

## Energy Security & Clean Energy Transition of India

### Why in News?

India aspires to be a developed nation by 2047 with inclusive, people-centric sustainable growth and improved living standards, without compromising public health or increasing emissions.

### What are India's energy demands to meet the goals of 2047?

- India is the third-largest producer and consumer of electricity worldwide.
- **Energy needs** - Total energy demand is expected to double in 25 years.
- **Per capita energy consumption** - It is to increase from 0.43 *tonne of oil equivalent (toe)* in 2022 to 0.8 toe by 2047.
- **Electricity demands** - The share of electricity in overall energy demand will increase from 18.3% in 2022 to 40.3% in 2047.
- **Per capita electricity consumption** - *It is to increase* from 1,331 *kilowatt-hour (kWh)* in 2023 to 3,675 kWh in 2047.

### How India can meet its energy needs sustainably?

- By 2047, the ambition is for every Indian to have access to all forms of modern clean or green energy.

*The green energy transition is a shift from an energy mix based on fossil fuels to one that produces very limited, if not zero, carbon emissions, based on renewable energy sources.*

- **Implementing LiFE - *Lifestyle for Environment principles*** can supply energy in sustainable manner while delivering quality of living standards equivalent to that of developed nations.
- **Robust energy markets** - It can enable the *development of requisite infrastructure* to ensure doorstep delivery across the country.
- **Transforming the rural economy** - It will *remove the developmental distance in energy* services between the urban and the rural.
  - Currently, 56% of rural households rely on traditional biomass, such as wood, dung cakes, charcoal and crop waste, for cooking.
- It is hoped this will completely shift to cleaner fuels by 2047 while in urban areas, a 100% switch to relatively low carbon intensive fuels such as gas will be achieved much earlier.
- **Electric cooking** - It is expected to catch pace, with about 15% households in rural areas and 20% in urban areas shifting to induction cooking by 2047.

To know about Green Energy in India, click [here](#)

### What are the drivers of energy security?

- Energy security continues to play a pivotal role in shaping India's energy transition.
  - India imported 88.9% of crude oil, 43.3% of natural gas and 25.04% of coal in 2023.
- **Reduced fossil fuels** - With a greater thrust towards adoption of clean and green fuels, India's consumption of fossil fuels will not see much increase.
- **Increase in share of clean energy** - It is expected to increase from 16% in 2022 to *40% of total primary energy mix by 2047*.
- **Natural gas** - Its supply is expected to *increase more than 3.5 times by 2047* to meet the demands of a gas-based economy.
- India's offshore exploration together with the expansion of domestic gas infrastructure will play a crucial role in this regard.
- **Nuclear energy** - The ratio of actual energy generated to the maximum possible energy it could generate — of 80-90% has a critical role to play in providing low-emission baseload power.
- **Small Modular Reactors** - SMR with power capacity of up to 300 MWe are gaining attention.
- Recently, a public-private partnership was announced for research and development towards setting up ***Bharat Small Reactors***.

### What are challenges in green transitions?

- **Mineral issues** - Critical mineral extraction is heavily concentrated.

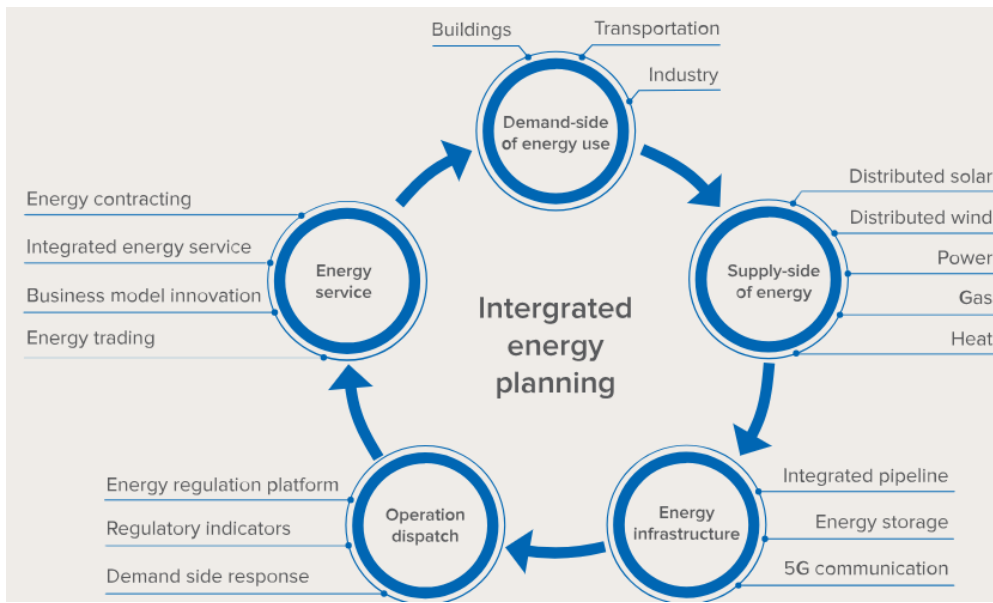
*Notably, China supplies 70% of graphite and 60% of rare earth elements today while the Democratic Republic of the Congo supplies 70% of cobalt and Australia supplies 55% of lithium.*

- The level of concentration is even higher for processing, with China dominating across the board.
- **Nuclear technology** - It comes with its own risks and *long gestation*.
- **Solar and wind power** - They need further attention as it is *impacted by infrastructure issues*.
- The *increased cost* of creating this excess capacity coupled with system integration costs raises tariffs and disruption anxieties.
- **Pricing issues** - Energy subsidies not just put *additional burden on the exchequer* but also promote *inefficient consumption*.
- Further, *cross subsidy distorts* the true cost of electricity and puts Indian industry at a disadvantage compared to its global competitors.

**Cross-subsidization** is a pricing strategy where a business charges more to one group of consumers to make up for lower prices for another group.

## How emission and growth can be balanced?

- India's per-capita primary energy consumption must grow significantly to meet the aspirations of its growing economy and population.
- **Key criteria** - It warrants an *integrated energy planning*.
- Ensuring *energy efficiency and conservation*.
- *Increasing the share of renewables* to support rising electricity demand.
- *Reducing energy poverty* by fixing the urban-rural energy gap through a people-centric approach.



- **Policy inputs** - NITI Aayog has formed several inter-ministerial working groups to develop a roadmap for achieving a net zero economy by 2070.
- **People-centric Energy Transition** - Niti Aayog collaborates with the Ashoka Centre to co-design this futuristic roadmap & facilitate convergent thinking across the ecosystem.
- **Importance** - It leads to a *low-cost transition pathway* for sustainable development.

To know about India's Nationally Determined Contribution, click [here](#)

## What lies ahead?

- India needs to diversify its import basket of countries of critical minerals.
- There should be strong extraction and manufacturing to avoid shifting from fuel dependency to mineral dependency.
- Newer delivery models like Direct Benefit Transfer, if implemented in a phased manner, leads to large energy efficiency gains.
- The subsidy burden may be reduced with faster penetration of solar rooftops, smart meters, feeder segregation and the modification of consumer demand for energy through various methods and behavioural change.

## Reference

[Down To Earth| Pathway to Clean Energy Transition](#)



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