India’s Energy Independence by 2047

“Global Chemicals and Petrochemicals Manufacturing Hubs in India” (GCPMH 2023)

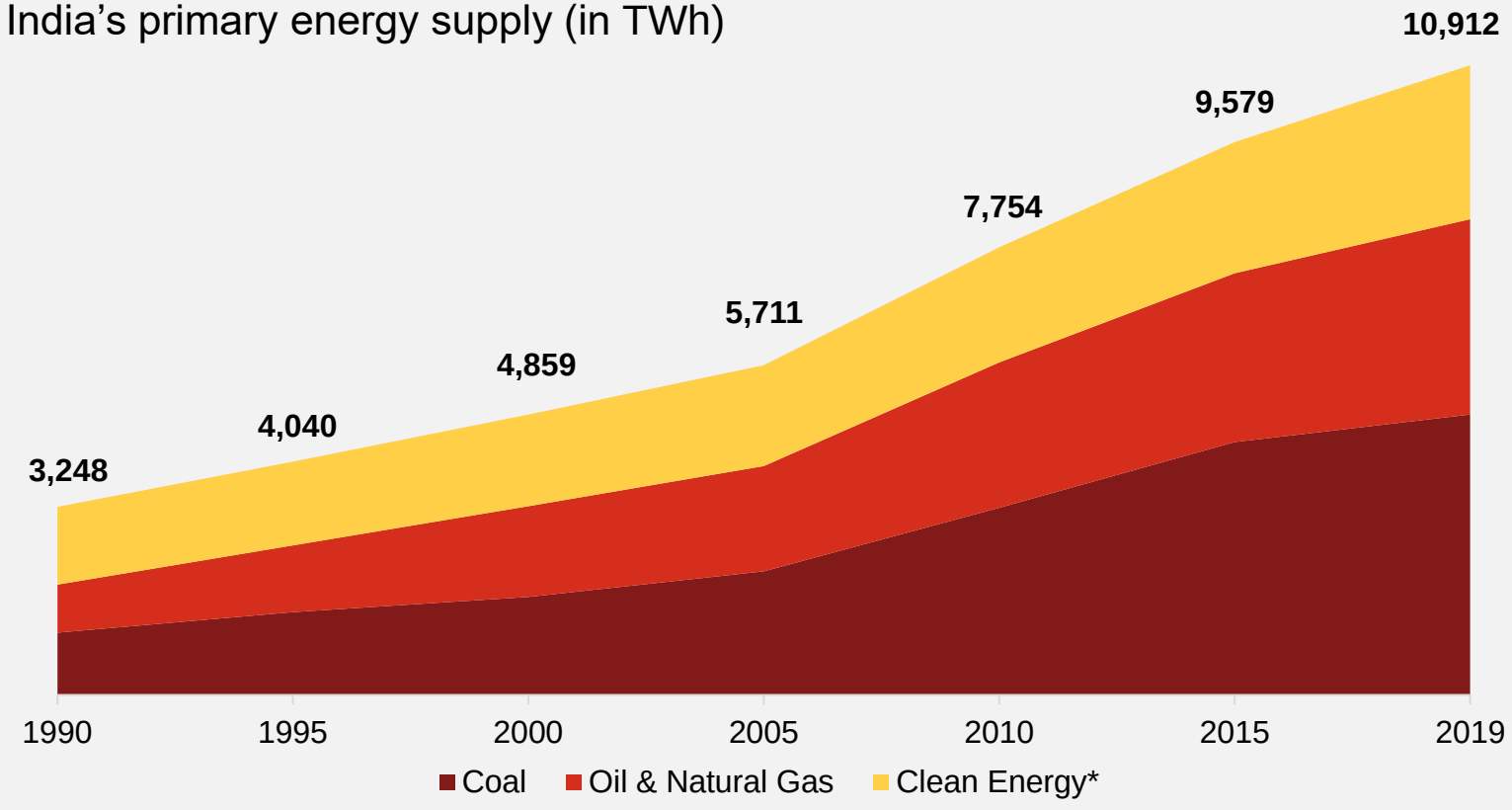
27th July 2023

Strictly Private and Confidential

India’s primary energy demand has grown at a CAGR of ~4% in last 30 years with a key role of fossil fuels in the energy mix

Evolution of India’s energy sector

India’s primary energy supply (in TWh)



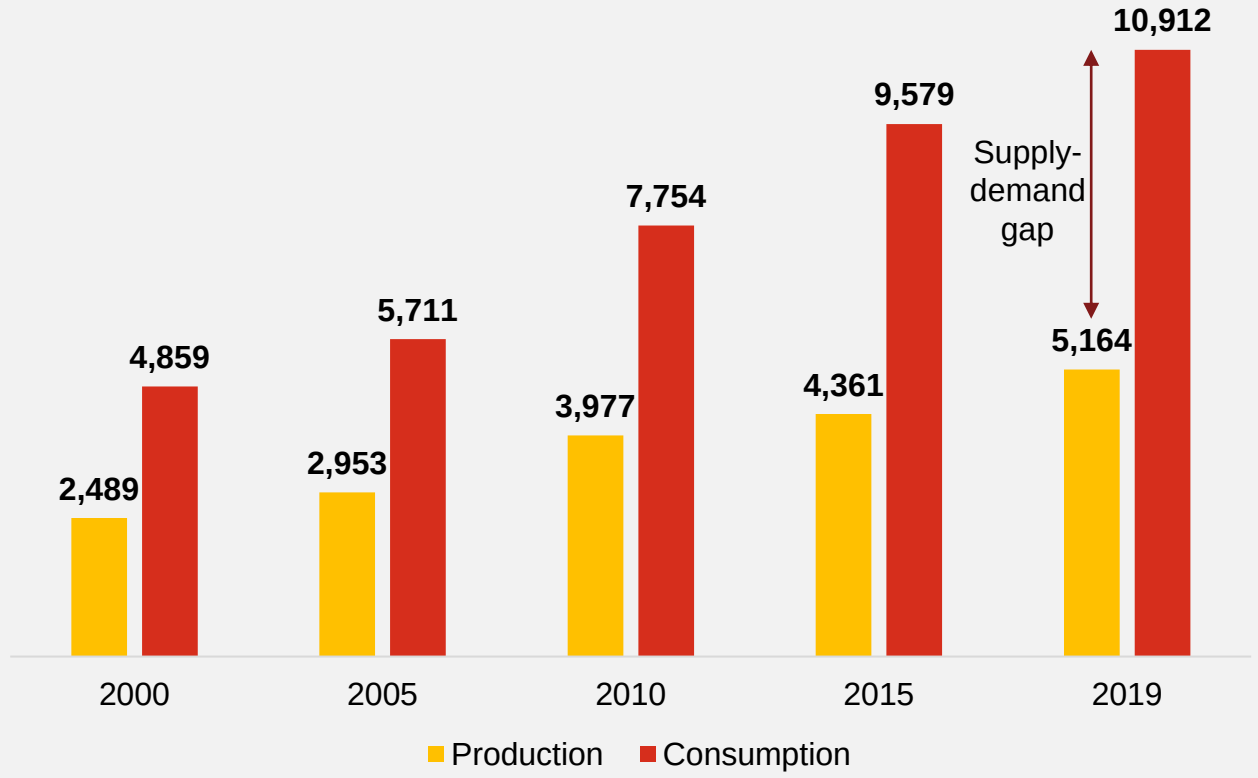
Source: IEA
**Clean energy consists of renewable, biofuels and nuclear energy*

Key Insights

- Primary energy supply increased by **~3.5 times in the last 30 years**
- **Fossil fuels** supply met **76%** of energy used
- Over the last decade, share of **renewable energy** in the energy mix improved significantly
- India is the **3rd largest energy consumer** in the world
- Yet the per capita energy consumption (6.4 MWh) is **less than 40% of the world average**
- Energy consumption is slated to **grow over the coming decades**

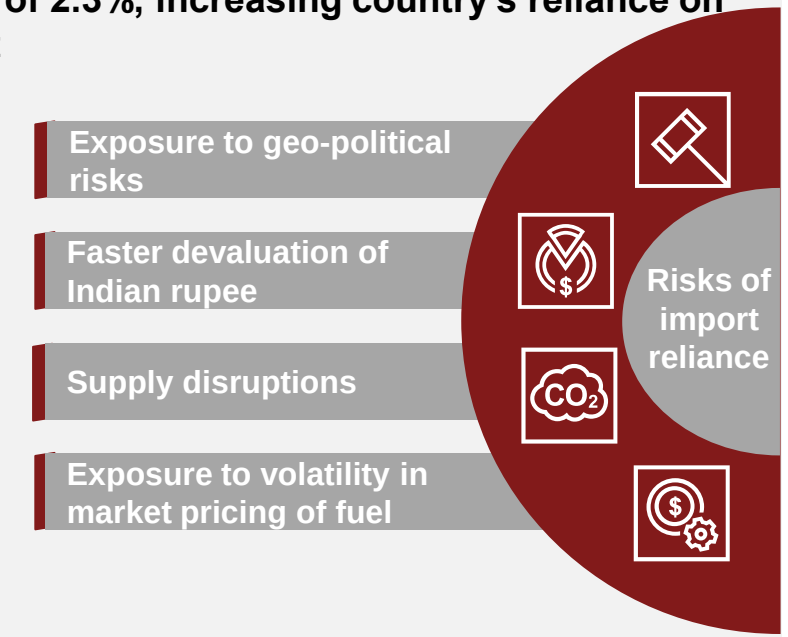
Increasing supply-demand gap in India's energy mix has increased India's reliance on energy imports

Energy supply-demand gap in India
(in TWh)



Key Insights

- India imported **53% of primary energy** - 28% of coal, 85% of crude oil and 52% of natural gas- in FY 2019
- Energy supply-demand gap is increasing with a **CAGR of 2.3%, increasing country's reliance on import**



Source: EIA, BP energy outlook

Several financial and operational drivers are pushing India towards import independence

Enhancing India's energy security
- Hon'ble PM announced the target of achieving energy independence by 2047
- Any disruptions to imports are an economic risk

Employment generation in the country
- India's unemployment rate stands at 6.57%
- Renewable energy could create 2 to 4.5 million new jobs over the next 25 years

Reduction in country's energy import bill
- Can reduce India's energy import bill currently at USD 126 billion
- Will reverse trade deficit trends

Push to renewable energy
- Target is 227 GW of renewable energy by 2022
- Push to RE sector shall concurrently reduce India's imports

Increase in investment in India
- Cash flow shall remain within the country
- Support for the economic and social development of the country

Other drivers
- India's commitment of net zero emissions by 2070
- Prevention of the devaluation of Indian rupee
- Vulnerability to global energy market

Source: Press releases

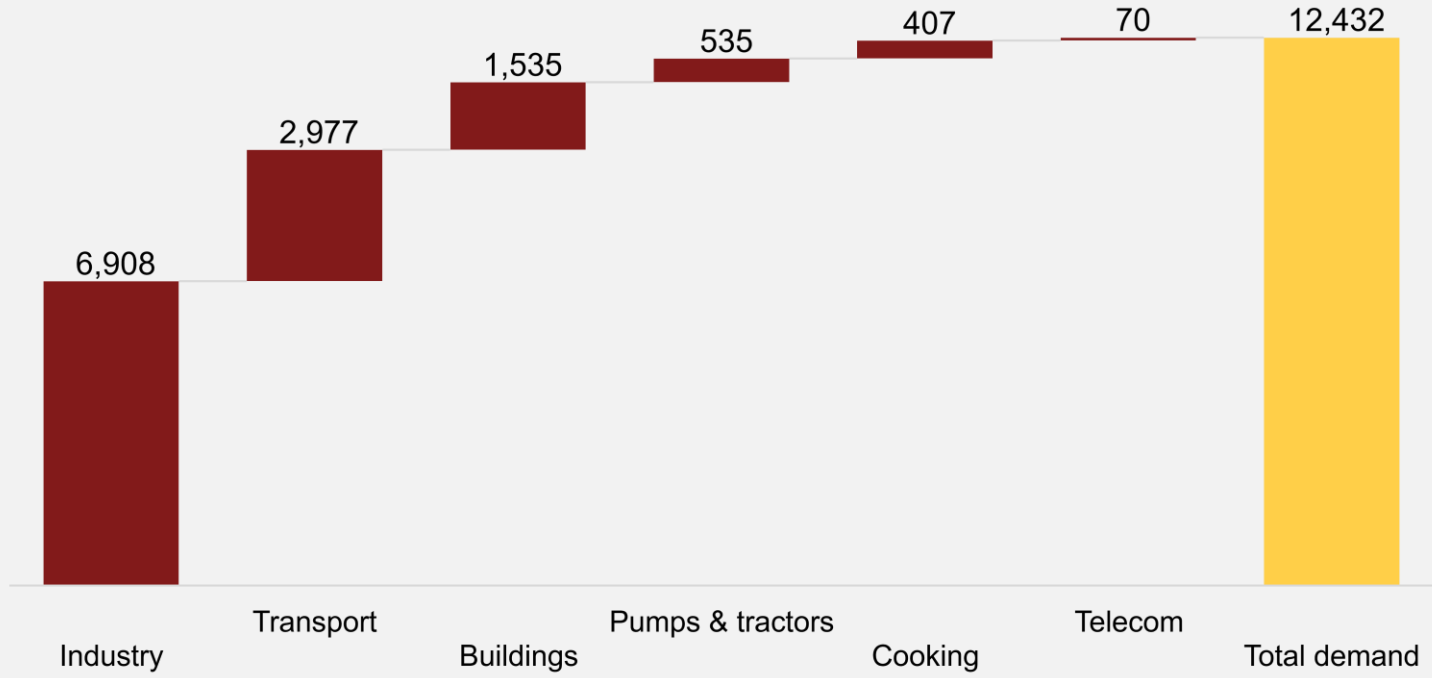
In accordance with India's target to achieve import independence by 2047, NITI Aayog has launched India Energy Security Scenarios 2047

Charting out sustainable path for India's energy independence

- **NITI Aayog's IESS 2047 calculator** explores potential future energy scenarios, covering demand and supply sectors leading up to 2047
- Maximum Energy Security Scenario has been chosen to identify the energy demand till 2047
- According to the original scenario results, India would still have **22% energy import dependence in 2047**
- This study attempted to **balance the energy needs with indigenous energy sources**

Primary energy demand in 2047

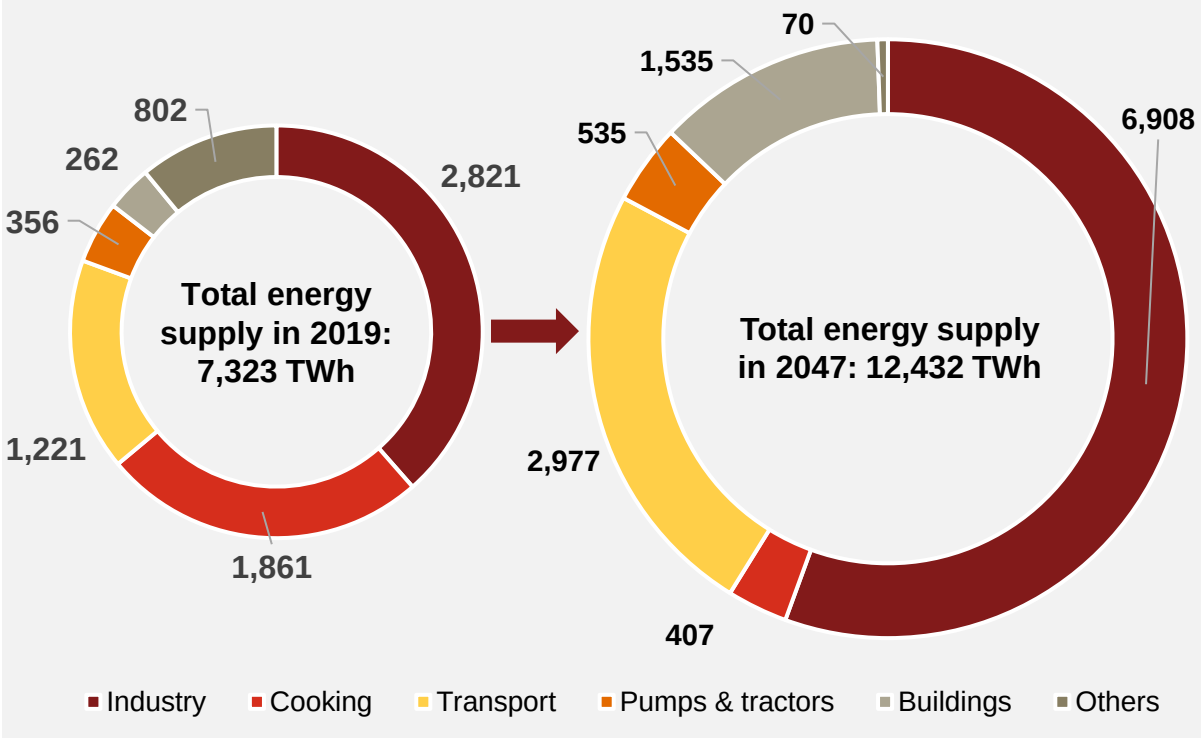
IESS 2047: Maximum energy security scenario (in TWh)



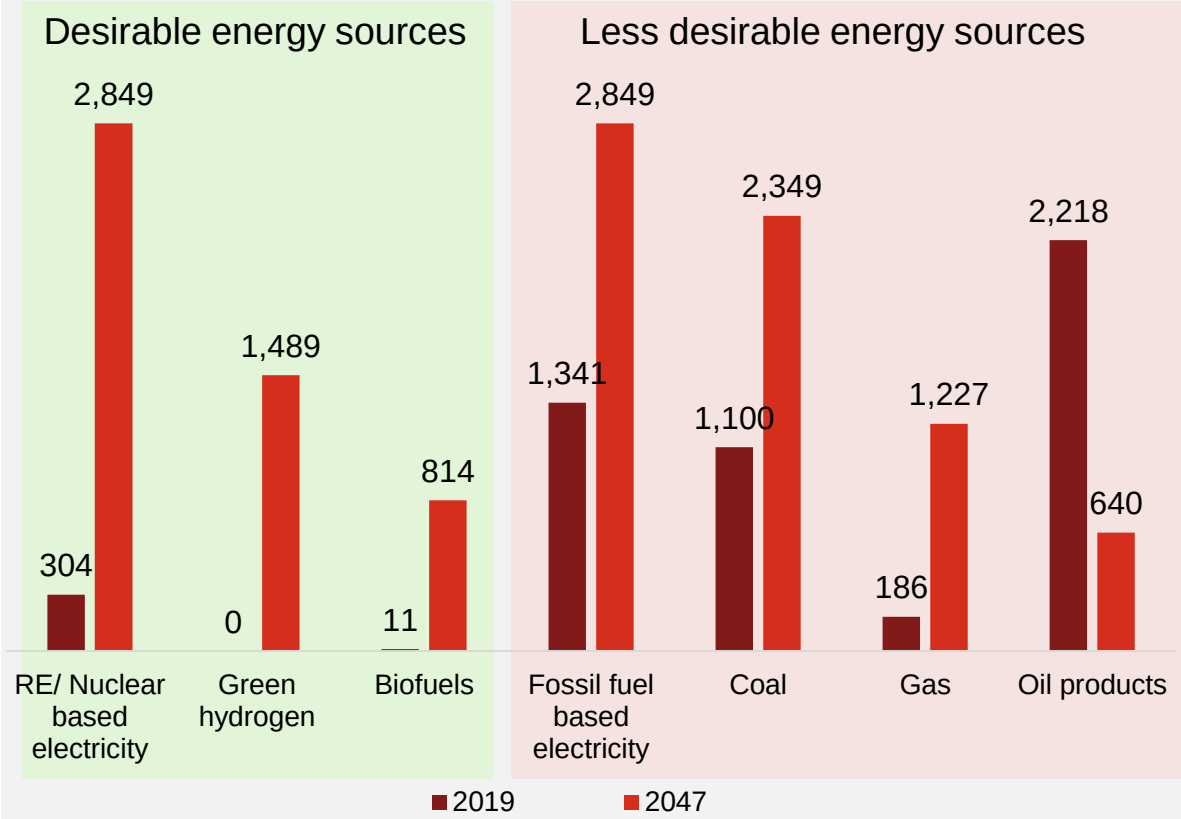
Source: India Energy Security Scenario, 2047 (IESS 2047)

Based on IESS ‘47 demand, this study identified required sector-wise contribution of different fuels to achieve import independence by 2047

Sectoral energy mix designed as a part of this study
(in TWh)



Fuel-wise energy mix designed as a part of this study
(in TWh)



Source: IEA, NITI Aayog’s India Energy Dashboard , PwC Analysis

To achieve import independence, focused efforts in all the parts of the overall energy value chain will be required

High level action plan to achieve energy independence

- Exploit **maximum potential of renewable (1,636 GW) and nuclear (768 TWh) energy**

- **Increase R&D investment** for green hydrogen research to reduce the production cost
- Invest in **desalination infrastructure**

- Exploit **maximum biofuels potential (930 TWh)**
- Promote **production of drop-in-biofuels and adoption of flex engines**

- **Ramp up exploration and production activities** to establish the prognosticated resources

- **Install carbon capture facilities** in fossil fuel-based power plants

- Promote **change in energy-use behaviour** to ensure energy savings

Role of key stakeholders in India's energy independence

Part of value chain	Key stakeholder	Major roles
Setting up goals and relevant policies	Ministries such as MoPNG, MoC, MNRE, and MoRTH	Proactively assess India's energy landscape, and **setup target/ relevant policies** to achieve import independence
Increase of primary energy supply	Coal mining companies, E&P companies, Power and utility companies, biofuels producers	**Increase the production of energy** in India through increased exploration or new renewable/ biofuels plants
Adoption and consumption of new, renewable energy	Large industries, municipal corporations, households	Awareness towards the advantages of adopting new, renewable energy
Research to improve energy efficiency and develop new technology	Research units such as DST, DBT, and CHT	**Improve the energy efficiency** of the current processes by introducing new technologies

Source: PwC Analysis

Thank you