



1. Overview

2. Components and
Governance of
Energy Sector

3. Growth Drivers
for Indian Energy
Sector

Content List

ANALYSIS REPORT ON INDIAN ENERGY SECTOR (JULY 2021 EDITION)

5. Government Initiatives

4. Future Trends &
Global Factors Affecting
Energy Industry

6. Conclusion

7. References

1. Introduction

The energy sector is the core of the economic development and industrial growth of a country. It provides fuels to the necessities of human lives. This sector includes all the corporations or companies which work in the production or supply of non-renewable and renewable sources of energy such as fossil fuels, solar power, wind energy, etc.

In the economic landscape of India, energy is one of the most vital sectors as there is large demand due to rapid economic, industrial, and economic development. The rise in income and high rate of urbanization are some of the main reasons for the rising energy demand and thus India stands as 3rd largest energy-consuming country in the world. The energy consumption is expected to increase by 4.5% annually by 2035. Here the demand is going to rise in all the four major energy-consuming sectors i.e. industry, transport, agriculture, and household.

The Indian energy sector is predominantly coal and oil-based, which are non-renewable sources of energy. India is majorly dependent on imports to cater to its energy demands and it drains off a major part of foreign reserves from the economy. India's per capita energy use is less than half of the world average but its large population and inefficient use of energy make it one of the largest energy consumers in the world.

In the world energy economy, India plays an important role. Over time, when it is about to achieve universal access to electricity for Industries as well as households, the energy use is going to further increase significantly. Thus India is going to enter into the most dynamic yet challenging phase for energy sector growth. The opportunities for renewable energy, energy-related technologies, and infrastructure support needed to evolve in the same proportion over time.

In 2020, during Covid 19, when the economic, industrial, and transportation activities were on a halt in India and around the world, energy consumption was disrupted largely. The 5% fall in India's energy consumption was recorded in this phase and the demand for coal and oil decreased significantly. It also affected the economic health of the energy sector. When India is coming out of the pandemic effect, the energy consumption is going to rise incrementally as the new buyers of white goods and vehicles are coming back to the market.

India needs to address the storage, distribution, and capacity requirement of the energy sector to meet its future demand. It needs an energy efficiency policy framework that can produce an affordable and reliable supply of energy to its consumers. Energy is the focal point of India's development plan and thus it needs to improve energy efficiency and reduce the dependency on renewable sources of energy through technological advancements.

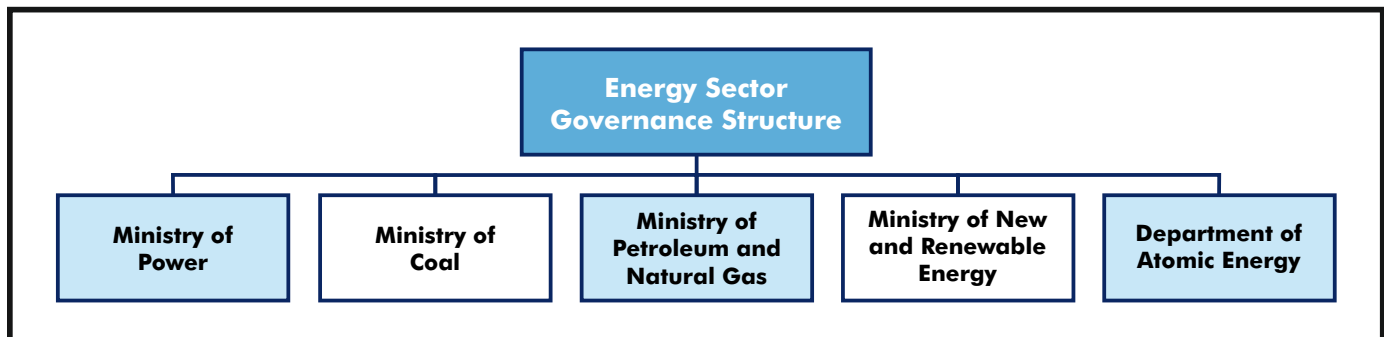


2. Components and Governance of Energy Sector

India's dynamic and growing energy sector caters to all the companies and corporations involved in the exploration, development, and distribution of non-renewable or renewable energy sources, and refining. It has a complex network of interdependent sub-sectors. The major classification of the energy sector took place based on the source of energy production and thus classified into two major sections:

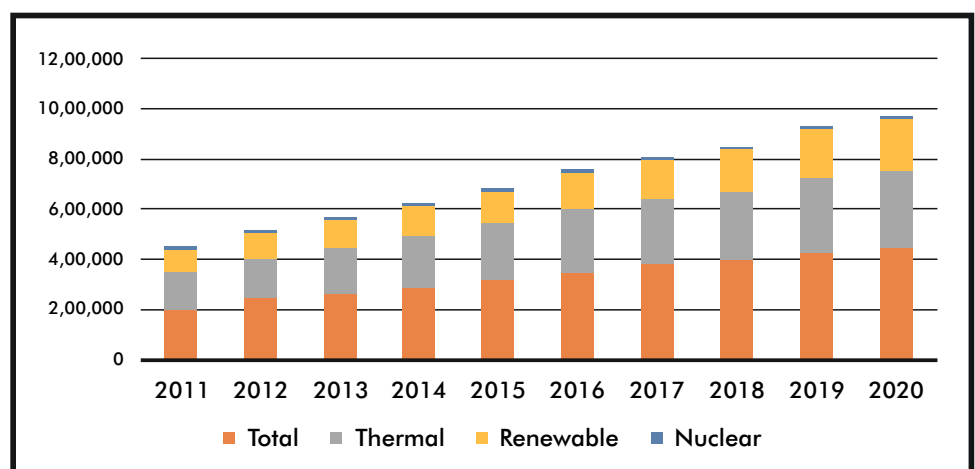
Components of Energy Sector	
Nonrenewable	Renewable
Petroleum Products & Oil	Hydropower
Natural Gas	Biofuels
Gasoline	Wind Power
Diesel Fuel	Solar Power
Nuclear	

The Indian energy sector policies are governed under the objectives of affordability, energy security, self-sufficiency, sustainability, and economic growth. The governance structure of the energy sector is very diverse in India. It is administered under 5 different ministries.



Along with these ministries, state electricity boards and electricity distribution companies will make the operations more complex and inefficient due to procedural dependencies. This governance structure makes real-time data gathering and analysis a cumbersome task. Thus no integrated data for energy consumption is available while data related to energy supply is collected individually by the ministries that are largely fragmented. The Kelkar Committee in its report of “Roadmap for Reduction in Import Dependency in the Hydrocarbon Sector by 2030” clearly mentioned that the several ministries and agencies involved in energy sector management lead to the challenges in coordination and resource utilization.

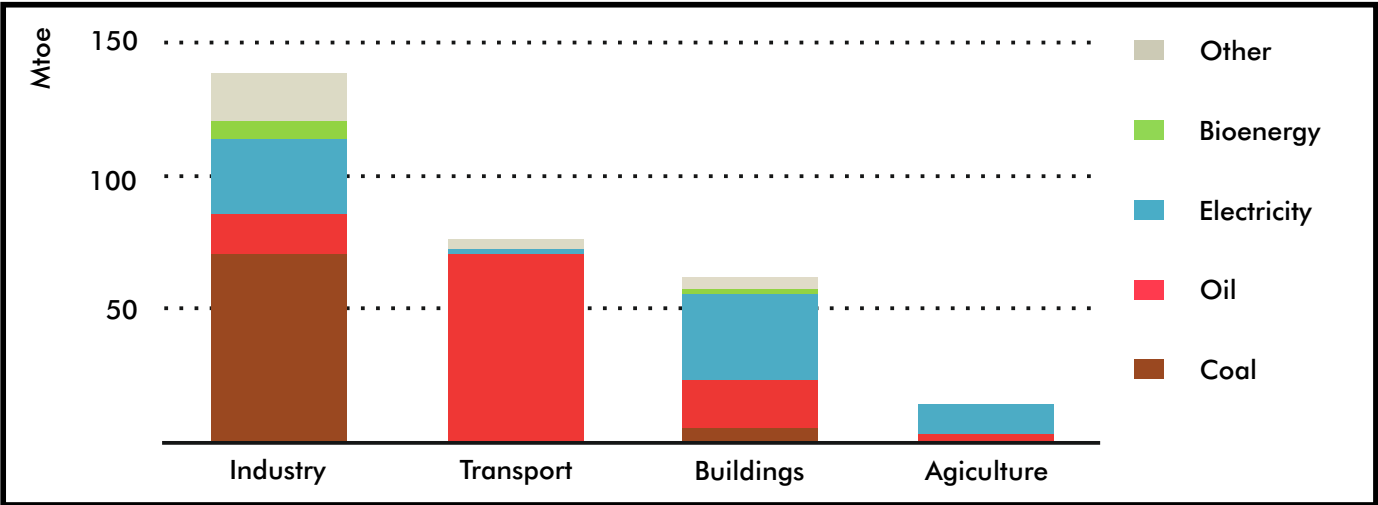
The political sensitivity and policy level reforms are driving the Indian energy sector towards a common goal to make India energy-efficient as well as self-sufficient in energy supply over the decades. India is among the top 3 countries in power generation and most of the Indian states



(Year wise Installed Capacity of Generation of Electricity in MW)

now have surplus power generation. 25 states in India have now achieved 100% household electrification. India allows 100% FDI in power generation (except atomic energy), transmission and distribution of electric energy, and power trading. Currently, India has 96.95GW of total installed capacity in renewable energy sources as of June 2021 which is distributed over Wind Energy (39.44 GW), Solar Energy (41.09 GW), Biofuel Energy: (10.34 GW), and Small Hydro Power (4.79 GW).

India has now ranked 22nd on the “Ease of Doing Business- Getting Electricity” ranking by World Bank which was remarkable progress in comparison to the 137th rank of 2014 ranking. Solar energy and natural gas have shown significant improvement in the last decade but still, the use of natural gas in India is among the lowest in the world. The rapid adoption of renewable sources of energy will create a positive impact on the energy security paradigm and thus provide the solution to the long-term energy demand of the country. Rooftop solar scheme and expanding natural gas network within the country is creating a vital option of fossil fuel for Indian energy consumption. There is an urgent need to address the issues of rational electricity tariffs and peak time pricing to enhance the infrastructure of power generation and distribution. This will re-energize the stressed power distribution companies and transmission infrastructure on a priority basis.

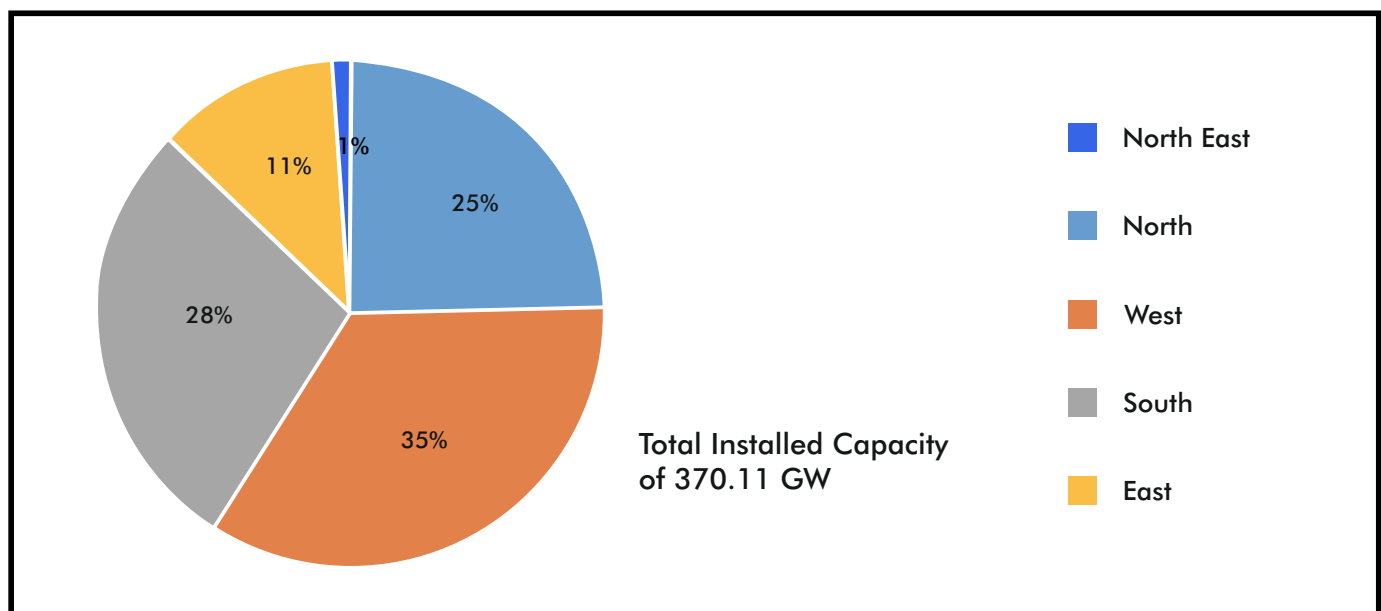


(Change in energy demand of fuel in different sectors between 2000-2019)



3. Growth Drivers for Indian Energy Sector

India is a diverse country and thus its energy demand also varies with geographical population. Especially its urban population's energy demand is always exceeding the energy demand of rural India because of the rampant use of air conditions, transportation, infrastructure development, etc. Electricity has constituted around 15% of total India's energy consumption and the demand for the same is evolving at the rate of nearly 6% per annum. This rise in demand is met by renewable energy sources in comparison to traditional coal and biomass due to policy shifts, as the new technologies are costing less. But there is a huge gap in the total installed capacity of electricity generation in the different regions of the country. Western India has a major share of installed electricity generation capacity (35%) in comparison to the installed capacity of eastern India (11%). This gap needs to be filled over time to incorporate the potential of other regions especially North eastern states in electricity generation.



(Region-wise Installed Capacity of Electricity Generation in 2020)

The energy consumption in India is always price sensitive. Thus, energy generation through renewable sources especially solar, wind, hydro, and biomass which are easily available is always considered to be more effective. The government inclination is lean on renewable energy and so by 2026-27 the share of coal in power generation will shrink to 38% and renewable energy will hold the majority around 44% in terms of the installed capacity. This will also help to check the increasing level of air pollution in the country which causes lacs of premature deaths every year.

The rapidly evolving urban demography in India is increasing energy consumption at a very high rate. The rising numbers of the urban middle class are resulting in high usage of personal vehicles and white goods due to the higher commutation and personal need of working individuals. This is increasing fossil fuel consumption on one hand and increasing air pollution on the other. The rate of urbanization in India is predicted to rise by 50% around 2035. This will enhance the power

demand for urban areas for both industrial as well as personal use.

The government policies are providing incentives to different stakeholders in the energy sector to strive towards energy as well as economic security. This is attracting foreign investment in the oil and gas sector. India has already built its three oil reserves and planning for two more that account of total around more than 15 MMT, is the action taken in the right direction. Even the ONGC Videsh and India's National Infrastructure and Investment Fund are investing in foreign energy assets to push India towards higher energy security in the future. Our major dependence on energy imports is resulting in higher trust and growing partnerships with partner countries which are helping us to fill our reserves for our self-sufficiency.

The government is making regulations for the sustainable operations of renewable energy sources in capacity building and existing utilization. This will help them in the technological advancement of the power sector such as the connection of capacities to the existing grids, payments of renewable energy purchases from multiple sources, and bidding process for the projects. This allows the seamless operation of the power sector and makes it more efficient to address the demand and supply gap. The financial support given under various schemes of the central government is boosting the usage and adoption of renewable energy sources for energy consumption by the Indian masses.

The industrial sector in India is focusing on low carbon sources in place of higher usage of fossil fuels. There should be long-term deep decarbonization, that will help to restructure the technological innovation in this sector. For this purpose, the industry needs to shift the focus from coal to renewable. The energy sector can also check for the resources available for coal washing and reduction in methane emission during coal mining. The technological innovations in coal combustion technology and carbon capture, its uses, and storage will also help to reduce industrial emissions at large.



4. Future Trends & Global Factors Affecting Energy Industry

The upgraded technology and rising energy demands at the global level have driven the need for the expansion of infrastructure for the growth of sustainable energy services in the countries like India. India constitutes nearly 18% of the world's population, and it ranks the fifth largest country in terms of energy consumption in the world. But the post-pandemic scenario will show sharp growth in the energy landscape of India.

Energy consumption has been doubled in the last two decades. The main reason for this is the government's ambition to develop infrastructure at a higher pace, working to be self-reliant in most of the sectors of the economy, increasing commutation needs, rising urbanization, rural electrification, etc. India is going to be the most populous country in the world by 2024 and thus it will open up new avenues of investments in the energy sector to meet the rising demand of this phase. The trend is showing huge opportunities for growth and thus around \$750 Billion investment is expected to pour in from different sources in this sector.

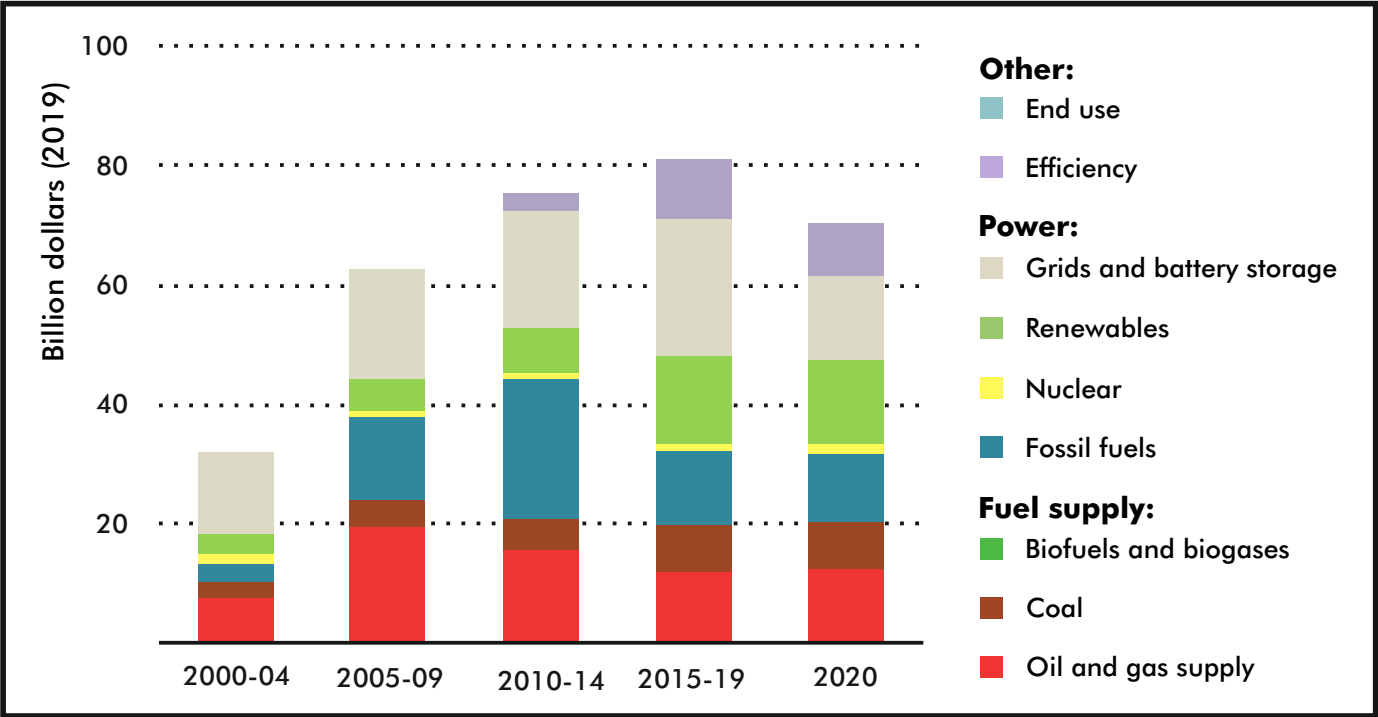
The growing Indian investment in oil reserves and India's growing refining capacity will soon put India as the focal point of refining in Asia and the world. The Ethanol Blending Program of India will help to provide BSVI compliant fuel by 2025 at the Pan India level. The rapidly changing global political scenario driving India as a better negotiator in the energy imports and striving towards energy security. As the energy supply chain is going to set the world order in decades ahead. Thus energy self-sufficiency will help India to stand rock-solid in case of global political instabilities, artificial price hikes because of the interrupted energy imports, etc. This will also make ways to handle the environment and economic development sustainably.

The changes in global prices of oil and gases during the Covid 19 pandemic, evolved the world energy market significantly. The oil demand has decreased sharply and thus the prices of oil have fallen too. The demand for energy sources is directly linked to prices and climate change scenarios and thus will see a massive change in trends during the post-pandemic scenario. The big economies are trying to come over from the economic slowdown and making huge investments, where India received \$15.36 Billion FDI in its power sector in the financial year 2020-21.

The bilateral global relationship will show potential in higher trade-in energy sector and allied services. Carbon emission constraints and carbon trading are also governing the path of the energy sector in India. World Carbon Trading has benefited India under Clean Development Mechanism. India has also shown fast growth in this market and generated around 31 million carbon credits. India is growing in this market much faster than the Information Technology sector and bagged the second position in the world. This will help India to sustain their energy requirement in the coming future.

In the Indian energy sector, investments are welcome in grid integration of renewable energy sources, smart grids and automation processes, digital transformation, and storage systems such as battery energy storage. In the battery storage development, India just entered its hand, and thus a huge opportunity to scale up is still going to unfold. The waste-to-energy is also showing a positive trend for attracting future investments as Carriage and content segregation is a field where technological intervention can be a game-changer. The energy sector in India overall has a lot of potentials as it is

recognized as a priority sector under Make In India program by the Government of India.



(Investment trends in energy: 5-year annual averages, 2000 to 2020)

India is also devoting its all resource to contribute to Global Climate Change Programme and has unanimously ratified the Paris agreement. Under the National Determined Contribution (NDC), India has pledged for the reduction of carbon emission intensity to 30-35% of its GDP by 2030 from the pre-industrial levels of 2005. In this way, the increasing renewable energy generation capacity will stand as a solid pillar. It will help to control the air pollution levels and check the global carbon constraints against environmental damage.

The incentive policy and effective regulations by the government are promoting renewable energy for mobility and power generation at a higher pace and helping India to realize the target of the Paris accord to achieve net-zero emissions by the 2nd half of the 21st century. In a major policy shift, India is planning to operate on 100 % electric car sales by 2030.

To attain these ambitious targets well within the time frame will show huge challenges for India but it will surely help to push its energy generation and security in a sustainable progress path. This will scale up the grid capacity, rate of electrification, energy efficiency, power consumption, and dependency on renewable energy sources at a much faster pace in this phase.



5. Government Initiatives

The roadmap to develop India goes from the sustainable path of energy efficiency and the government of India is committed to attain the same. As energy efficiency drives the way for higher productivity, rapid industrial and infrastructural growth and shows a reduction in Green House Gas emissions, environmental degradation, and solid waste generation. Thus, Government of India takes several initiatives through various line ministries and concerned departments. The Bureau of Energy Efficiency under the Ministry of Power is operating on several initiatives such as Standard and labelling by the Bureau to provide star ratings to electrical appliances and equipment. Some of the major initiatives taken by the government for the energy sector and mitigate the challenges of climate change are:

- **The Pradhan Mantri UJJWALA Yojna (PMUY)**

The scheme was launched in 2016 to achieve universal access to clean cooking options which will eventually help in improving the health conditions of poor household women. The scheme provides free LPG connections to women in poor households and helps them to rapidly transit to clean cooking from traditional biomass. This will save their time collecting firewood and use their efficiencies in other employment opportunities. This will also check the air pollution and health hazards for women's life. Currently, more than 80% of Indian households are having access to clean cooking options.

- **24*7 Power for All**

It was a central government initiative in collaboration with state governments to guarantee 24*7 electricity availability to all by 2019. This includes all the households, industries, commercial and other establishments which require power to operate. The plan is prepared based on state-specific requirements for power generation, transmission, and distribution systems.

- **Unnat Jyoti By Affordable LEDs For All (UJALA) Scheme**

It was the largest movement to replace the lightning source in India. This initiative was launched with the mission objective to replace 770 million old lamps with energy-efficient LED bulbs by 2019. This program has changed the dynamics of the Indian LED market and operated without any subsidy from the government's side.

- **Ujjwal Discos Assurance Yojna (UDAY) Scheme**

The scheme was launched in 2015 to re-energize the stressed distribution companies in the power sector. The Ministry of Power has approved the takeover of 75% debts of DISCOMs as of 30 September 2015 to give them a new start and to provide financial and operational transformation. 32 Indian states/UTS have till now implemented this scheme and rejuvenated the power distribution system. The scheme has covered around 97% of the outstanding debt of the DISCOMs of these states/ UTs to date.

- **Faster Adoption and Manufacturing of Hybrid and Electric Vehicle (FAME) Scheme**

This flagship program of the Government of India is to promote the sales of electric vehicles through upfront subsidy in form of demand incentives in the purchase of electrical vehicles with the setting up of charging infrastructure. Currently, the second phase of the scheme is operating till 31st March 2024. It works under the National Electricity Mobility Mission Plan 2020 of the government of India.

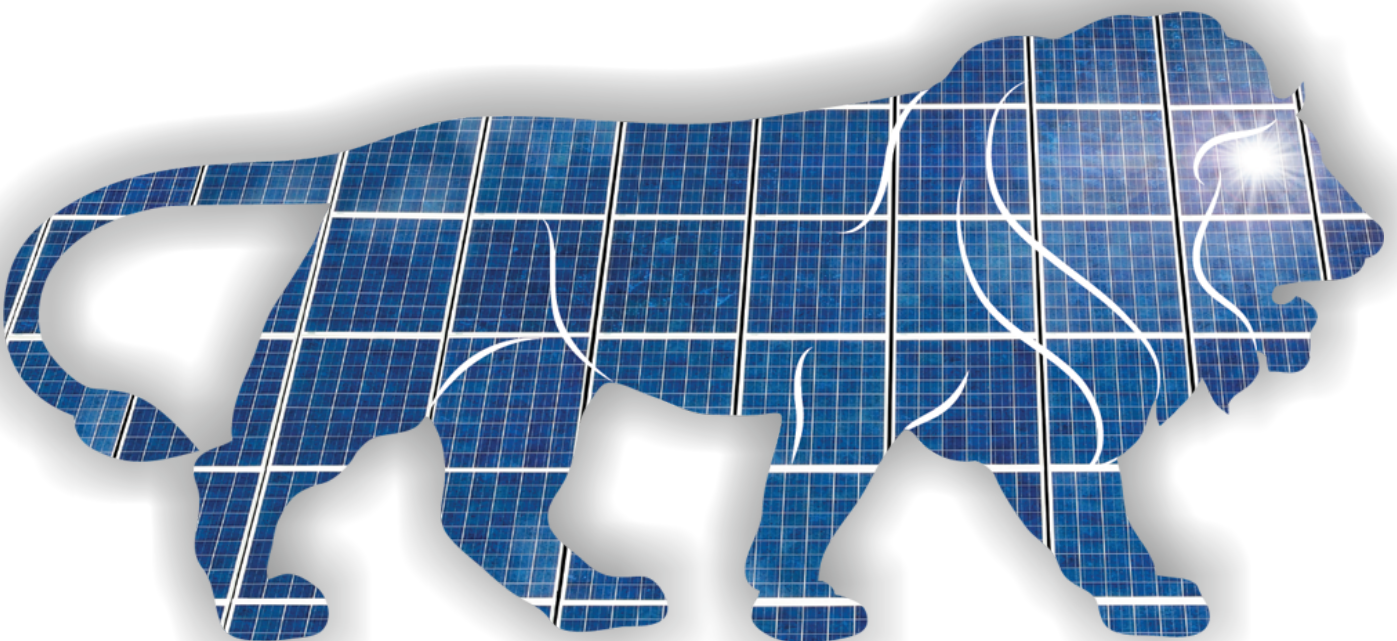
Revamped Distribution Sector Scheme

It is a reform-based and results-linked scheme of the Government of India for improving the poor electricity supply problem through the up-gradation of infrastructural facilities. This will make the power supply to consumers more reliable and efficient. This will help in establishing a financially sustainable distribution sector by improving the AT & C losses at the pan India level of 12-15% by 2024-25. The scheme has also set the target to achieve ASC- ARR gap to zero by the same time.

- **Perform, Achieve and Trade (PAT) Scheme for Industrial Energy Efficiency**

The Ministry of Power has launched this scheme as a regulatory mechanism to reduce specific energy consumption. The Government of India has linked the specific energy consumption of energy-concentrated industries into a market-linked mechanism. It is an incentive mechanism for energy saving in form of certificates. These certificates can be traded among energy-intensive industries as per their energy consumption.

Along with all these initiatives, the Government of India has initiated the International Solar alliance of 124 countries to tap the benefits of solar power by the countries around the Tropic of Cancer and the Tropic of Capricorn. Many state governments are also encouraging renewable energy uses by the masses through parking fee waivers, tax waivers, registration fee waivers, and infrastructure development.



6. Conclusion

Energy efficiency is the most reliable and sustainable way to ensure a safe and progressive future. It ensures the right way forward for economic development and to address environmental issues. The rapid technological advancement and recent pandemic scenario have made it difficult to predict the future of energy security in India but it is evident that due to massive policy reforms and the programs such as ethanol blending, the construction of green energy corridors, and the currently launched hydrogen mission will set the right momentum and help in reducing the import surge in fossil fuels. All this together will help us in combating the environmental and economic challenges.

The Indian energy sector of course has immense potential because of the exponential growth of energy demand. But, the state-owned corporations and strict price control place a huge challenge to open competition and further investment. The energy market is required to be fueled up by transparent pricing, and an efficient supply mechanism. To achieve the ambitious target, it is vital to solve the bottleneck issues related to distribution in the energy sector and promotion of innovation and technology to improve efficiency.

A centralized and integrated ministry setup will help to visualize this vision and allow us to best utilize our resources to achieve the ambitious targets related to energy security sustainably and efficiently. This will check the overriding policy reforms and increase the effectiveness of programs at large. The centralized data repository for energy demand and supply will pave the way for better policy formulation and better coordination to achieve challenging targets. Some more steps are needed to enhance the ease of doing business in India through policy reforms and regulatory measures like stable policy incentives, single clearance window, etc.



As India will increase the employment levels and fight gender bias, the rising workforce will give a major push to urbanization. In that case, the infrastructural development to secure the energy needs of this urban population will be a great challenge to deal with. To scale up energy projects and attract investment and technological advancement in the energy sector will become a savior.

It is the right time to restructure the Indian energy sector by focusing on the participation of different stakeholders by developing a common platform to discuss challenges and opportunities. The collaborative engagement of Government authorities with industries, corporate, and academia will help in adapting the global learning in the Indian energy landscape. An institutional design with an aggressive policy framework for the growth of renewable energy is important to raise the awareness among the Indian masses to contribute to the energy security movement and to timely achieve the commitments made by Indian authorities on international forums.

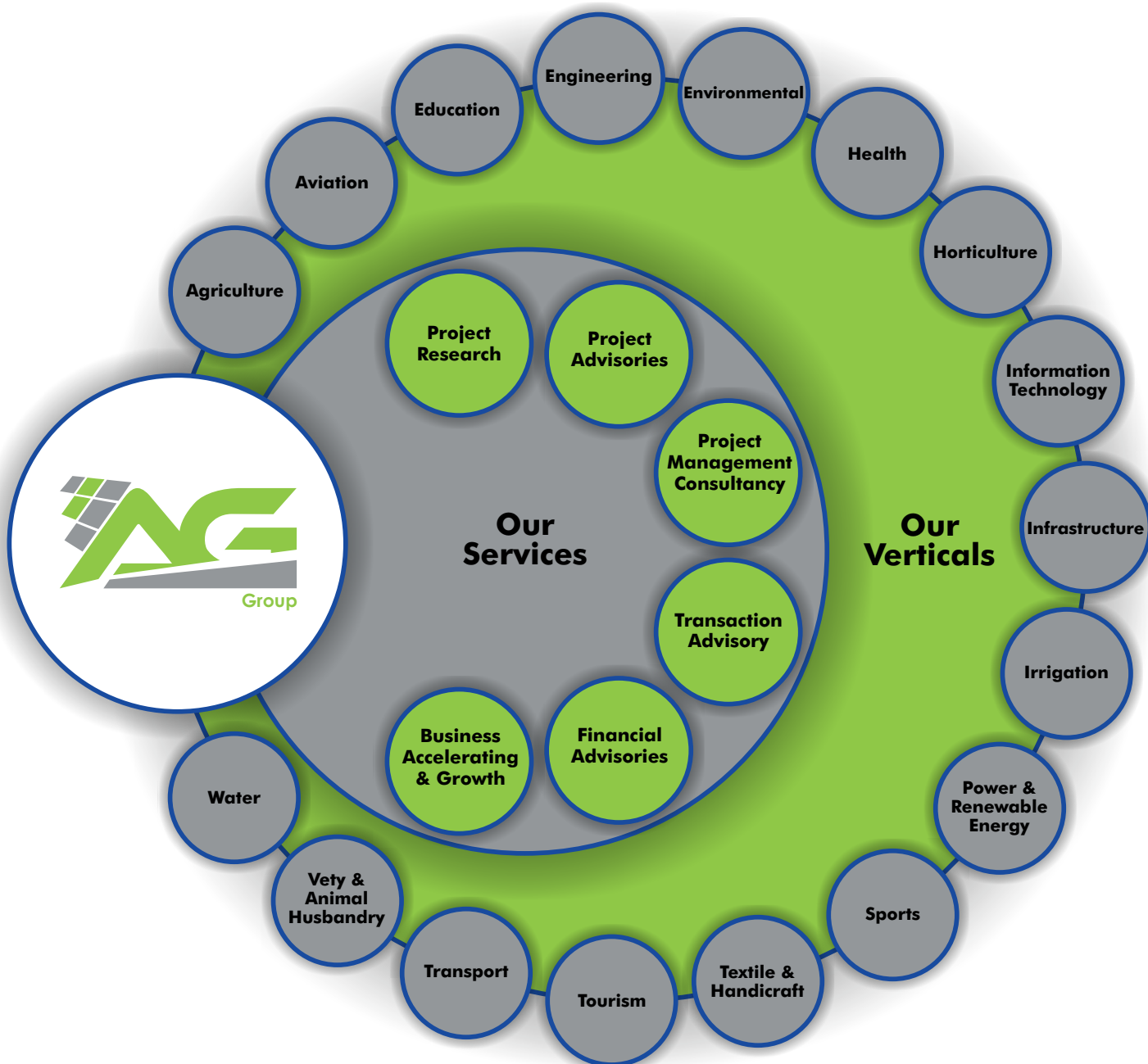
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