

Navigating energy transition with energy security



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Energy, with its strong positive correlation to every conceivable aspect of development, such as economic growth, access to education, improved health, availability of water, nutrition, infrastructure, and even life expectancy, can, as the phrase goes, 'move mountains'.

The vision to achieve Viksit Bharat@2047 and to do so in a manner consistent with the announcement to be Net Zero in GHG emissions by 2070 underscores the urgent need for India to transition to greener forms of energy or 'Energy Transition'.

This means shifting from traditional, polluting energy sources like coal to cleaner, renewable sources like solar and wind. At the same time, we must ensure safe, reliable, and improved access to energy at reasonable prices to facilitate economic growth and achievement of the developmental priorities of a country or 'Energy Security'.

A recent report by the Principle Scientific Adviser, Government of India and IIM Ahmedabad (<https://tinyurl.com/4764d2na>) estimates India's energy demand to double by 2040. IEA estimates show that India leads global energy demand growth in every World Energy Outlook (WEO) scenario.

The European Union consumes 34,888 kWh per person, while the UK and the US have per capita levels of 28,501 kWh and 77,028 kWh, respectively, while India consumes only 7,586 kWh per person. Indeed, India's energy consumption would need to appreciate significantly during the Amrit Kaal, a period of rapid economic growth, to power economic growth, meet the SDG commitments and achieve all-round prosperity.

This growth must be in line with MISSION LIFE, a national initiative for sustainable development and energy efficiency.

So far, India has pursued a dual approach towards this objective, focusing on phasing in renewable sources of energy and improvements in energy efficiency.

Both have been hugely successful, with non-fossil fuel's share in installed electricity capacity at 45.4 per cent and a reduction in the emission intensity of GDP by 33 per cent in 2019 compared to 2005.

Specific policy and regulatory interventions such as the Energy Conservation Building Code, Shunya labelling programme, Standards and Labelling programme, star rating of appliances, among others, including fuel composition, promotion of an ecosystem that supports electric vehicles and measures to promote energy-efficiency pump sets in agriculture, will play a vital role in enabling further reduction in the emission intensity (@Economic Survey 2024-25).

Even so, more than 80 per cent of India's current energy demand is met through fossil fuels.

The intermittency of renewable energy sources (due to the dependence on the sun and wind) and the lack of viable battery storage technologies (that would have allowed energy storage to tackle intermittency) are inherent limitations, requiring coal to remain essential to ensure power grid stability.

The associated costs, therefore, increase the price of a 'round-the-clock' energy supply through renewable sources. Further, the high opportunity cost of scarce land resources required for renewable energy must be factored in as renewable power capacity is scaled up.

Strategic investments in Research and Development are crucial for a smooth transition to low-carbon development strategies. These investments will identify and deploy viable low-emission and clean technologies such as Carbon Dioxide Removal (CDRs), Bioenergy with CO₂ Capture & Storage (BECCS), Carbon Capture, Utilisation and Storage (CCUS), and coal gasification.

The urgency for technological innovation requires an active collaborative effort between industry and prominent national-level public and private educational institutions. Collaboration in technology with other countries could also support domestic efforts.

Energy transitions have never been achieved within a single generation and certainly not globally as is being attempted now. The West's quiet burial of the principle of 'Common but differentiated responsibilities and respective national capabilities' while pursuing energy-guzzling technologies like Artificial Intelligence makes it doubly harder for developing countries like India. Unlike the developed countries that have already reached higher per capita energy consumption and carbon emissions, India's task is to scale up its energy consumption and move to greener sources as it does so.

Therefore, India's economic growth will rely on various energy sources, including fossil fuels, albeit with cleaner coal technologies. Given India's legitimate growth aspirations, its approach to 'Net Zero' demands an approach that recognises and incorporates fiscal, banking, social, and employment implications.

Further, it must address the challenges posed by resource scarcity and technological limitations. With domestic financial resources as the mainstay, access to global financial resources at an affordable cost will remain a critical piece of the strategy.

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