NEXT IAS

DAILY EDITORIAL ANALYSIS

TOPIC

DECODING INDIA'S ENERGY TRANSITION

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Context

- Recently, the **World Economic Forum (WEF)** revealed that **India secured 71st position in 2025**, down from 63rd in 2024 and 67th in 2023 because of **several 'structural challenges'.**

India's Global Standing in Energy Transition

- The **World Economic Forum (WEF)**, in collaboration with **Accenture**, recently released its 2025 *Fostering Effective Energy Transition* report.
- It evaluates 118 countries based on the **Energy Transition Index (ETI)**, which assesses their performance and readiness for clean energy transformation.
  - **India ranked 71st** with an ETI score of **53.3**, down from **63rd in 2024**.
  - **Sweden retained the top spot** with an ETI score of **77.5**.
- **Renewable Energy Expansion:** Increased from **48 GW in 2009** to **204 GW in 2024**, achieving a **10% CAGR**.
  - Projected **solar PV capacity** for 2025–2029 is **188–278 GW**, making India a global leader (*IRENA, 2025*).

India's Energy Transition: Current Status

- **Non-Fossil Fuel Milestone:** As of June 2025, India has achieved over 50% of its installed electricity capacity from non-fossil fuel sources, **five years ahead of its 2030 target for the Paris Agreement.**
  - The total installed power capacity is around 476 GW, with approximately 235.7 GW coming from non-fossil sources (226.9 GW renewable, 8.8 GW nuclear), and about 240 GW from thermal power.
- **Renewable Growth:** Solar and wind have been the fastest-growing segments. Solar capacity has reached over 110.9 GW, and wind is at 51.3 GW as of mid-2025.
- **Electrification:** India achieved 100% village electrification and has continued expanding grid connectivity and household access.

Persistent Structural Challenges

- **Fossil Fuel Dependence:** India is the **third-largest renewable energy producer** (1.77 EJ) after China (13.9 EJ) and the U.S. (6.65 EJ).
  - **Fossil fuels remain dominant in the national energy mix.**
  - **Coal consumption** rose to **21.98 Exajoules (EJ) in 2023**, up from **6.53 EJ in 1998**, marking a **5% CAGR**.
  - **Petroleum use** has increased, especially in **agriculture**, between 2022 and 2023 (*NITI Aayog, 2024*).
- **Unequal Access to Clean Energy:** Disparities in **clean cooking fuel access** continue to plague rural and low-income households:
  - The **Pradhan Mantri Ujjwala Yojana (PMUY)** has expanded LPG access to Below Poverty Line (BPL) households.
  - However, **sustained usage** is limited due to **cost, supply issues, and inconvenience**, leading to **fuel stacking** (use of multiple fuels).

Other Challenges

- **High Fossil Fuel Dependence:** Despite progress, fossil fuels still supply the bulk of India's primary energy and are responsible for 75% of total greenhouse gas (GHG) emissions.
- **Rising Energy Demand:** India's primary energy supply has grown by 54.5% in the last decade due to its booming population and economic growth. Meeting future demand sustainably remains a challenge.

- **Emissions Intensity**: India has reduced emissions intensity of its GDP by 33% from 2005-2019, but steep further reductions are still required for net-zero aims.
- **Financing & Investment:** Achieving massive renewable targets and grid modernization will need sustained and increased domestic and international investment.
- **Grid Integration & Flexibility:** Integrating high shares of variable renewables (solar, wind) requires developing grid storage, transmission upgrades, and market reforms to ensure reliability.
- **Technological Gaps:** Wider adoption of emerging technologies like green hydrogen, battery storage, and advanced grid management is needed for deep decarbonization.
- **Data & Governance:** Accurate, timely energy data and robust policy frameworks are required for evidence-based decision making and proper monitoring of transition progress.
- **Social Considerations:** The transition must remain inclusive—ensuring energy access, affordability, and job creation while navigating potential transitions in coal-dependent regions.

Related Flagship Missions & National Strategies

- **National Solar Mission:** Aims for 100 GW of solar capacity, promoting grid-connected and off-grid solar projects.
- **National Green Hydrogen Mission:** Targets 5 million metric tonnes of green hydrogen annually by 2030, with 19,744 crore allocated for incentives and R&D
- **PM Surya Ghar: Muft Bijli Yojana:** Supports rooftop solar installations for households, with over 17 lakh systems already deployed.
- **Production Linked Incentive (PLI) Scheme:** 24,000 crore allocated to boost domestic manufacturing of solar PV modules and wind turbines.
- **Viability Gap Funding (VGF) for Battery Energy Storage Systems (BESS):** 5,400 crore scheme to build 30 GWh of storage capacity.
- **Elevated Investment Caps:** NTPC and NLCIL received approval to invest 20,000 crore and 7,000 crore respectively in renewable projects.
- **National Transmission Plan for 500 GW:** Ensures seamless evacuation and integration of renewable power into the grid.
- **Interstate Transmission System (ISTS) Waiver:** Reduces project costs by waiving transmission charges until 2028.
- **Renewable Purchase Obligations (RPOs):** Mandate DISCOMs to procure a fixed percentage of power from renewable sources.
- **Green Open Access Rules:** Facilitate easier access for consumers to buy renewable energy directly from producers.
- **Strengthened Power Purchase Agreements (PPAs):** Provide long-term certainty for investors.

Way Forward: Opportunities to Catalyze Energy Transition

- **Infrastructure and Technology:** India needs to focus on:
  - **Grid stability**, **energy storage**, and **interconnectors**.
  - **Off-grid solutions** for electrifying remote regions.
  - Strengthening schemes like **PM Surya Ghar Muft Bijli Yojana** through better monitoring and accountability.
- **Green Finance and Industrial Alignment:** India needs robust financial support to de-risk and scale clean energy projects:
  - The **National Green Hydrogen Mission (2023)** offers **state-specific incentives** tied to industrial strengths.

- The **National Investment and Infrastructure Fund (NIIF)** can help co-finance clean energy projects by **lowering systemic investment risks**.

- **Policy Stability and Long-Term Capital: Stable and adaptive energy policies** to attract **long-term risk capital**.
  - Regulatory clarity to bolster investor confidence in India's energy systems.

Conclusion

- India continues to demonstrate key strengths, including improvements in **energy efficiency**, **clean energy investments**, and **progressive energy policies,** despite a downward shift in rankings.
- A **multi-tiered strategy** — combining **targeted policies**, **financing mechanisms**, and **decentralized infrastructure** — will be crucial to align economic growth with sustainable energy goals.

Source: BL

Mains Practice Question

Q. Evaluate the key challenges India faces in its energy transition and discuss how government initiatives and technological innovation can address these barriers to create a sustainable energy future.

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