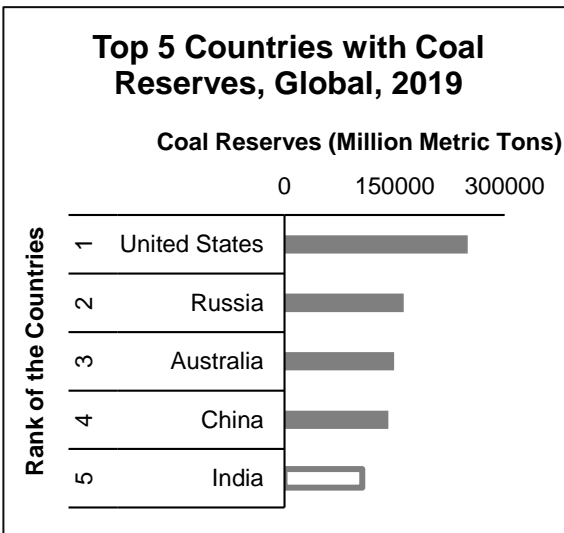
- 3rd Largest Energy Consumer.
- India's share in the global and Asia's energy consumption is **5.83%** and **13.22%** respectively.



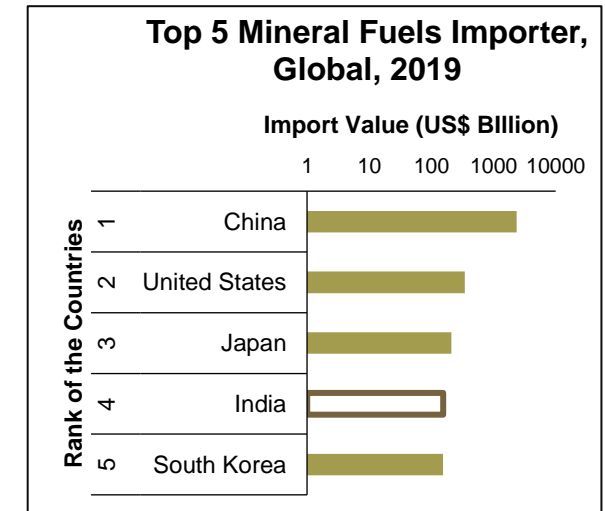
- 3rd Largest Electricity generating country.
- India's share in the global and Asia's electricity generation is **5.77%** and **12.28%** respectively.



- 4th Largest Power generating country from Renewables.
- India's share in the global and Asia's electricity generation is **4.81%** and **11.77%** respectively.



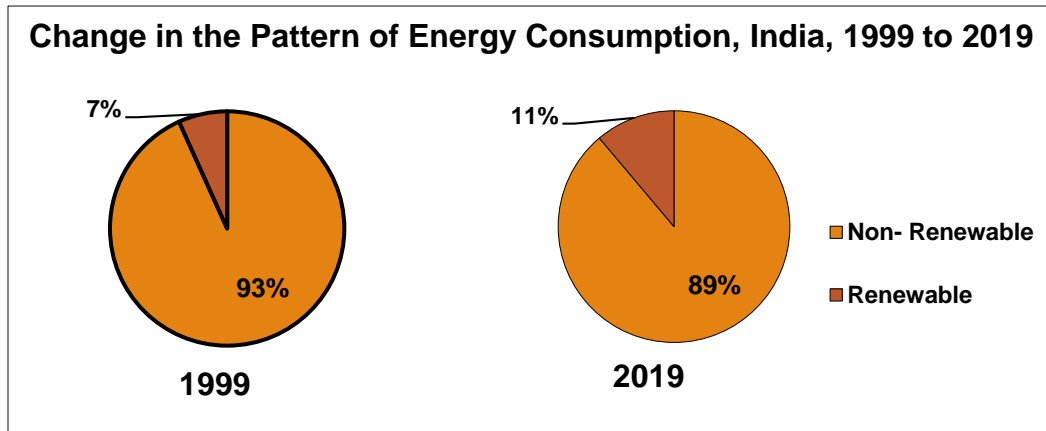
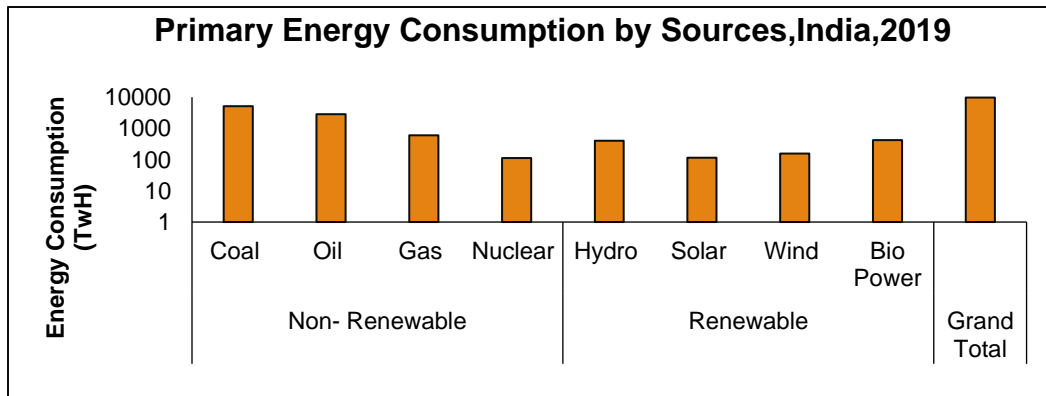
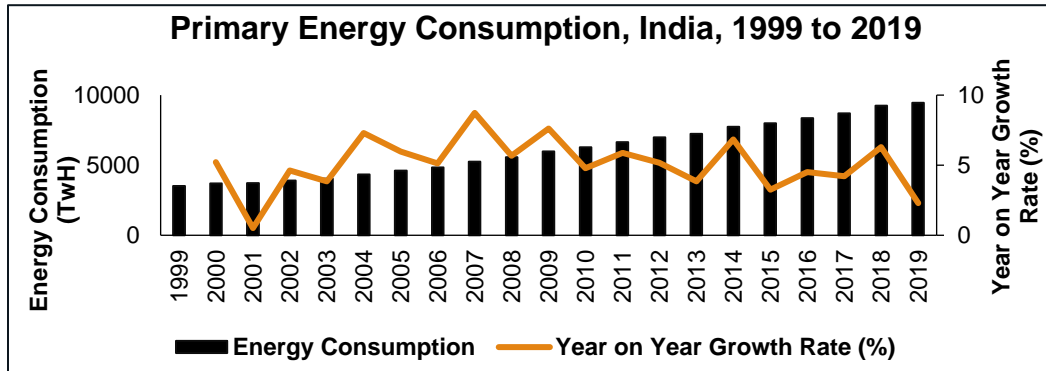
- India has the 5th largest coal reserves in the world.
- Coal can be classified into 4 types based on the carbon percentage.
Anthracite (Carbon Content or C > 87%) | Bituminous (C = 70% – 87%) | Lignite (C = 60% – 70%) | Peat (C < 60%).
- Coal with the high percentage of carbon is recognized as the best quality coal and useful for higher power generation. However, in India, both anthracite and bituminous is produced in lesser quantity.
- Hence, this situation makes India the **4th largest** importer of all types of mineral fuels (Oil, Coal, Gas etc.) in the world.



Source: BP Statistical Review, Statista, Intracen, LSI Research



The Energy Landscape in India

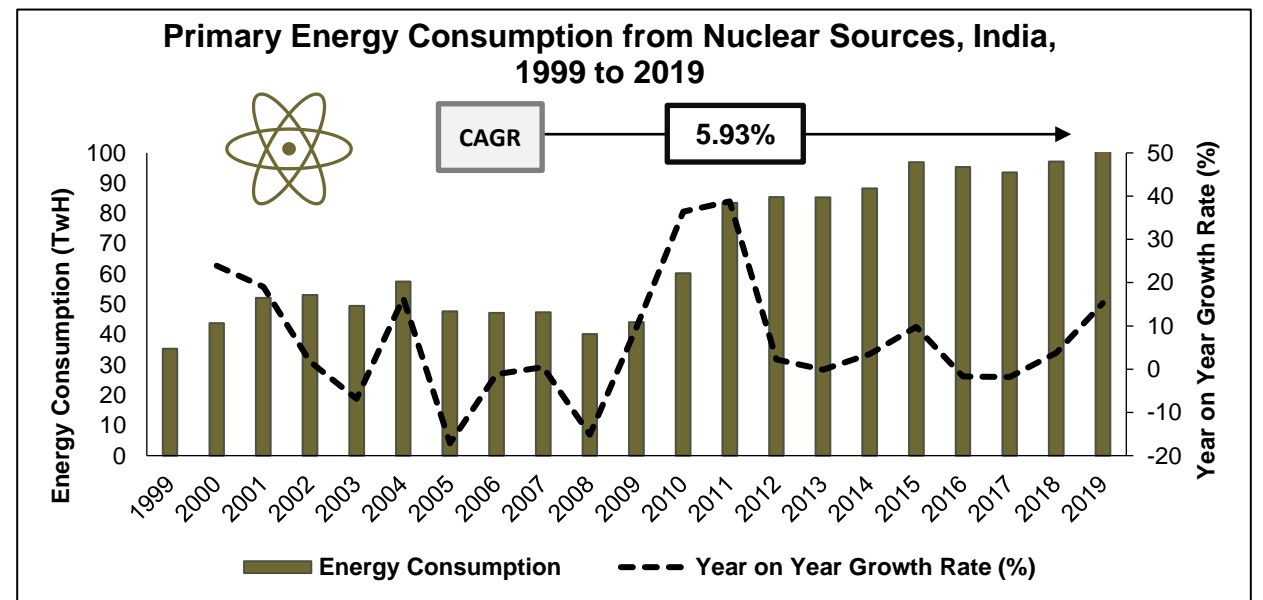
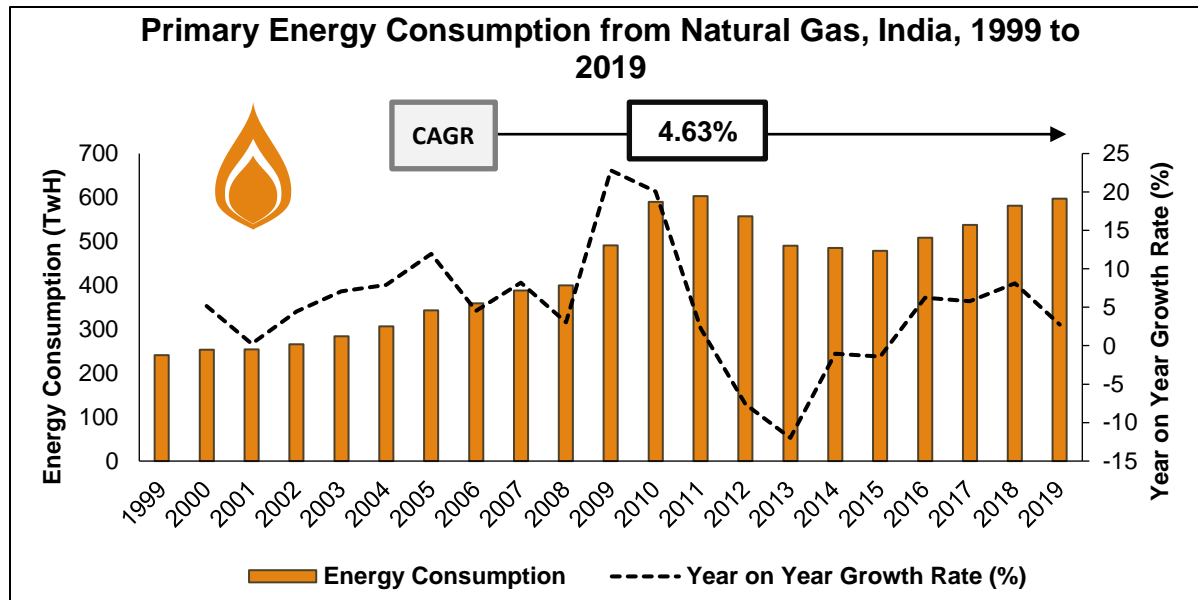
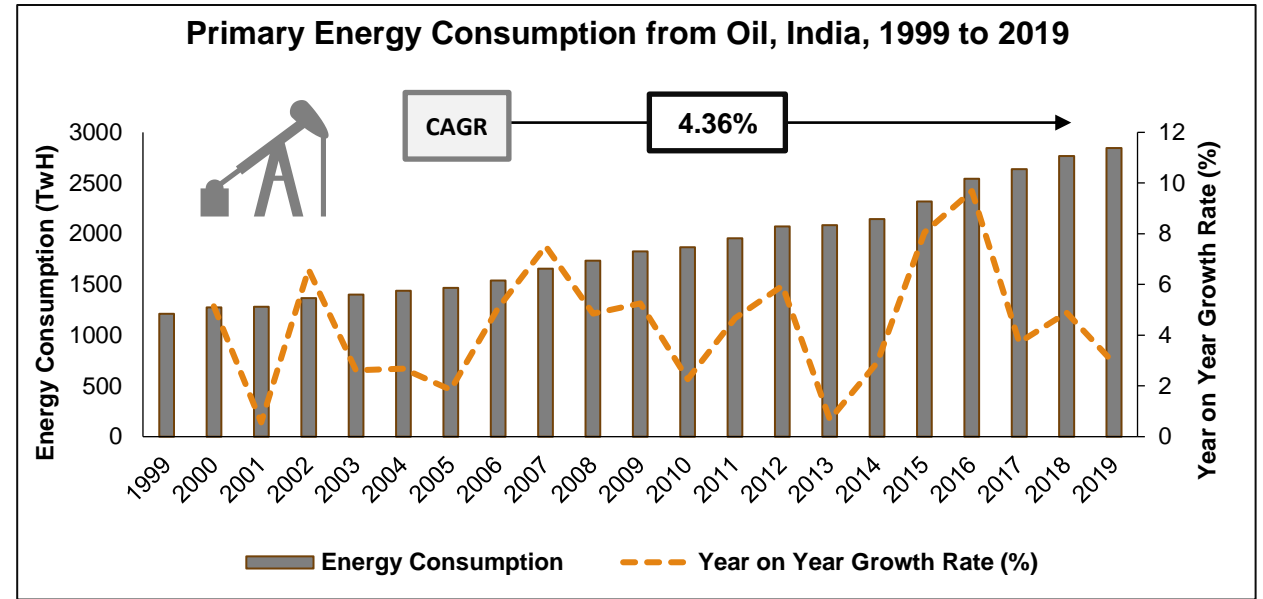
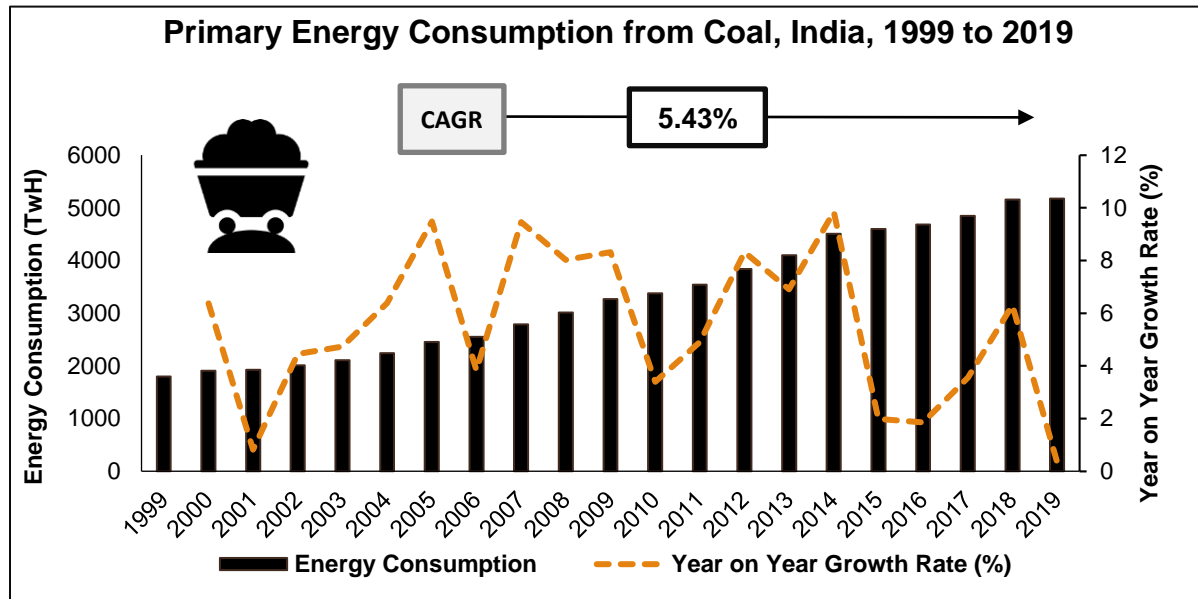


Source: Our World in Data, LSI Research

- In India, the energy consumption has been rising significantly in the recent years with the growing population and promising economic growth. The Primary Energy Consumption had increased at the CAGR of **5.26%** between 1999 to 2019.
- Just like the global sector, India has always been more dependent on the non-renewable energy sources. Among all the other non-renewable energy sources, coal has always dominated as the major source and its share had increased from **54.71%** to **59.28%** between 1999 to 2019. However, the primary energy usage pattern of the country has been changed over the years.
- India has always been a leading carbon emitter in the world because of using excessive coal for power production. Moreover, the produced coal in India is not of best quality to generate power efficiently. Depending more on imported coal is a way out which ultimately raises the import bills. This is why in recent years the country has started using renewables as these energy sources offer viable option to generate electricity in eco-friendly way.
- Between 1999 to 2019, in the overall energy usage, the share of non-renewable energy sources had decreased from **93.27%** to **88.85%** in India, whereas the share of renewables had increased from **6.73%** to **11.15%**.
- In case of using the renewable energy sources, the consumption of solar energy sources had increased the most with the CAGR of **55.47%** between 1999 to 2019.
- Expansion of electrification in the different corners of the country, rapid infrastructural development, rising urbanization etc. will trigger the energy requirement in the coming days. Hence, greater reliance on renewables will enhance the economic, social, and environmental benefits.



India's Dependence on Non-Renewable Sources of Energy

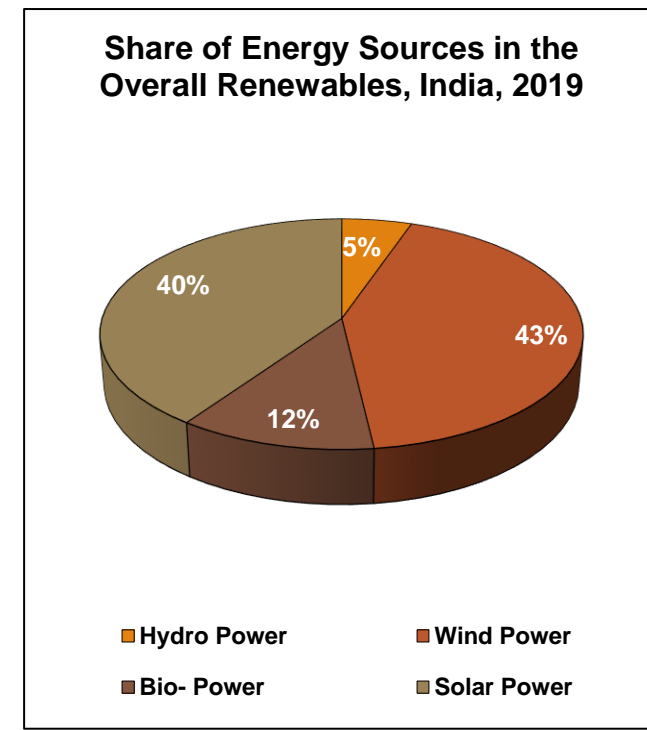
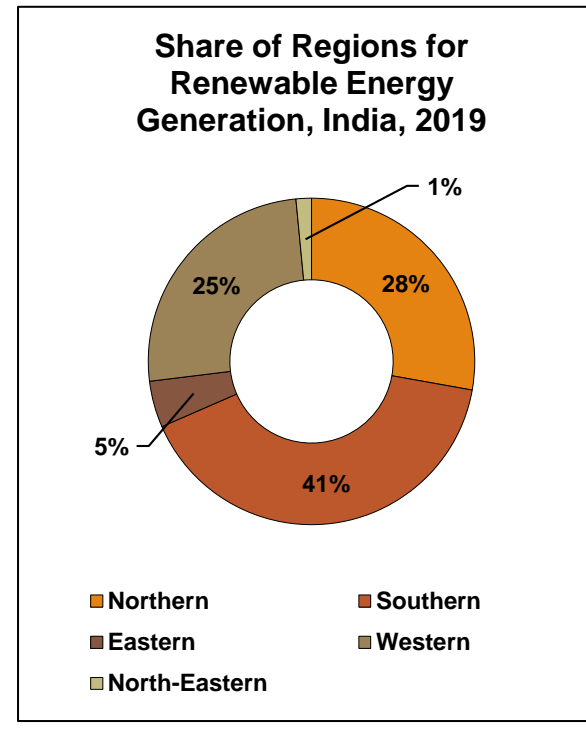
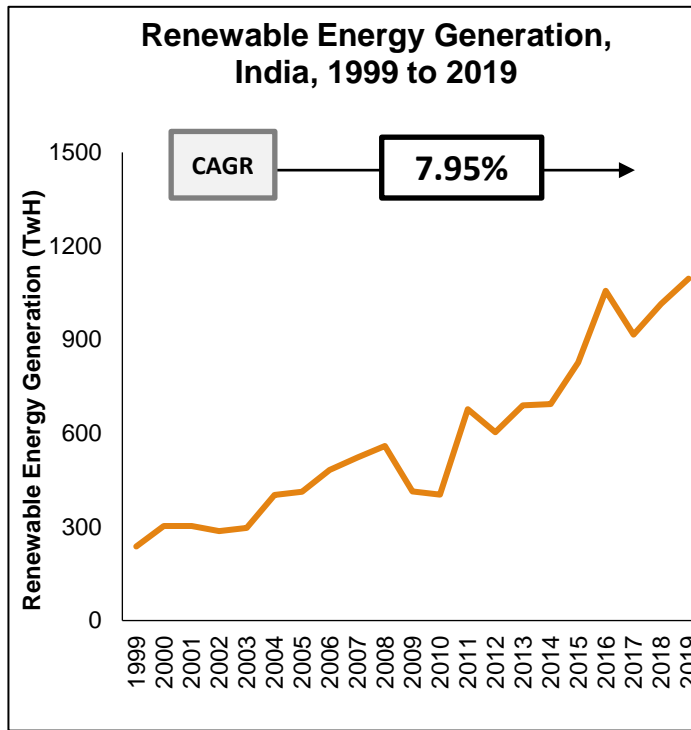
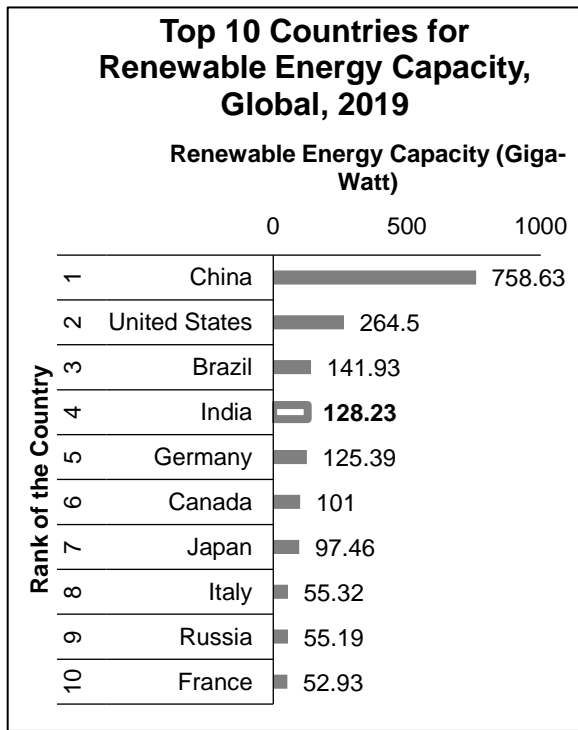
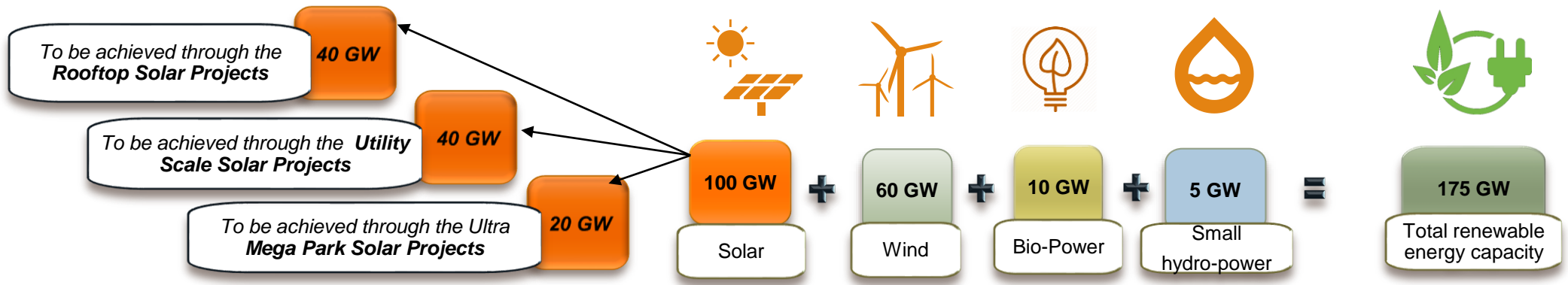


Source: Our World in Data, LSI Research

Switching to Renewable Energy Sources

Government of India fixed an ambitious target of achieving 175 GW of Renewable Energy Capacity in the country by 2022 to satisfy the commitments of the Paris Climate Change Conference held in 2015.

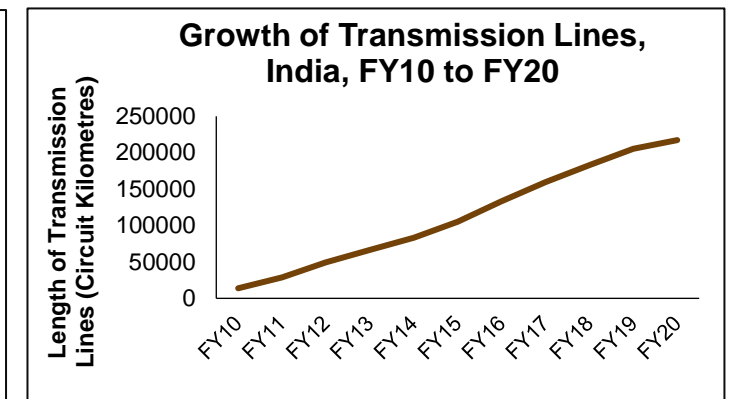
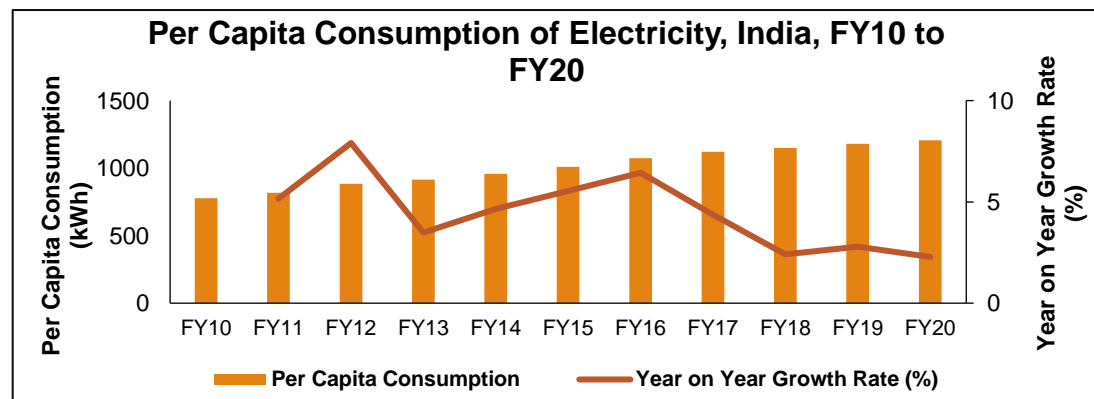
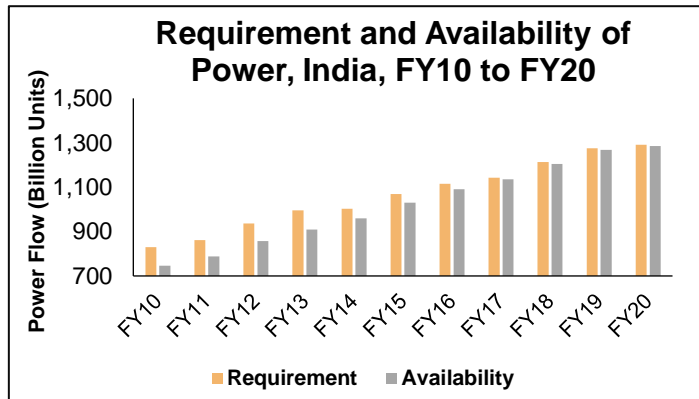
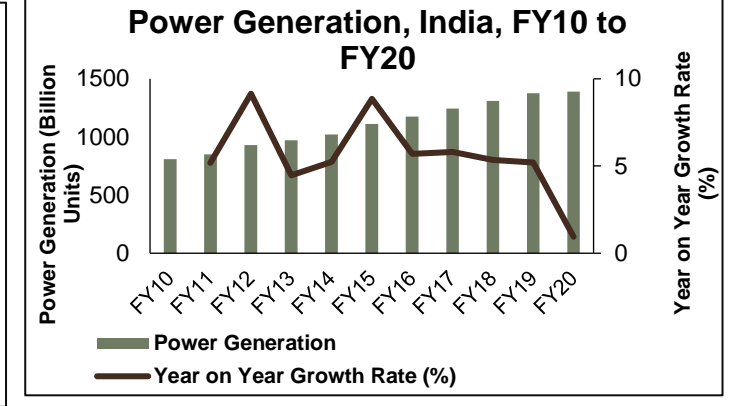
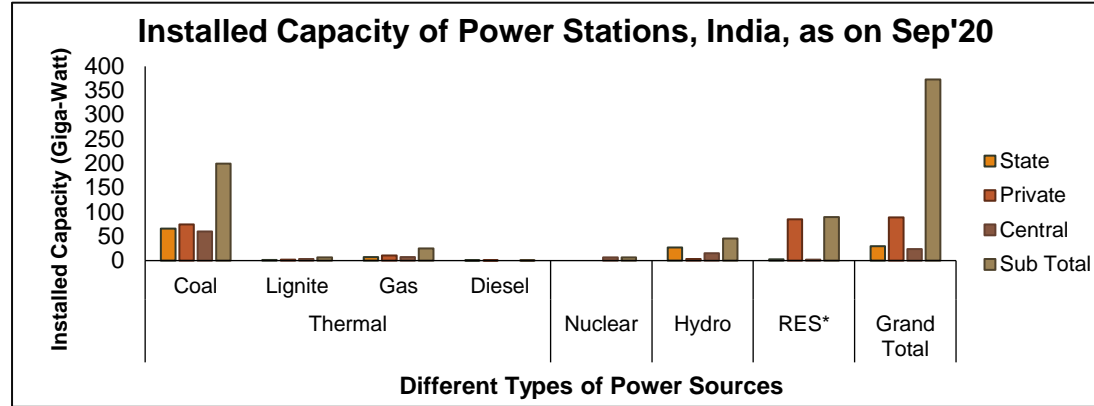
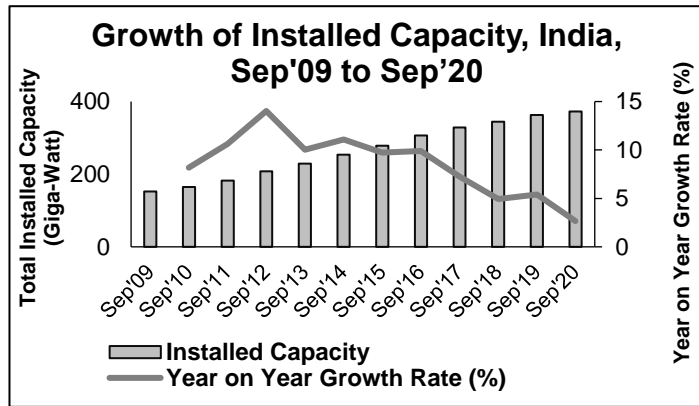
Breakdown of 175 GW of Renewable Energy, India



Source: Statista, Our World in Data, Central Electricity Authority, LSI Research



Growth of Power Infrastructure



- Being a key component of the country's infrastructure, the growth of power sector has been significant in the last few years in India.
- Between FY10 to FY20, the power generation had increased at the CAGR of **5.56%** in India.
- The gap between the power demand and supply has also been reduced at the CAGR of **22.5%** between the same time frame.

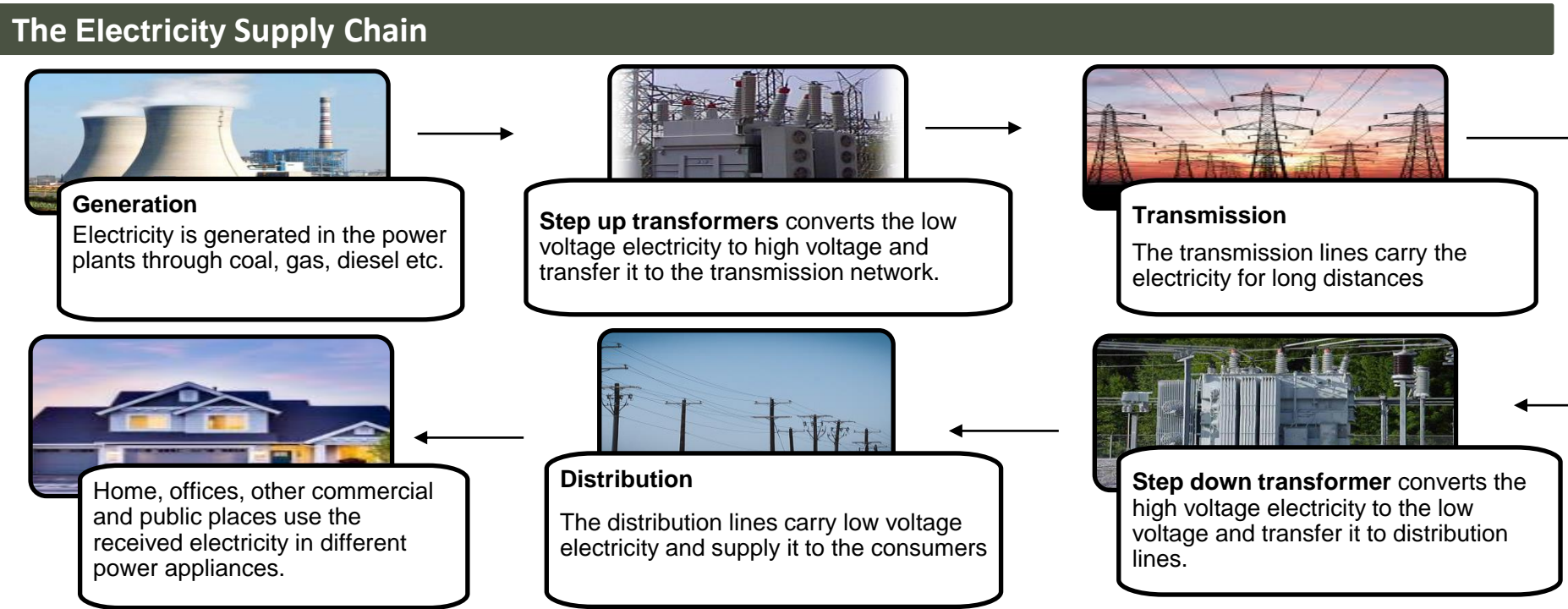
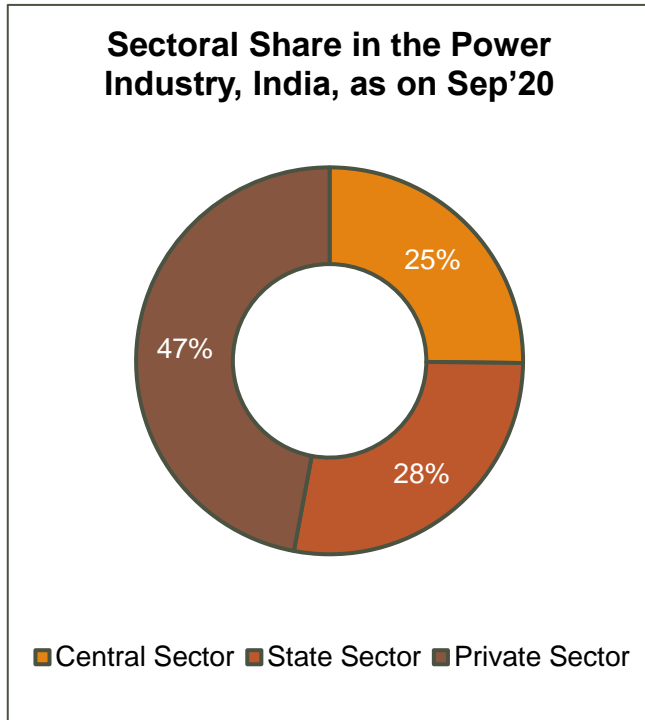
Total installed Capacity as on Sep'20	373 GW
India's Global rank for Electricity Generation in 2019	3rd
Per capita power consumption in FY20	1208 kWh

- Despite the massive growth in installed capacity, power supply, transmission lines etc., the shrinking performance of the Indian economy in recent years is affecting the performance of the power sector.
- With the decelerated manufacturing activities, the demand of the power has significantly fallen down.
- Hopefully, with the economic recovery, the situation will be under control soon.

Source: Central Electricity Authority, Ministry of Power, LSI Research



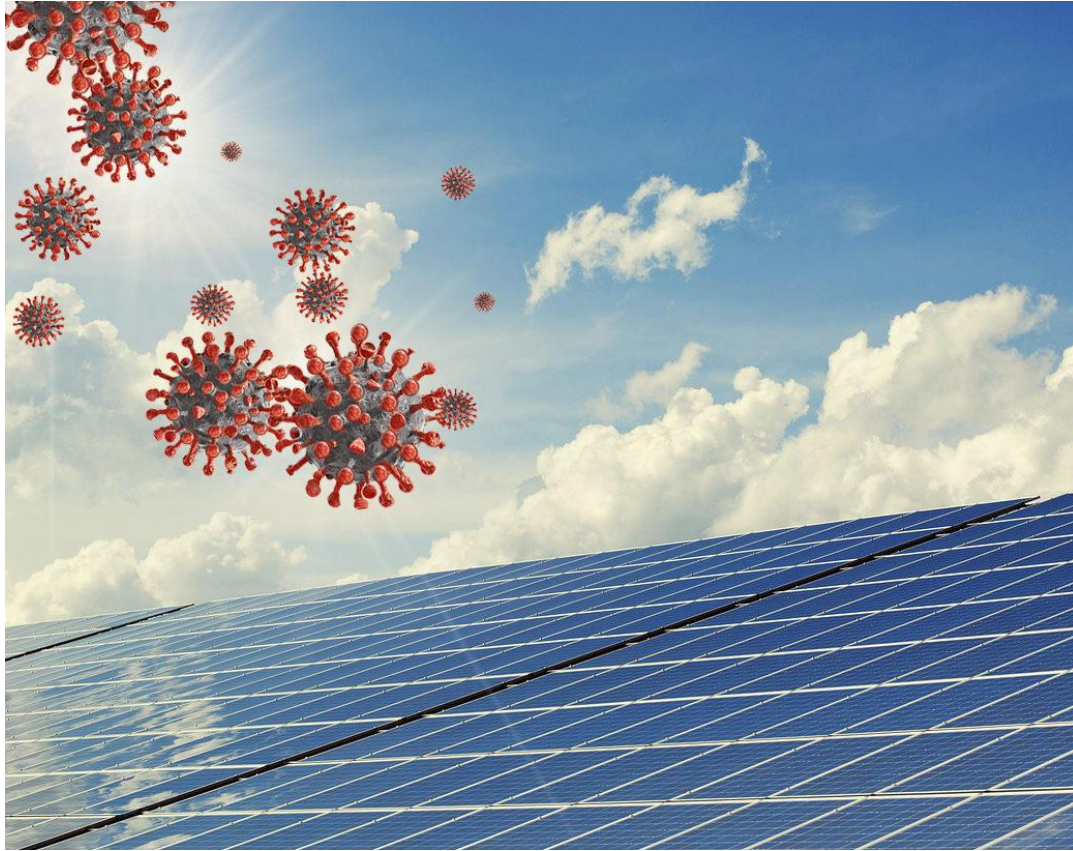
Key Stakeholders in the Power Sector



Some of the Examples of Key Players in the Power Industry

Sector	Key Players
Central Sector	Central Electricity Regulatory Commission
	Power Finance Corporation
	Power Grid Corporation of India
Private Sector	Tata Power Company Ltd.
	Reliance Power Limited
	Adani Power
State Sector	West Bengal State Electricity Board
	Karnataka State Electricity Board
	Delhi Electricity Board

Source: Central Electricity Authority, Indian Power Sector, LSI Research



COVID-19 Impact and the Way Ahead

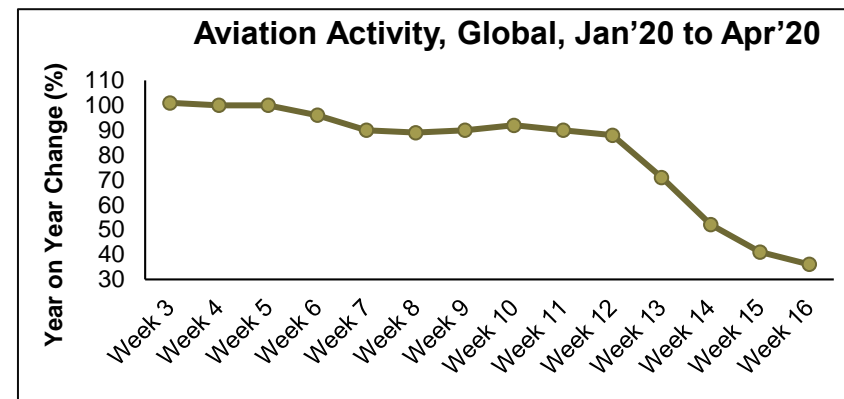
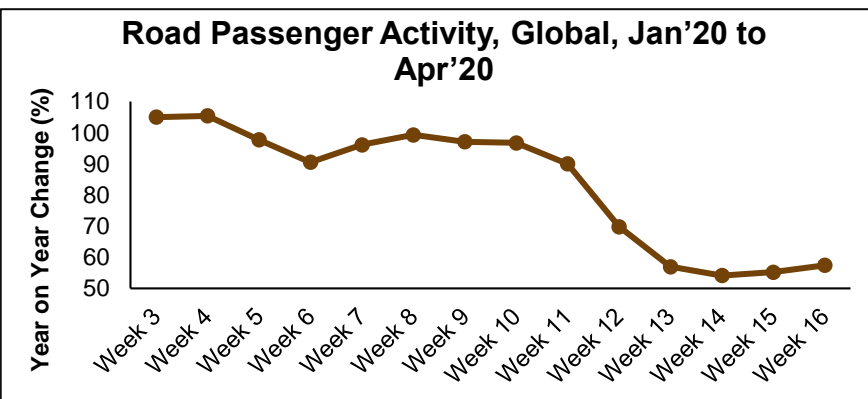
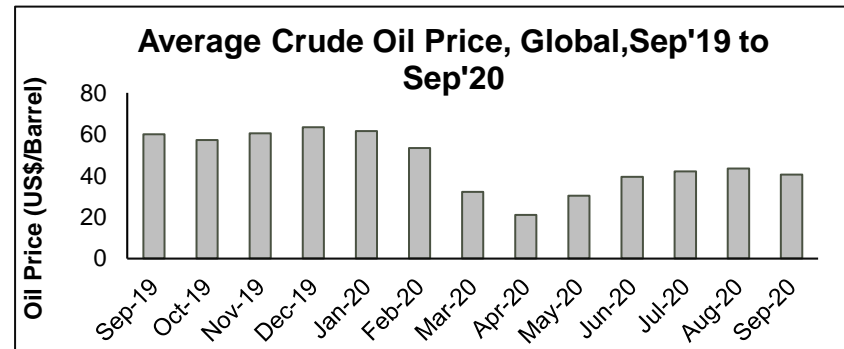
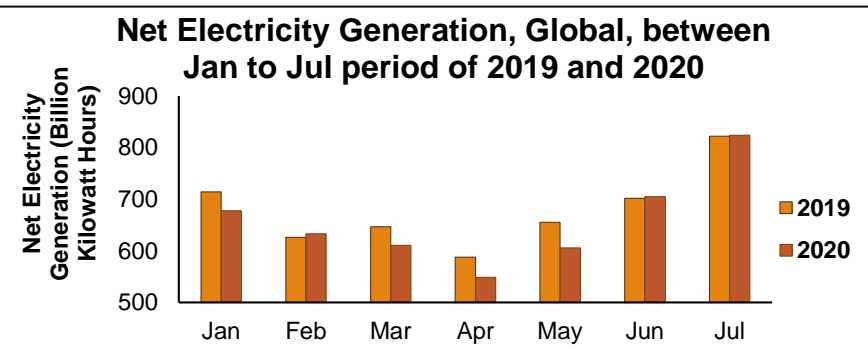


Impacts of Lockdown in the Global Energy Sector

- Amid the coronavirus outbreak, many countries (India, China, Vietnam, Taiwan, New Zealand, Australia, France, Spain etc.) started their complete or partial lockdowns between Jan to Apr'20 to mitigate the spread of infection and limiting the numbers of affected people.
- Millions of people across the world were confined to their homes. Except the essential services, all industries and services were closed which made the economies on the verge to collapse. With lockdowns imposed in several countries, transportation such as road and air travel were largely restricted, borders of many countries were closed at that time to prevent the international travellers from spreading the virus. These all things caused global energy demand to plummet. Ceased industrial operations also led to the falling commercial energy requirement.

A few examples of the impact of lockdown in the global energy sector

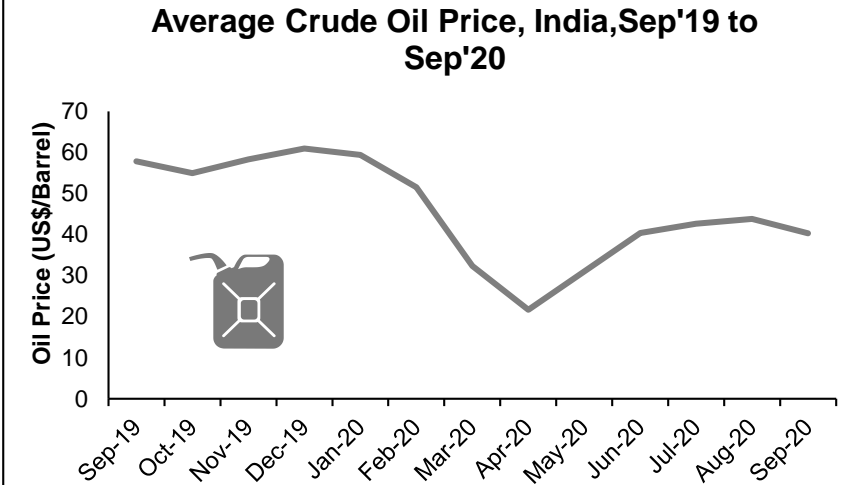
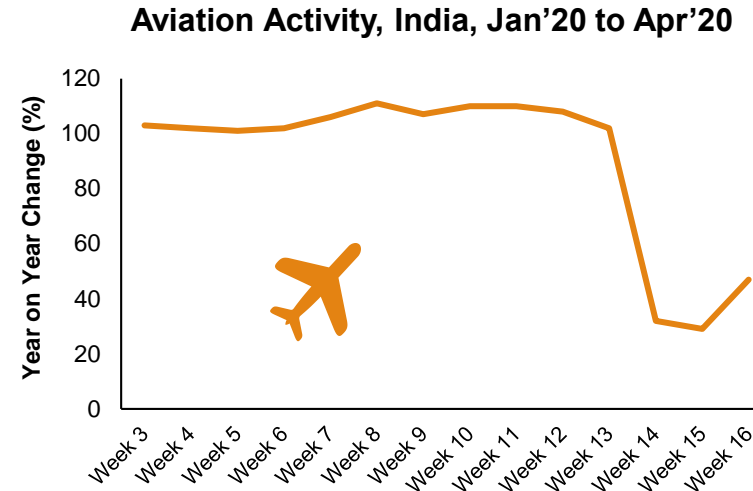
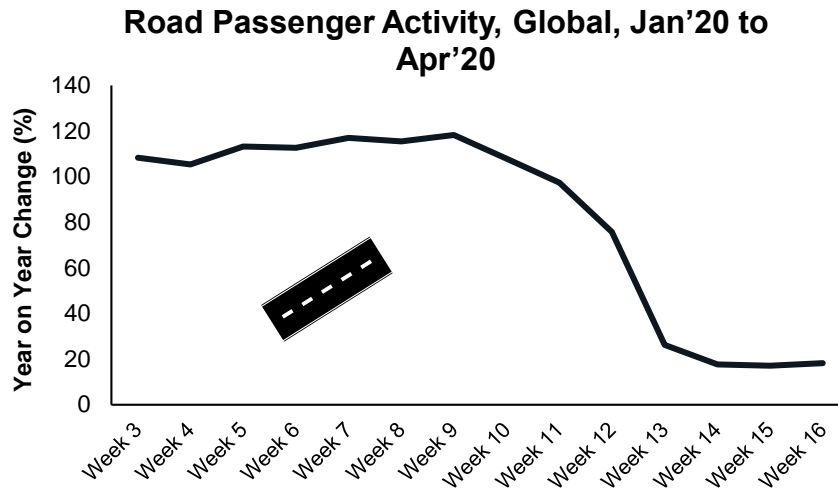
- According to the forecasts of IEA (International Energy Exchange), the global energy demand will contract by **6%** in 2020, the biggest percentage drop for 70 years.
- For the first quarter of 2020, the global energy demand fell by **3.8%** compared to Q1'19.
- Countries in full lockdown were witnessing an average decline of **25%** in energy demand per week.
- Restrictions on economic activity reduced the global coal demand by **8%** in the first quarter of 2020.
- For the first time in the history, the price of West Texas Intermediate (WTI) crude oil fell to **-\$40.32** a barrel in interlay trade in New York. Not only it was the lowest crude oil price ever recorded but also well below the zero mark. At this price, the seller of crude oil would be paying the buyer \$40 for each barrel that is bought.



Source: Energy Information Administration - EIA, IndexMundi, International Energy Agency, LSI Research



Impacts of Lockdown in the Indian Energy Sector

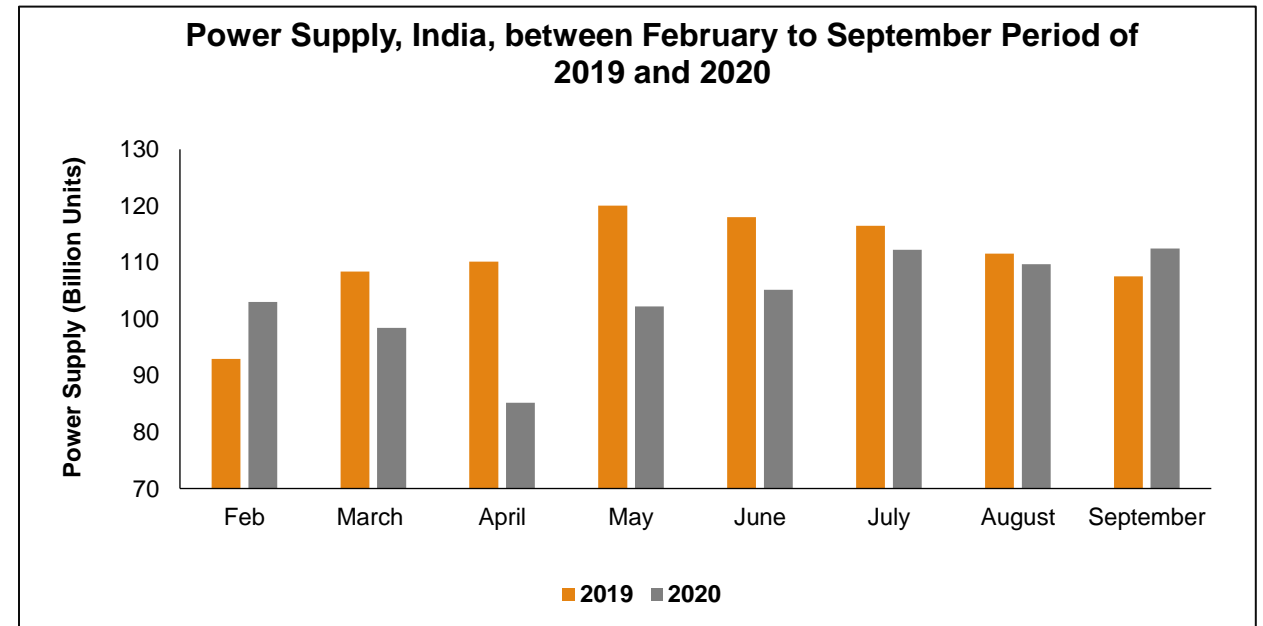
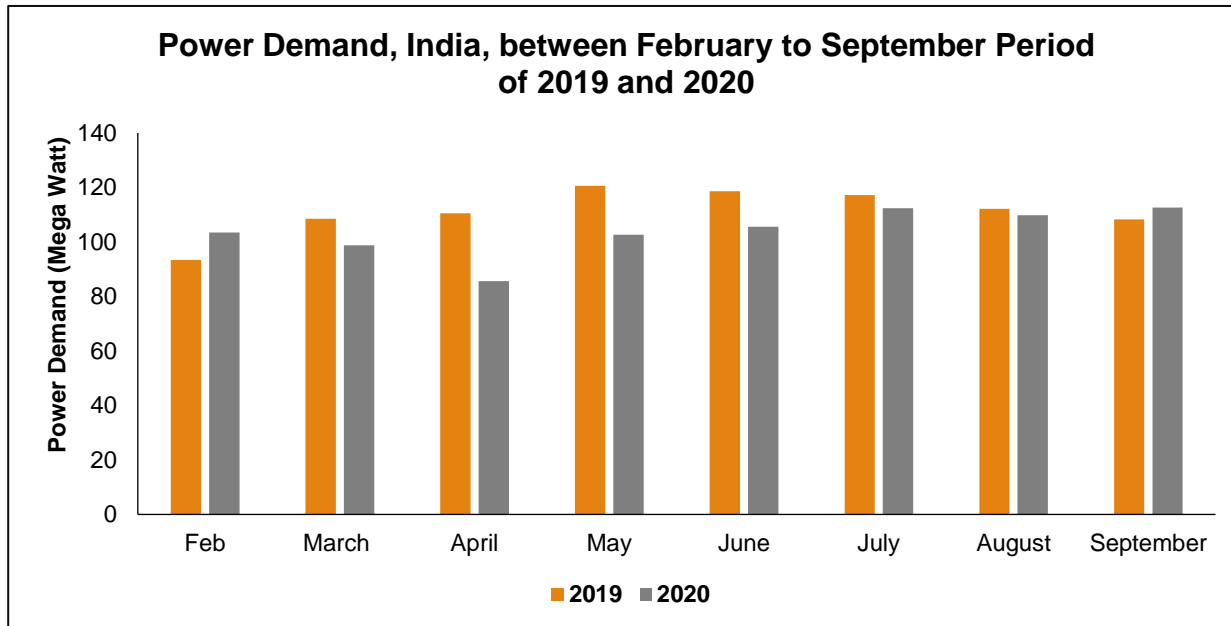
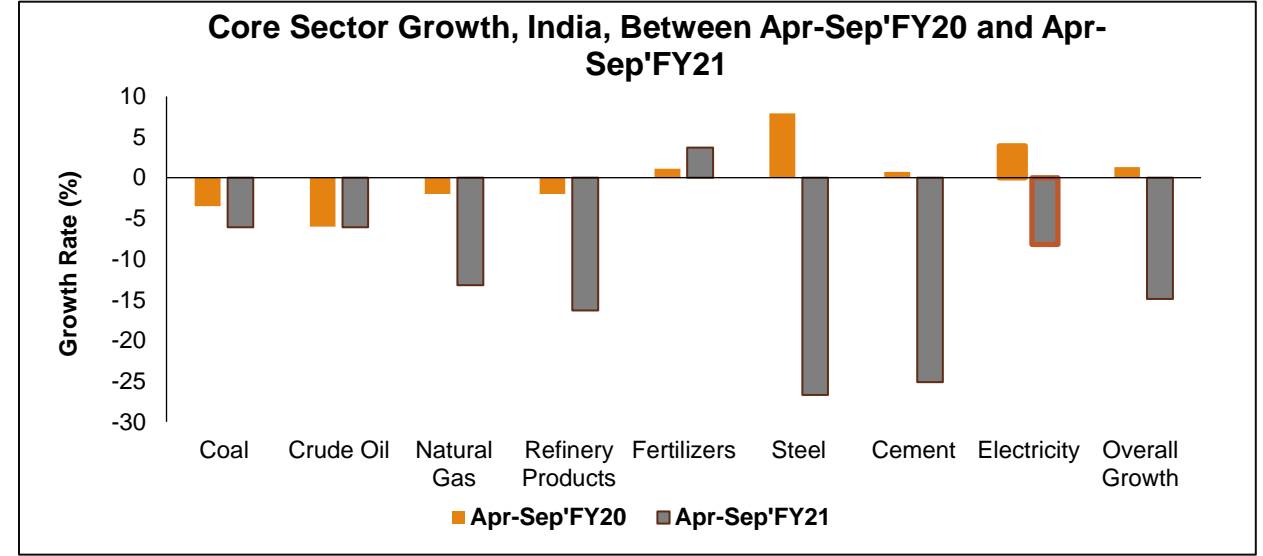
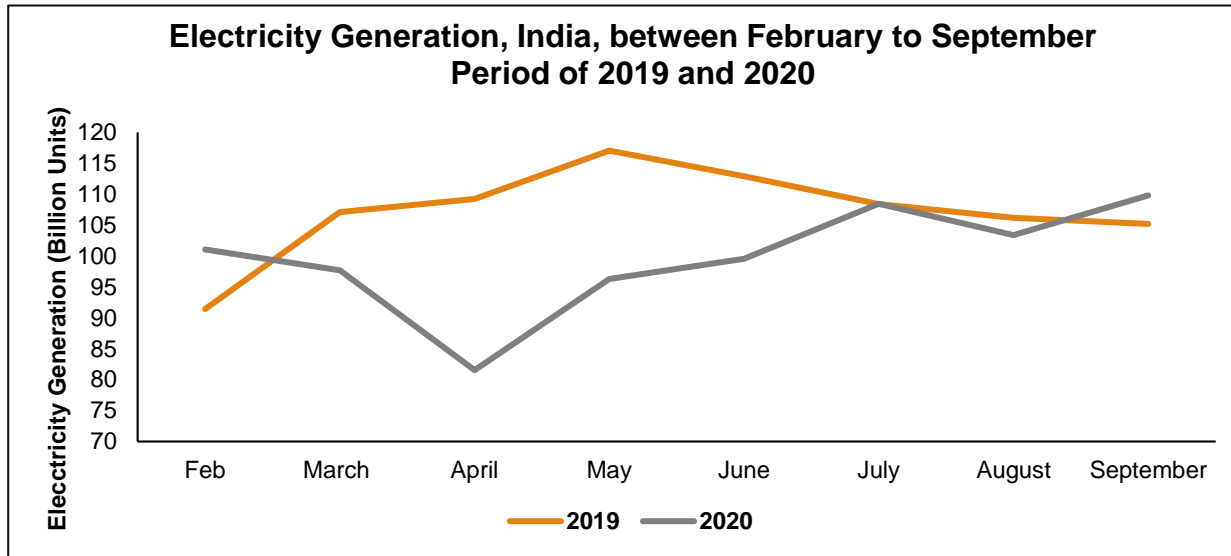


- The Government of India confirmed India's first case of COVID-19 on 30 January 2020 in the state of Kerala. When the number of confirmed COVID-19 positive cases were around 500, then at first 22nd Mar'20 was declared as the 'Janata Curfew' (people's curfew). Following this, on 24th March, the nationwide lockdown was announced by the Prime Minister of India from midnight of that day, for a period of 21 days. Then it was extended for few more weeks.
- According to the proper norms, the lockdown restricted people from stepping out of their homes. All transport services road, air and rail were suspended, with exceptions for transportation of essential goods, fire, police and emergency services. Services such as food shops, banks and ATMs, petrol pumps, other essentials and their manufacturing were exempted being the essentials. The whole education sector and hospitality services were also closed.
- As expected, just like the global sector, the energy demand in India was also massively affected due to the ceased economic activities. The country had already been experiencing a prolonged economic slowdown and this extended lockdown made India's economy more disrupted. India's Real GDP growth rate collapsed by 23.9% in Q1'FY21 which is the worst ever in the history.

Source: IndexMundi, International Energy Agency, LSI Research



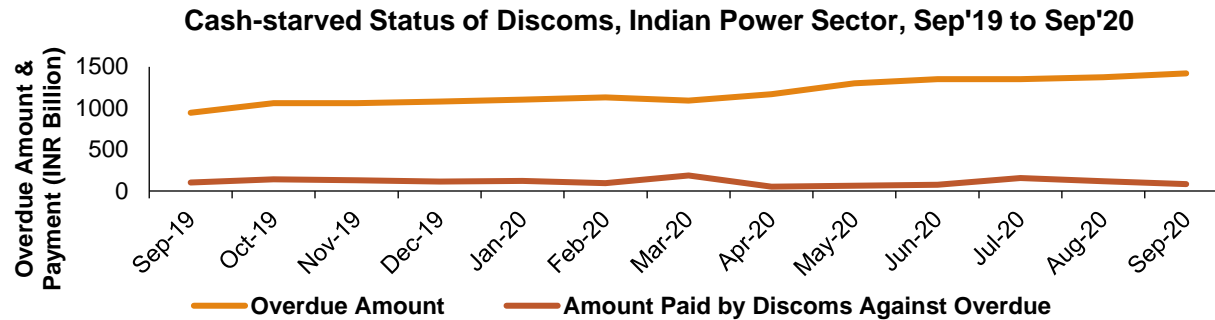
Performance of Indian Power Sector during the Lockdown Phase



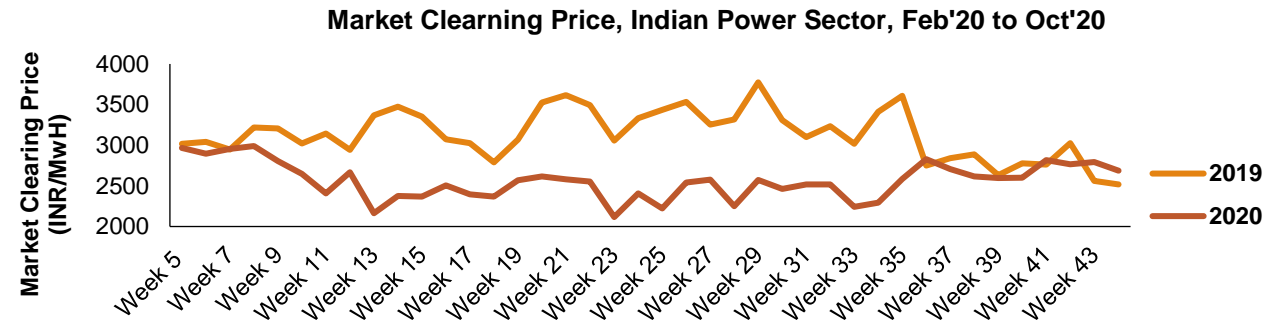
Source: Central Electricity Authority, Office of Economic Adviser, LSI Research



Stressed Condition of the Discoms (Power Distribution Companies)



Note: Overdue is the sum of money which should have already been paid or returned by the expected deadline but has not yet been paid.



Note: Market Clearing Price or MCP is the lowest price obtained during the electricity auction process where quantity demanded of power equals quantity supplied.

- The Indian Discoms or Power Distribution Companies have been in cash-starved situation since a long time due to the following issues:
 - Non-payment of bills from the customers due to their poor financial conditions
 - Government announced initiatives for supplying electricity in different parts of the country at negligible cost or at free of cost for greater accessibility of power among the mass.
- Moreover, the Indian economy has also been growing in its slowest pace in the last five years which caused decelerated manufacturing activities leading to lower power demand. The outcome of the continuous power demand slowdown from the industrial sector was better felt by the Discoms. The payment of the power tariffs from the industrial and commercial organizations are much greater than the tariffs of households and the agricultural sector. Hence, these all factors became the reasons behind lesser cashflows, loss and rising pile of debts to the discoms.
- Now, with the extended lockdown, the power sector has been adversely impacted again in India. Between Sep'19 to Sep'20, the overdue amount of the power sector has increased by **49.94%** and Discom's payment against the overdue has reduced by **20.31%**.
- Apart from this affected cashflow scenario, many activities in the renewable energy sector got halted and time-line of completion of the projects got delayed, operational activities of the power plants also got disrupted due to reduced human resources.
- Complete shutdown of most of the industrial and economic activities also caused lesser power demand leading to falling MCP (Market Clearing Price) of power during electricity auction process. The MCP was **23%** lesser in the lockdown period compared to the same time frame of 2019.

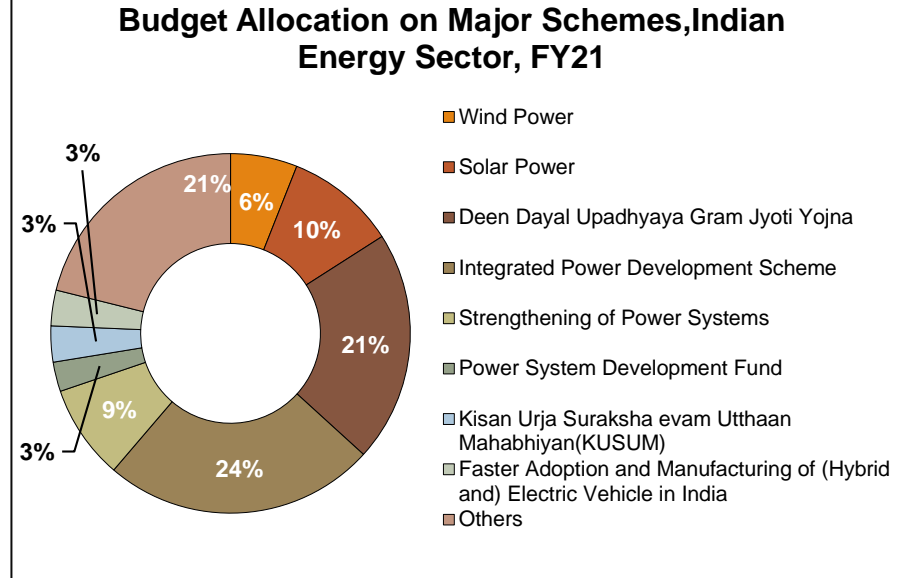
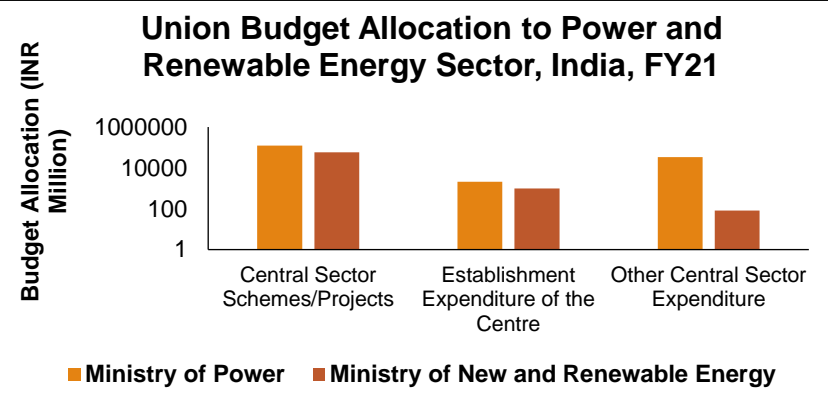
Source: Indian Energy Exchange, PRAAPTI, LSI Research



Government Investment in the Energy Sector

Union Budget Allocation FY21

An allocation of INR 220 Billion has been made for the power and renewable energy sector in the Union Budget 2020-2021.

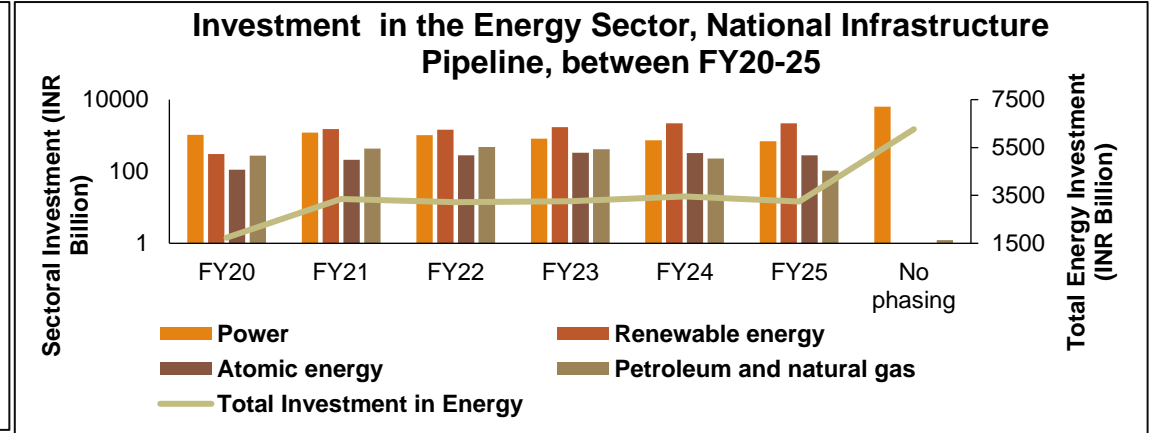
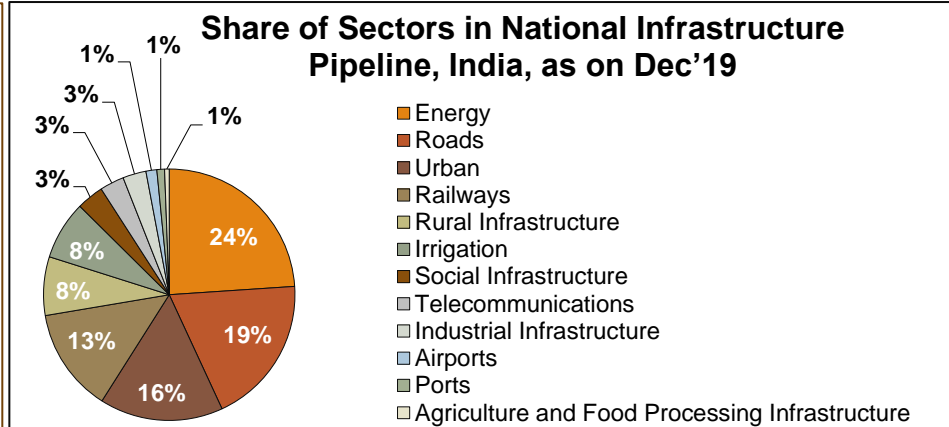


A few Initiatives for the Power Sector

- Greater generation of clean energy
- Concessional corporate tax rate of 15% to new domestic companies in manufacturing and power sector
- Efforts to replace conventional energy meters by prepaid smart meters.
- Expansion of National Gas Grid to 27,000 kilometres
- Setting up a large solar power capacity alongside the rail tracks

National Infrastructure Pipeline

The National Infrastructure Pipeline, announced in Dec'19 is an initiative of INR103 trillion and it consists of more than 6,500 projects across sectors including clean and affordable energy.



Source: Union Budget, press information bureau, LSI Research



Important Recommendations



Greater generation of Clean Energy from renewable energy sources.



The market needs to be deregulated to allow bulk suppliers of coal, power generators and distribution companies. The regulatory hurdles in the overall structure need to be reduced so that participation of private players can be increased. The presence of more private bodies will increase the competition and bring down the power price.



The charges of electricity for the farmers are highly subsidised. The reduction in their tariff rates takes place at the cost of non-agricultural businesses. This process is known as Cross Subsidization process which needs to be controlled. Sometimes, it affects the tariff rates of the households too. A balanced tariff format has to be structured. Higher tariff format increases the payment burden on the industrial sector which in turn hinders the loan repayment of the discoms since they receive delayed payments from the industries.



Instead of being a leading country for solar power generation, India depends on other countries for importing solar products or raw materials for developing any large or small-scale projects. The domestic Indian market for solar products and intermediary goods is also there but the cheap and subsidised solar products of China have influenced the solar project developers over the years to import more from them. The greater import of Chinese solar products not only increases the overall import value of India but also discourages the growth of domestic solar goods manufacturers. Hence, the Indian solar manufacturers need to get proper facilities to expand their businesses.



The overall energy sector requires technical upgradation for reducing the reliance on human intervention for its day-to-day operations and for lowering the operational inefficiencies. Sudden outbreak of COVID-19 caused millions of migrant workers to get back to their homes which led to massive disruption in the energy generation process. The sector needs to identify and resolve this and other such vulnerabilities in its operations for strengthening overall energy supply chain.



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