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.

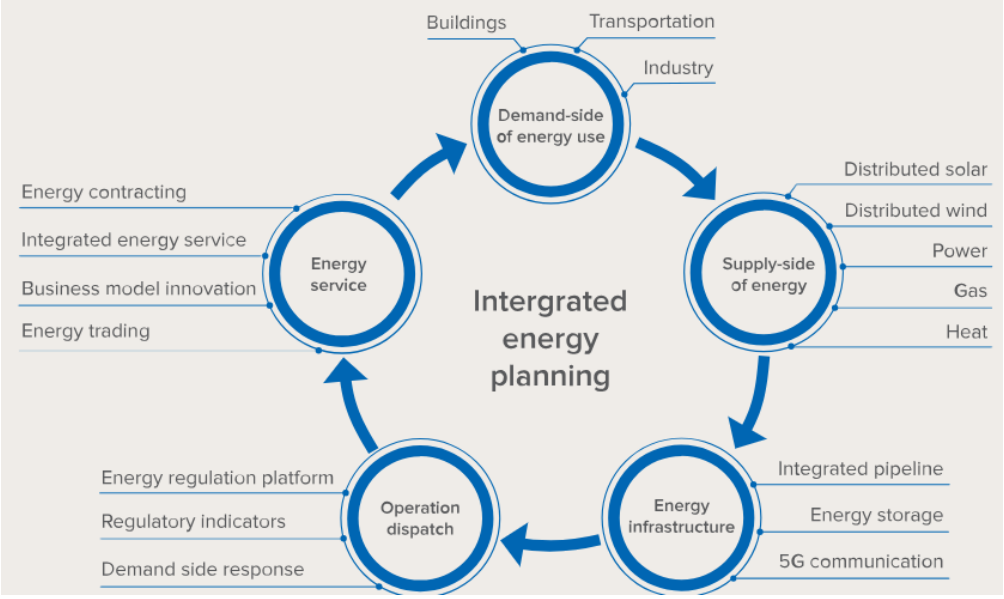
  Notably, China supplies 70% of graphite and 60% of rare earth elements today while the Democratic Republic of the Congo supplies 70% of cobalt and Australia supplies 55% of lithium.

- 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 needs 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.
- P**eople-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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