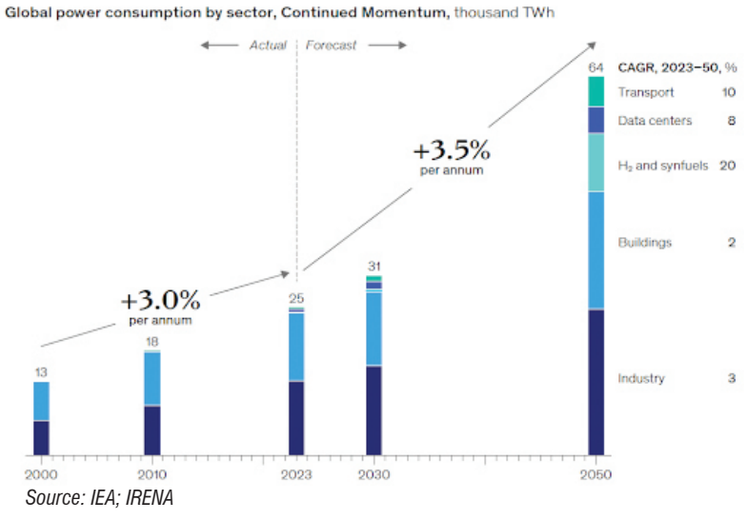
Managing energy transition risks

Energy transition is a strategic shift to low-carbon or renewable sources to address climate change and ensure long-term energy security, but it is also fraught with multiple challenges. The authors believe that using an Enterprise Risk Management (ERM) framework can help develop comprehensive strategies to address such challenges.



Source: IEA; IRENA

Energy transition refers to the shift from fossil fuels to low-carbon or renewable sources. It also involves decarbonising industries such as processing, manufacturing, transportation, utilities and construction. India has chosen an energy transition path to meet 50 percent of its electricity demand from renewables with an installed RE capacity of 500 GW by 2030, and achieve net-zero emissions by 2070.

Energy transition has to deal with technological limitations, capital availability, policy constraints, and social and workforce issues. The involvement of multiple stakeholders, whose interests often clash with the goals of energy transition, makes it even more complicated.

Energy and climate policy stakeholders include governments and international organisations focusing on energy security and climate goals, while companies seek profitability, sustainability, and compliance. Investors prioritise financial returns and ESG risks, while consumers demand affordability. Other key players include environmental groups, workers, technologists, regulators, communities, academia, and the media.

Risks and challenges of energy transition

Economic and financial risks: Energy transition requires the adoption of renewable energy sources across all sectors, which requires significant upfront investment and may involve market risks, such as demand volatility, supply chain constraints, and cost escalations.

Policy and regulatory risks: Government policies can help attract financing and investments in clean energy and decarbonisation projects. However, subsidies on fossil fuels can threaten the competitive pricing of renewable energies.

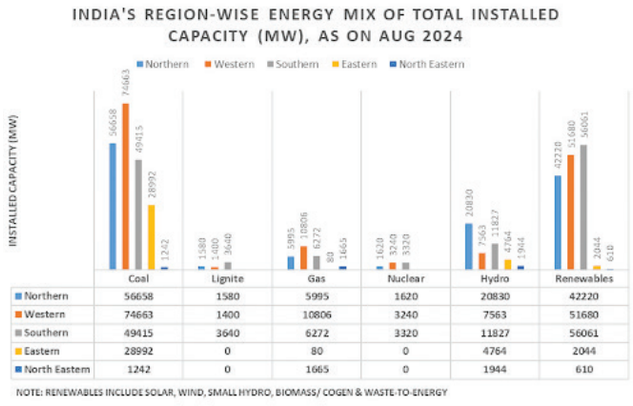
Social and environmental risks: Transitioning away from fossil fuels could risk jobs. Re-skilling, upskilling and re-employment opportunities in the clean energy sectors could largely mitigate the social risks. Mining of materials needed for RE generation can impact the environment and community.

Technological risks: A hybrid mix of RE options (e.g. solar, wind, hydro, and biomass) is needed to manage the risks associated with intermittent generation. Decentralised, volatile energy sources challenge grid stability and security, which can be overcome by using advanced digital technologies. Use of digital technologies and artificial intelligence (AI) are adding to the energy burden of the data centers. Data centres could account for up to 4,500 TWh of electricity consumption by 2050 globally, equaling almost 8 per cent of total electricity consumption.

As a global IT hub, India will need to invest significantly in green data centres powered by renewables and supported by a resilient grid infrastructure.

Challenges of energy transition in the Indian context

Energy demand and supply risks: Energy demand in India is rapidly increasing due to economic development and urbanisation. As of Aug 2024, fossil fuels accounted for 54 percent of total electricity production in India, while clean energy sources (nuclear, hydro, renewables) accounted for 46 percent. The grid needs to be strengthened and modernised to accommodate the



	Coal	Lignite	Gas	Nuclear	Hydro	Renewables
Northern	56658	1580	5995	1620	20830	42220
Western	74663	1400	10806	3240	7563	51680
Southern	49415	3640	6272	3320	11827	56061
Eastern	28992	0	80	0	4764	2044
North Eastern	1242	0	1665	0	1944	610

rising RE connections and create transfer capacity, for which investments in new infrastructure would be required.

Financial and institutional barriers: IEA estimates that the Indian market for renewables, energy storage, and low-carbon technologies will be over USD 80 billion by 2030. Institutional support, with government policy support, will be needed for the markets to access low-cost, long-term financing.

Policy and regulatory issues: Subsidies given on clean energy by the Indian government in FY 2023 were less than 10 percent, as against 40 percent for fossil fuels, and most of the remaining subsidies were given for agricultural electricity. The subsidy policy needs to be revisited to create a sustainable energy economy. Energy transition and equity have to be balanced, ensuring that the means of energy production are secure, sustainable and affordable. Phasing out of fossil fuels has to be planned to avoid negative impacts on jobs and livelihoods. Creating alternate jobs and re-skilling workers to suit the energy industry trends could prevent such risks.

Technological and infrastructure challenges: Modernisation of ageing electricity infrastructure, technology and capacity expansion to accommodate the growing RE industry would need capital investments to make the grid adaptive, resilient and secure. In another thrust area - the transportation sector, the bottlenecks in the adoption of EVs need to be addressed, e.g. relatively higher prices, dearth of charging infrastructure and indigenous mass production capacity of EVs and their components.

New opportunities in energy transition - hydrogen, biofuels and EVs

India is offering financial incentives and subsidies to promote the adoption of hydrogen, biofuels, and electric vehicles. Three crucial policy initiatives adopted by India are the National Hydrogen Mission (promoting the production and use of green hydrogen), the National Policy on Biofuels (increasing the use of biofuels in the energy mix) and the FAME Scheme (incentives for Faster Adoption and Manufacturing of Hybrid and Electric Vehicles).

Hydrogen: Hydrogen is emerging as a key player in energy transition in transportation, industry and power generation. The annual target of 5 MT of green hydrogen requires 135 GW of renewable energy capacity to power the electrolysers, according to CEEW (Council on Energy, Environment and Water). Policy initiatives, advanced technologies for mass production of electrolysers and affordable renewable energies can reduce the cost of green hydrogen. The National Green Hydrogen Mission aims to make India a global hub for producing, using, and exporting green hydrogen and its derivatives and becoming a market leader.

Biofuels: Biofuels are derived from organic materials. India is targeting 20 percent bioethanol blending with petrol by 2025. India aims to intensify the use of biofuels in the energy and transportation sectors. The abundant biomass resources such as agricultural wastes, forest residues and urban bio-wastes can be turned into low-cost, low-carbon fuels, leveraging technologies such as biomass gasification, anaerobic digestion and bioethanol production.

Electric vehicles (EVs): The transport sector relies heavily on fossil fuels, accounting for 37 percent of global CO2 emissions. However, the critical materials (e.g. Lithium, Cobalt and Nickel) needed for EV batteries are concentrated only in a few locations, raising supply concerns. Social and environmental risks are also associated with mining materials for batteries. Risks notwithstanding, there are huge opportunities in transport electrification and decarbonisation.

Need for ERM framework for energy transition

An Enterprise Risk Management (ERM) framework offers an integrated approach to proactively identifying and assessing risks in the energy transition. It prioritises operational, financial, reputational, legal, and environmental risks, particularly regulatory changes, stranded fossil fuel assets, and environmental impacts.

Risk mitigation strategies

Facilitating structured stakeholder dialogue aligns interests and builds collaborative strategies. It is also important to diversify energy portfolios with hybrid renewables, model transition scenarios, ensure equity, and integrate ESG metrics into risk management and reporting.

Accelerating energy transition requires a multi-faceted approach involving economic incentives, green energy financing, technological innovation, robust planning, policy measures, and community involvement. A robust enterprise risk management (ERM) framework is needed to address the risks and challenges of the energy transition, take affirmative steps to combat the fallouts of indiscriminate socio-economic development and climate change and ensure energy security and sustainability.

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