India’s Green Transition and Dependence on Coal

Mains: *GS II – Energy| Environment*

Why in News?

The recent rapid renewable expansion alongside persistent coal dependence, reveals that India’s transition remains incomplete.

What is the renewable energy progress of India?

- **Installed capacity** – Renewable energy accounted for *42.4% of installed power capacity* by March 2026, compared to merely 0.72% in 2005.
- **Decline of Coal’s share** – The coal’s share in installed capacity declined from *58.7% to 42.2%* during the same period.
- Since 2017, renewables have consistently contributed the largest share of new power capacity additions.
- **Government initiatives** – The National Solar Mission, PM-KUSUM, and Production Linked Incentive (PLI) schemes for solar manufacturing, Green Hydrogen Mission, International Solar Alliance (ISA), have accelerated India’s clean energy ambitions.
- **Climate commitments** – India has also committed itself internationally through, The Paris Climate Agreement, Panchamrit targets announced at COP26, The goal of achieving net-zero emissions by 2070.
- These developments indicate that India’s renewable transition is genuine and significant.
- Despite impressive installed capacity figures, renewable energy contributes far less to actual electricity generation.

  *In April 2026, renewables generated only **15.8% of electricity**.*

  *Coal still accounted for **71.8% of electricity generation**.*

What are the structural reasons behind coal dependence?

- **Intermittency of Renewable Energy –** Renewable sources lack round-the-clock reliability.
- India currently lacks sufficient Large-scale battery storage, Pumped hydro storage, Smart grid systems, and Flexible balancing mechanisms.
- As a result, coal plants remain essential for ensuring uninterrupted electricity supply.
- **Limited Retirement of Coal Plants –** Although renewable capacity has increased,

India has retired very few old coal plants.

- Most thermal plants continue operating because, they provide stable electricity, they are already financially invested assets, and state utilities rely on them for energy security.
- **Rising Electricity Demand –** India's electricity demand is rapidly increasing due to Urbanisation, Industrialisation, Digitalisation, rising air-conditioning usage, electric mobility expansion.
- Renewables alone are presently unable to meet peak demand consistently.
- **Weak Transmission Infrastructure –** Renewable-rich states such as Rajasthan and Gujarat often face transmission bottlenecks.
- India still requires: stronger interstate transmission networks, green energy corridors, modernised distribution infrastructure.
- **Geopolitical Vulnerabilities and Energy Security –** India's continued coal dependence is closely linked to global energy markets.
- Nearly half of India's fossil fuel imports pass through the Strait of Hormuz, including, crude oil imports from Saudi Arabia, LNG imports from Qatar.
- Consequently, geopolitical tensions in West Asia directly affect India through, rising oil prices, higher coal prices, increased electricity tariffs, inflationary pressures, and widening fiscal deficits.
- Even domestically generated electricity remains indirectly exposed to global fossil fuel volatility because fossil fuels determine the marginal cost of power generation.
- The recent energy price spikes demonstrate that India's energy security challenge is far from resolved despite renewable expansion.

Stabilising Role of Coal

• Coal's persistence should not be viewed merely as policy failure or institutional inertia.
• Coal currently performs several stabilising functions:
  - Provides baseload power,
  - Ensures frequency stability,
  - Supports grid balancing,
  - Compensates for renewable intermittency,
  - Maintains energy reliability during demand peaks.

What are the best practices in other countries?

- **China –** China has managed to reduce vulnerability more effectively because, oil and gas constitute only a small share of its power mix,
- The electric vehicles and hybrids dominate new vehicle sales and domestic manufacturing strengthens supply chains,
- The large-scale battery storage deployment is advancing rapidly.
- China's integrated industrial and energy strategy has reduced dependence on imported fuels.
- **Spain –** Spain presents another successful example where, renewables significantly reduced gas dependence.
- The grid reforms enabled large-scale renewable integration, and electricity pricing became less tied to fossil fuel markets.
- These examples show that renewable expansion alone is insufficient without systemic

transformation.

What measures could be taken?

- **Large-Scale Energy Storage –** Investment in lithium-ion batteries, sodium-ion technologies, pumped hydro storage, green hydrogen storage, is essential to manage renewable intermittency.
- **Grid Modernisation –** India requires smart grids, digital load management, advanced forecasting systems, real-time balancing infrastructure.
- These will improve renewable integration and reduce coal dependence.
- **Strengthening Transmission Networks –** Expansion of Green Energy Corridors, interstate transmission systems, renewable-rich regional connectivity, will help distribute clean energy efficiently across the country.
- **Market Reforms –** Electricity market reforms should encourage flexible pricing, ancillary service markets, renewable balancing incentives, private investment in storage and grid technologies.
- **Gradual Coal Transition –** India should adopt a calibrated coal transition strategy involving, retirement of inefficient thermal plants, cleaner coal technologies in the interim, reskilling of coal-dependent workers, just transition frameworks for coal-producing regions.
- **Domestic Manufacturing and Strategic Resilience –** Reducing import dependence for solar modules, batteries, rare earth materials, is essential for long-term energy sovereignty.

What lies ahead?

- India’s renewable energy transition is substantial, but it remains incomplete.
- The country has successfully expanded renewable capacity, yet coal continues to dominate actual electricity generation because the broader electricity system has not fully adapted to intermittent renewable power.
- The distinction between installed capacity and actual generation is crucial for understanding India’s energy reality.
- Until storage systems, modern grids, and balancing infrastructure become sufficiently advanced, coal will continue to play a stabilising role in the power sector.
- India’s energy challenge today is therefore not merely about generating more green electricity, but about creating an integrated and resilient power system in which renewables can reliably substitute fossil fuels.
- Only then can India reduce its vulnerability to geopolitical crises, global energy shocks, and fossil fuel volatility while simultaneously achieving sustainable growth and climate goals.

Reference

[The Hindu| India’s Energy Transition and Dominance of Coal]

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