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Renewable Energy in India

Climate change is an existential threat that has the potential to change the course of human history for the worse. **Fossil fuels are the traditional energy sources that constitute the largest contributors to climate change.** They account for over **75% of global** greenhouse gas emissions and approximately **90% of all carbon dioxide emissions.**

For a better future, **green energy is the key solution** through which India's net zero emission target **by 2070** can also be accomplished.

Therefore, India should pioneer a new model of **economic development that could avoid the carbon-intensive approaches** that many countries have pursued in the past and **provide a blueprint for other developing economies for** clean energy **transition.**

What is renewable energy?

- Renewable energy is defined as energy that comes from resources, which are naturally replenished on their own.
- The major renewable energy sources presently are Solar energy, Wind energy, Hydroelectric power (large and small units), Wave energy, Ocean thermal energy conversion and Tidal energy and Biomass power.

Current scenario of Renewable Energy in India

- India is the world's 3rd biggest renewable energy producer (136 GW out of 373 GW) of total installed energy capacity in 2021 coming from renewable sources.
- India has been ranked 5th for installed hydroelectric power capacity. As of 31 March 2020, India's installed utility-scale hydroelectric capacity was 45,699 MW, or 12.35% of its total utility power generation capacity. The following is the breakup of the total installed capacity for Renewables, as of 31 December 2021-
- Small Hydro Power: 4.83 GW
- Large Hydro: 46.51 GW
- Wind power: 40.08 GW
- Solar Power: 49.34 GW
- Biopower: 10.61 GW

Benefits of renewable energy

- **Private sector involvement:** the set target of 450GW from renewables by the government created a huge opportunity for the private sector to get involved in the design and manufacturing of components of renewable energy technology in India only and thus book profits.
- **Low cost of maintenance**: Renewable energies like wind energy, biopower or solar energy requires almost zero maintenance and thus provide longer working hours and reduced labor cost.
- **Environment friendly**: as they have almost nil carbon footprint and does not emit any harmful pollutants like PM2.5 or PM10 or greenhouse gases like carbon dioxide, NOx etc.
- **Fulfill several government objectives**: like achieving the Panchamrit goals, SDGs, make in India, INDC of Paris Climate Deal and employment generation.
- **Decentralized**: Renewable energy plants can be located near the location of demand for energy. For example, a biogas plant or a solar plant can be established near a far-off cluster of villages thus eliminating the need to connect such remote villages to the national grid. For example, UT Daman has been receiving its energy completely from solar energy generated inside and in the vicinity of the city, thus reducing its dependence on the national power grid.

Factor's responsible for increasing demand for renewable

- Waiver of inter-state transmission charges for the sale of solar and wind power.
- The renewable purchase obligation (RPO) targets state DISCOMS to boost demand for renewable energy in states.
- Permitting FDI in the renewable sector has accelerated the progress.
- Rising demand for electricity as the economy rebounds after the COVID lockdowns.
- Falling prices for renewable energy, with per unit tariff for solar energy getting reduced up to 80% from the 2008 level.
- India's push to manufacture solar photovoltaic modules through the government support schemes aimed at boosting Indian manufacturers' competitiveness and attracting investment (Production Linked Incentive schemes)

Need for transition to renewable energy

- Increasing climate crisis due to historic and current continuous burning of Fossil fuels for the majority of power generation in the world and India. Renewable energy can limit climate disruption and boost energy security. Renewables are the peace plan of the 21st century.
- Volatile supplies of non-renewable energy sources due to regional wars and sanctions on supplying nations. For example, Iran and Russia- the two major energy producers in the world are under various international sanctions, thus reducing the supply of energy products in international markets.
- To promote Sustainable development by reducing externalities of pollution and promoting a green economy.
- As a signatory to the Paris Climate Agreement, India is committed to increasing its share of renewable energy capacity to 450 GW by 2030. Thus, a transition to renewable is needed to fulfill our commitments to the international community.
- The government of India has set targets to reduce India's total projected carbon emission by 1 billion tonnes by 2030, reduce the carbon intensity of the nation's economy by less than 45% by the end of the decade, achieve net-zero carbon emissions by 2070 and expand India's renewable energy installed capacity to 500 GW by 2030.

Prospects of Renewables in India

- Renewable Energy Country Attractiveness Index of EY ranked India 3rd behind USA and China as the most attractive renewable energy destination.
- The estimation of the potential wind resources in India is 102,788 MW assessed at 80m Hub height. The installed capacity of wind power in India was 22,645 MW as of 30 March 2015.
- India has a coastline of 7,500 km with an estimated wave energy potential of about 40,000 MW.
- India has a potential of 8,000 MW of tidal energy as per the estimates. An agreement is signed to implement India's first 3.75 MW mini-tidal power project in West Bengal.
- The total OTEC potential around India is estimated as 180,000 MW considering 40% of gross power for parasitic losses.
- India is very rich in biomass. It has a potential of 19,500 MW (3,500 MW from biogas-based cogeneration and 16,000 MW from surplus biomass). Currently, India has 537 MW commissioned and 536 MW under construction.
- Growing private sector interest in the renewable energy sector in India is evident from major private companies of India like Reliance Powers planning to invest Rs 5 lakh crore in green energies.

Achievements of India in the Renewable energy sector

- India has today become the **most attractive destination for investment** in the renewable sector.
- During the last six years, the renewable energy sector has attracted over Rs 4.7 lakh crore of investment, including FDI of about Rs 42,700 crore.

- India witnessed 20% CAGR **growth in renewable generation** since FY16 while total electricity generation saw 4.3% growth in the same period.
- The current **cost of energy** (LCOE) for large-scale solar in India **has reduced** to around Rs 2.5 per kWh, compared to ~Rs 12 in 2010.
- India is now in the **4th global position for overall installed renewable energy capacity**. Renewable energy has a share of 26.53% of the total installed generation capacity in the country.
- Renewable energy installed capacity increased 286% in the last 7.5 years.
- **Highest ever wind capacity** addition of 5.5GW in 2016-2017.
- The **world's largest renewable energy park of 30 GW** capacity solar-wind hybrid project is under installation in Gujarat.

Challenges of Renewable Energy in India

- **High initial cost of installation:** While the development of a coal-based power plant requires around Rs 4 crore per MW, the investment required a wind-based plant, with a capacity utilization of 25%, which requires an investment of Rs 6 crore per MW.
- **Reliability:** By their very nature, solar and wind energy are variable in availability both spatially as well as geographically. Hence, they need to be supported by conventional sources of power.
- **Creation of storage infrastructure:** To overcome the variable nature of renewable sources of energy, it is vital to invest in affordable batteries of large capacity.
- **Poor DISCOM's condition:** An important challenge for further scaling up renewables in India is the poor financial condition of power distribution companies (discoms), most of which are owned by state governments and are reeling under heavy debts.
- **Funding:** As already stated, renewable energy requires setting up large projects to harness economies of scale. This acts as a deterrent for private companies to invest initially.
- **Low Social acceptance:** renewable-based energy system is still not very encouraging in urban India. Despite heavy subsidies being provided by the government for the installation of solar water heaters and lighting systems, its penetration is still very low.
- **Weak domestic manufacturing capability**: It is important to set up manufacturing capacity in India to decrease imports and promote Atmanirbhar Bharat. It would also aid in the creation of multiple manufacturing jobs.
- **Sustainability:** that is, how to expand reliable energy access and use while maintaining affordability for consumers and financial stability for the DISCOMs.
- **Integration into the national grid**: that is how to integrate increasing shares of renewable energy securely and reliably into the national electricity grid.

Government policies for the promotion of Renewable in India

- **Renewable energy certificate**: REC mechanism is a market-based instrument to promote renewable energy and facilitate the compliance of renewable purchase obligations (RPO). It

aims to fix the mismatch between the availability of renewable energy resources in the state and what is required by a RPO.

- **Release of Green Hydrogen mission:** The Mission aims to aid the government in meeting its climate targets and making India a green hydrogen hub. This will help in meeting the target of production of 5 million tonnes of Green hydrogen by 2030 and the related development of renewable energy capacity.
- **Launch of PLI scheme**: A Production Linked Incentive (PLI) Scheme 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage' to promote renewable energy storage infrastructure and manufacturing capacity.
- **Green term ahead market**: As a first step towards Greening the Indian short-term power market, the government has launched pan-India Green Term Ahead Market (GTAM) in electricity which is an alternative new model introduced for selling off the power by the renewable developers in the open market without getting into long term PPAs.
- **International efforts**: An India Energy Modeling Forum was launched under the US-India Energy partnership. Also, India has launched the International solar alliance which is a treaty-based international inter-governmental organization and aims to mobilize more than $1000 billion of investment needed by 2030 for the massive deployment of solar energy.
- **The Setting up of the Solar Energy Corporation of India**: with the mandate of the SECI allows wide-ranging activities to be undertaken with an overall view to facilitating the implementation of the National Solar Mission and the achievement of targets set therein. The SECI has the objective of developing renewable energy (RE) technologies and ensuring inclusive RE power development throughout India.
- **National Offshore Wind Energy Policy, 2015**: Under this Policy, the Ministry of New & Renewable Energy (MNRE) has been authorized to explore and promote the deployment of offshore wind farms in the Exclusive Economic Zone (EEZ)

Source :TOI