

"INDIA'S RENEWABLE ENERGY: IMPACT AND STRATEGY" – PAPER - III



Renewable Energy: A Comprehensive Overview

Renewable energy represents a critical component of the global transition towards sustainable and environmentally friendly energy solutions. It encompasses various energy sources that are replenished naturally and have minimal impact on the environment compared to fossil fuels.

Renewable Energy – Components - Renewable energy sources are diverse and include:

1.Solar Energy: This is harnessed from the sun's rays using photovoltaic (PV) panels or solar thermal systems. Solar energy can be used for electricity generation, heating water, and powering various devices. It is the most rapidly growing renewable energy source due to its decreasing costs and technological advancements.

2.Wind Energy: Wind turbines convert kinetic energy from wind into electrical energy. Wind energy is abundant in many parts of the world and has become a significant contributor to global renewable energy capacity.

3.Hydropower: This involves generating electricity by harnessing the energy from flowing or falling water. It is one of the oldest and most reliable renewable energy sources. Hydropower plants can vary in size from large dams to small micro-hydro systems.

4.Biomass: Biomass energy comes from organic materials such as plant and animal waste. It can be converted into biofuels like ethanol and biodiesel, or used directly for heating and power generation. Biomass is considered renewable as long as the rate of consumption does not exceed the rate of replenishment.

5.Geothermal Energy: This is derived from the heat stored beneath the Earth's surface. Geothermal power plants use steam from geothermal reservoirs to drive turbines and generate electricity. It is a stable and reliable energy source with a small environmental footprint.

6.Tidal and Wave Energy: These forms of energy are generated from the movement of tides and waves in the ocean. They are relatively underdeveloped but offer significant potential due to the predictability of tidal patterns and the vastness of ocean energy resources.

Each of these renewable energy sources contributes to a diversified energy portfolio, reducing reliance on fossil fuels and mitigating environmental impacts.

Renewable Energy and India's Energy Security

Energy security is a crucial aspect of national security, economic stability, and sustainable development. For India, enhancing energy security involves ensuring a reliable, affordable, and sustainable energy supply. Renewable energy plays a pivotal role in achieving these goals for several reasons:

Diversification of Energy Sources: By integrating renewable energy sources into the energy mix, India reduces its dependency on imported fossil fuels. This diversification mitigates risks associated with price volatility and supply disruptions in global energy markets.

Reducing Import Bills: Fossil fuels such as coal, oil, and natural gas constitute a significant portion of India's energy imports. By investing in renewable energy, India can decrease its reliance on these imports, thus saving valuable foreign exchange and improving trade balance.

Enhancing Energy Resilience: Renewable energy sources, particularly solar and wind, are abundant and locally available. This reduces the vulnerability of the energy infrastructure to geopolitical tensions and supply chain disruptions.

Sustainable Development: Renewable energy supports sustainable development by reducing greenhouse gas emissions and environmental degradation. This aligns with global climate commitments and contributes to long-term energy security.

India's push towards renewable energy is reflected in its ambitious targets and investments in this sector. The government's focus on renewables is part of a broader strategy to ensure a stable and secure energy future for the country.

Significance of Renewable Energy for India

Renewable energy has far-reaching benefits beyond energy security, impacting employment, health, and climate change:

Employment Opportunities: The renewable energy sector is a significant driver of job creation. The construction, operation, and maintenance of renewable energy projects create a wide range of employment opportunities, from engineering and technical roles to administrative and support positions. For instance, the expansion of solar and wind farms generates thousands of jobs in manufacturing, installation, and service sectors.

Health Benefits: Transitioning to renewable energy reduces air and water pollution associated with fossil fuel combustion. Cleaner air and water contribute to improved public health by reducing respiratory and cardiovascular diseases. Additionally, reducing emissions from power plants helps in combating climate-related health issues such as heat stress and vector-borne diseases.

Climate Change Commitment: Renewable energy is integral to global efforts to combat climate change. By reducing reliance on fossil fuels, India can lower its carbon footprint and meet its climate commitments under international agreements such as the Paris Agreement. The growth of renewables supports India's goal to achieve substantial reductions in greenhouse gas emissions and promote a low-carbon economy.

Status of India's Renewable Energy

India has made significant strides in expanding its renewable energy capacity. As of the fiscal year 2023-24:

Installed Capacity: India's total installed energy capacity reached 442 GW, with renewable energy contributing approximately 33% (144 GW) of this capacity. Hydro energy accounted for 11% (47 GW) of the total.

Contribution to New Power Generation: Renewable sources played a dominant role, contributing over 70% of the 26 GW of new power generated nationwide during FY24. Solar energy emerged as a leading component, with solar installations representing approximately 81% (15 GW) of the total renewable energy addition.

Wind and Nuclear Energy: Wind capacity increased significantly, nearly doubling from 2.3 GW in FY23 to 3.3 GW in FY24. Nuclear capacity also saw a notable addition of 1.4 GW, marking its first increase since FY17.

Auction and Bidding: Renewable energy (RE) auctions reached a record high with approximately 41 GW of capacity auctioned in FY24. This reflects a strong commitment to expanding renewable energy infrastructure. The report also highlighted the completion of eight auctions involving energy storage components, signaling innovation in power procurement.

Peak Power Demand: India experienced a surge in peak power demand, reaching 240 GW in FY24. This increase was driven by economic growth and weather anomalies.

Government of India's Strategy in Promoting Renewable Energy

The Government of India has adopted a multifaceted strategy to promote renewable energy:

Ambitious Targets: India has set ambitious targets for renewable energy capacity. The goal is to achieve 175 GW of renewable energy capacity by 2022 and 450 GW by 2030. These targets include solar, wind, hydro, and biomass energy.

Policy Support: The government has implemented various policies to support the growth of renewable energy. These include financial incentives, tax benefits, and subsidies for renewable energy projects. The National Solar Mission and the National Wind-Solar Hybrid Policy are examples of such initiatives.

Infrastructure Development: Investments in infrastructure, such as transmission networks and energy storage systems, are crucial for integrating renewable energy into the grid. The government is working on expanding and modernizing the grid to accommodate increased renewable energy capacity.

International Cooperation: India has engaged in international partnerships and agreements to advance renewable energy technology and finance. The International Solar Alliance (ISA) is a notable example of India's leadership in global renewable energy initiatives.

Recent Schemes and Measures to Promote Renewable Energy in India

Several recent schemes and measures have been introduced to further promote renewable energy:

PM Surya Ghar: Muft Bijli Yojana: This initiative aims to boost rooftop solar installations in residential sectors. By offering financial incentives and subsidies, the scheme is expected to add 30 GW of capacity and promote clean energy adoption among households.

Amendments to Electricity Rules of 2022: The Ministry of Power has amended electricity rules to mandate the sale of un-requisitioned surplus power on exchanges. This is expected to enhance supply-side liquidity and foster competitive prices on power exchanges, benefiting both consumers and producers.

Energy Storage Auctions: The introduction of energy storage auctions reflects a growing emphasis on innovative power procurement methods. Energy storage solutions are essential for managing the intermittent nature of renewable energy sources and ensuring a stable power supply.

Increased Budgetary Allocation Budget (2024- 25): The budgetary allocation for the renewable energy sector has significantly increased, from ₹10,000 crore in the previous year to more than ₹20,000 crore. This substantial increase reflects the government's commitment to expanding renewable energy infrastructure and achieving its targets.

Conclusion

Renewable energy is at the forefront of India's strategy to achieve energy security, economic growth, and environmental sustainability. With significant investments and policy support, India is making notable progress in expanding its renewable energy capacity and reducing reliance on fossil fuels. The recent initiatives and schemes demonstrate a strong commitment to fostering a sustainable energy future. As India continues to harness its renewable energy potential, it is poised to become a global leader in sustainable energy solutions, driving both economic development and environmental stewardship.

MAIN PRACTICE QUESTIONS

- 1. Analyze the role of renewable energy in enhancing India's energy security and its contribution towards achieving the country's climate change commitments.**
- 2. Evaluate the impact of recent government schemes and policy changes on the growth and integration of renewable energy in India's power sector.**

ANSWER

- 1. Analyze the role of renewable energy in enhancing India's energy security and its contribution towards achieving the country's climate change commitments.**

Renewable energy plays a pivotal role in bolstering India's energy security and supporting its climate change commitments. As India's energy landscape transitions, renewable sources such as solar, wind, and hydropower are becoming central to the nation's energy strategy. The substantial increase in renewable energy capacity, now constituting approximately 33% of India's total installed energy capacity, underscores its growing importance.

By diversifying the energy mix and reducing reliance on fossil fuels, renewable energy mitigates the risks associated with global oil and gas price volatility and supply disruptions. This diversification enhances energy security by providing a stable, domestic source of power that is less susceptible to geopolitical and market fluctuations.

Furthermore, renewable energy is integral to India's climate change strategy. The shift towards cleaner energy sources aligns with India's commitments under international climate agreements, such as the Paris Agreement.

By reducing carbon emissions and reliance on coal, India is making strides towards its goal of achieving a significant reduction in greenhouse gas emissions. The increasing share of renewables in the energy mix contributes to a decrease in carbon footprint, supports sustainable development, and helps in meeting emission reduction targets.

In brief, renewable energy not only fortifies India's energy security but also plays a crucial role in advancing its climate objectives and fostering a sustainable future.

2. Evaluate the impact of recent government schemes and policy changes on the growth and integration of renewable energy in India's power sector.

Recent government schemes and policy changes have significantly impacted the growth and integration of renewable energy in India's power sector.

The PM Surya Ghar: Muft Bijli Yojana, aimed at promoting rooftop solar installations, is a landmark initiative that enhances residential access to solar power. This scheme is expected to add approximately 30 GW of new capacity, facilitating greater adoption of solar technology among households and reducing dependency on conventional grid electricity.

By making solar installations more affordable and accessible, the scheme accelerates the expansion of solar energy and aligns with India's renewable energy targets.

Additionally, the 2022 amendments to the electricity rules, mandating the sale of un-requisitioned surplus power on exchanges, introduce greater transparency and efficiency into the power market.

This policy encourages competitive pricing and improves liquidity on power exchanges, making renewable energy more attractive to utilities and investors. The record levels of renewable energy auctions and the introduction of energy storage components in these auctions highlight the government's commitment to innovative and flexible power procurement methods.

Overall, these schemes and policy changes foster the growth of renewable energy by promoting investment, improving market dynamics, and facilitating the integration of clean energy into the national grid. They are crucial for advancing India's energy transition and achieving its sustainability goals.