



RENEWABLE ENERGY - GS III MAINS

Q. Renewable energy offers much needed prospects to the Indian energy sector but with challenges. Enumerate the measures needed to make it more sustainable for Indian conditions. (15 marks, 250 words)

News: *The challenges of renewable energy*

What's in the news?

- Large-scale renewable energy development can avoid reproducing the injustices of past large-scale infrastructure projects, while being sensitive to developmental objectives.

Renewable Energy Capacity in India:

- India, a country with a rapidly growing economy and increasing energy demands, has made significant strides in its renewable energy sector.
- It added 18.48 GW of renewable energy capacity in the fiscal year 2023-24, which is over 21% higher than the 15.27 GW added a year ago.
- It was primarily driven by solar installations (12.78 GW) and wind energy (2.27 GW).
- The total installed renewable energy capacity has increased from 76.37 GW in 2014 to 178.98 GW in October 2023, marking an increase of around 2.34 times.

Ambitious Targets:

- India has set ambitious targets for renewable energy and plans to install 500 GW of renewable energy capacity by 2030. It includes a significant increase in solar and wind energy.
- It is a significant increase from the previous target of 450 GW.
- The plan involves an investment of at least ₹2.44 lakh crore or ₹2.44 trillion.

Recent Government Measures:

1. Government Commitments:

- Reduce India's total projected carbon emission by 1 Bn tonnes by 2030, reduce the carbon intensity of the nation's economy by less than 45% by the end of the decade, and achieve net-zero carbon emissions by 2070.

2. Proposed Solar Cities and Parks:

- Solar city per state-approved and approved setting up 57 solar parks of 39.28 GW across the nation. The government is also giving a push to Floating PV Projects.

3. National Green Hydrogen Mission:

- The Union Cabinet approved the National Green Hydrogen Mission with a total initial outlay of INR 19,744 Cr, including an outlay of INR 17,490 Cr for the SIGHT programme, INR 1,466 Cr for pilot projects, INR 400 Cr for R&D, and INR 388 Cr towards other Mission components.



4. Off-shore Wind Energy:

- The medium and long-term targets for off-shore wind power capacity additions are 5 GW by 2022 and 30 GW by 2030.

5. Wind-Solar Hybrid Policy:

- In 2018, national policy was announced to promote an extensive grid-connected wind-solar PV hybrid system for efficiently utilizing transmission infrastructure and land.
- A way to address the intermittency challenge of one renewable power source is to combine solar and wind, achieving better grid stability.
- It provides flexibility in a share of wind and solar components in the hybrid project; however, the capacity of one resource must be at least 25% of the rated power capacity of other resources.

6. Aatma Nirbhar Bharat:

- PLI scheme in Solar PV manufacturing with financial outlays of INR 24,000 Cr introduced under Aatma Nirbhar Bharat.
- Imposition of Basic Customs Duty of 25% on Solar Cell & 40% on Solar PV Modules w.e.f. 01.04.2022.

Challenges Of Renewable Energy:

1. High Upfront Costs:

- One of the most significant challenges of renewable energy is the high upfront costs associated with the installation of renewable energy technologies.
- While renewable energy sources like solar and wind power save money in the long run, the initial setup costs can be prohibitive.
- It is particularly true in developing countries, where the cost of borrowing is high.

2. Infrastructure and Technical Challenges:

- Renewable energy technologies require specific infrastructure and technical expertise.
- For instance, solar and wind energy systems require extensive land use, which can lead to conflicts over land rights.
- These systems also require regular maintenance and skilled technicians for installation and repair.

3. Variability and Intermittency:

- The variability and intermittency of renewable energy sources pose significant challenges.
- Solar and wind power, for instance, are dependent on weather conditions and time of day, making them less reliable than traditional energy sources.
- It necessitates the development of energy storage systems and grid infrastructure capable of managing these fluctuations.

4. Policy and Regulatory Hurdles:

- Policy uncertainties and regulatory barriers can also hinder the growth of renewable energy.



- Inconsistent policies and lack of long-term planning can create an uncertain investment environment, discouraging private sector involvement.
- Furthermore, bureaucratic red tape and complex permitting procedures can delay project implementation.

5. Access to Raw Materials:

- Access to raw materials and rare earth metals is another challenge facing the renewable energy sector.
- These materials are essential for the manufacture of renewable energy technologies, and a projected shortage could impact the sector's growth.

6. Geographical Disparities:

- Geographical disparities in the adoption of renewable energy technologies also pose a challenge.
- While some regions have abundant renewable resources, others may lack the necessary infrastructure or resources to harness these energies.

7. Land Use Challenge:

- Large-scale renewable energy projects, particularly solar parks, require extensive land use.
- Some studies estimate that India may need 50,000-75,000 sq. km of land, about half the size of Tamil Nadu, to achieve its Net Zero targets.
- This land requirement poses a significant challenge as it may lead to the conversion of agricultural land into solar farms.

8. Impact on Food Security:

- The conversion of agricultural land for renewable energy projects could potentially impact food security.
- Experts worry that this push for renewable energy may lead to food insecurity in the future as the country would need at least 400,000 hectares of land by 2030 to achieve its renewable goals.

Measures Needs to be Taken:

1. Use of Wasteland:

- One potential solution is to promote the use of wastelands for renewable energy projects.
- It could help to reduce the pressure on agricultural land and ensure that food production is not adversely affected.

2. Budgetary Provisions:

- India is exploring innovative solutions to these challenges. For instance, the Union Budget 2024-25 has allocated Rs 10,000 crore for a grid-based solar power scheme.



- It includes provisions for viability gap funding for offshore wind energy for an initial capacity of 1 GW.

3. Global Recognition:

- India's efforts in renewable energy have received global recognition. During his visit to India, the UN commended India on its shift towards renewable energy.
- It stated that India can become a true global superpower in the fight against climate change if it speeds up its shift from fossil fuels to renewable energy.

4. Eliminating Fossil Fuel Subsidies and Implementing Carbon Pricing:

- By cutting subsidies and increasing taxes on fossil fuels, India is reducing the economic incentives for using fossil fuels and creating a price signal that reflects the environmental costs of carbon emissions.
- This can encourage the transition towards cleaner and more sustainable energy sources.

From a coal dominant economy to transform into a renewable dominant economy, it requires a comprehensive approach that encompasses policy reforms, targeted investments, and stakeholder collaboration to drive the necessary changes in the energy landscape and promote a sustainable, low-carbon future.