Policy Brief

on

"A Unified National Energy Policy Framework for India: Adequacy, Access, Affordability, and Appropriate Sustainability"

ADEQUACY | ACCESS | AFFORDABILITY | APPROPRIATE SUSTAINABILITY

May-2026

INSA Centre for Science, Technology & Innovation Policy (CSTIP)

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India's energy system stands at a strategic inflection point. Rising domestic demand, structural dependence on imported fuels, including 88% of crude oil, 51% of natural gas, and over 19% of coal in 2024–25[i], and accelerating climate commitments have exposed a fundamental vulnerability: the absence of an integrated, unified national energy policy architecture. Addressing this gap is not merely an administrative exercise; it is a prerequisite for India's ambition of energy self-reliance by 2047 and net-zero emissions by 2070.

Despite significant achievements such as near-universal household electrification under the Saubhagya scheme[ii], clean cooking access to over 9 crore households under PMUY[iii], and a renewable energy capacity that has grown from 38 GW in 2015 to over 266 GW by 2025[iv], India's energy governance remains fragmented across multiple ministries, statutory bodies and the nation's constitutional structure. This fragmentation produces siloed optimisation, inconsistent incentives, and missed opportunities for cross-sector efficiency.

The Strategic Imperative

India's primary near-term energy risk is not generation capacity, it is **grid stability and system integration**. Over 60 GW of commissioned renewable projects remain unable to supply power due to transmission bottlenecks[v]. Gas-based power assets of approximately 25 GW lie underutilised[vi]. Coal-fired plants operated at only 68.45% plant load factor in 2024–25, despite continued coal imports of over 243 MMT, revealing a logistics and infrastructure mismatch rather than a resource deficit[vii].

These structural gaps are compounded by a **financing and market alignment challenge**: supply-side policies such as ethanol blending and compressed biogas (CBG) under SATAT have expanded production capacity without ensuring commensurate demand absorption, pricing reform, or evacuation infrastructure[viii]. A calibrated approach that synchronises supply growth with market readiness is essential.

Challenges

- High structural dependence on imports of fossil fuels, LNG, LPG, electricity, and critical minerals required for nuclear, solar PV, and battery storage systems.
- Fragmented energy governance across multiple ministries and sectors leading to siloed planning, policy incoherence, technology bias, and market distortions.
- Rapid growth in electricity generation capacity without corresponding expansion in grid integration, transmission, storage, and dispatch infrastructure.
- Renewable energy curtailment during surplus periods alongside inability to meet peak demand and underutilisation of gas-based assets.
- Whole-system efficiency challenges due to low fossil-fuel power generation efficiency despite high efficiency of end-use electrification technologies.
- Coal-dominant power mix limiting short-term decarbonisation despite increasing electrification efforts.
- Resource–impetus mismatch, where abundant domestic resources remain underutilised due to infrastructure, logistics, regulatory, technological, and market barriers.
- Continued dependence on coal imports despite high domestic coal production because of logistics and quality constraints.
- Large untapped potential in solar, geothermal, ocean energy, thorium, biomass modernisation, and waste heat recovery systems.
- Weak alignment between resource availability, technology readiness, policy support, and consumer adoption.
- Innovation and deployment "valley of death" between early-stage research and commercial deployment for advanced energy technologies.
- Limited translational funding, inadequate industry–academia collaboration, and weak technology commercialisation frameworks.
- India's energy transition poses significant social equity challenges, particularly for coal-dependent communities, informal workers, and energy-poor households that are highly vulnerable to economic disruption, unreliable energy access, and rising energy costs.
- Persistent gaps in clean energy access, affordability, and gender-inclusive energy planning continue to limit equitable distribution of the benefits of the energy transition.

- Weak alignment between production-focused policies, financing mechanisms, market readiness, and downstream infrastructure has created significant barriers to effective implementation and long-term commercial viability of emerging energy sectors.
- India's energy transition requires substantial long-term investment for renewable energy, storage, grid modernisation, green hydrogen, CCUS, and other emerging technologies, far beyond the capacity of public financing alone.
- High cost of capital, inadequate long-tenor financing, and limited access to credit for MSMEs continue to constrain deployment of both large-scale and decentralised clean energy systems.
- Underdeveloped green capital markets and limited integration of international climate finance mechanisms hinder mobilisation of private and global investment at the scale required for the transition.
- India's carbon credit market remains underdeveloped, with the Carbon Credit Trading Scheme (CCTS) yet to establish robust registry systems, verified offset methodologies, and effective price discovery mechanisms.
- Absence of a credible domestic carbon price signal limits commercial viability and private investment in CCUS, waste-to-energy, and industrial decarbonisation technologies.
- Energy policy design remains overly focused on production targets and subsidies, with insufficient emphasis on integrated value-chain planning, market creation, risk-sharing mechanisms, and financing architecture needed to translate installed capacity into delivered energy value.
- Heating and cooling remain among the least electrified and policy-prioritised segments of India's energy transition, despite accounting for a major share of energy consumption, while cooling demand alone is projected to increase nearly eight-fold by 2050 due to urbanisation, rising incomes, and climate-induced temperature rise.

The Four-Pillar Framework

This policy brief proposes a **Unified National Energy Policy Framework** structured around four mutually reinforcing pillars:

Figure 1 Four Pillars of India's Energy Security Framework

Two cross-cutting system levers **Circular Economy (CE)** and **Carbon Capture, Utilisation and Storage (CCUS)** underpin Pillars III and IV, together representing the largest non-generation pathways to energy demand reduction and industrial emissions mitigation.

Priority Recommendations

The recommendations outlined in this brief reflect a comprehensive and system-wide approach to energy policy reform. Under adequacy, they focus on securing and diversifying supply through a mix of traditional and emerging energy sources, while strengthening infrastructure, storage, and digital systems. The access pillar emphasizes last-mile reliability and inclusion, particularly through decentralised solutions, clean cooking initiatives, and community-based energy systems. Affordability-oriented recommendations aim to balance the cost of transition with financial

innovation and consumer protection, ensuring that vulnerable groups are not disproportionately affected. Finally, the appropriate sustainability pillar brings together long-term structural shifts, including circular economy practices, indigenous technology development, just transition planning, and participatory governance, ensuring that the energy transition is environmentally sound, socially equitable, and economically viable.

The table presents a concise overview of the proposed recommendations across the four pillars, offering a distilled summary of the broader set of interventions. The detailed rationale, implementation pathways, and supporting analysis for each of these recommendations are elaborated in the accompanying document, while this table serves to provide a quick, structured snapshot of the overall policy direction.

Table 1 Key Recommendations

Pillars	**Recommendations**
Pillar I: Adequacy	Diversifying energy partnerships; Evolving procurement frameworks; Maximising the strategic role of coal; Scaling up and diversifying non-coal energy sources; Strengthening energy security buffers; Building digital energy infrastructure; Scaling diversified storage solutions; Advancing grid modernisation efforts; Prioritising circular industrial transitions; Scaling waste heat recovery adoption; Accelerating efficient electrification
Pillar II: Access	Strengthening reliable local supply; Supporting clean cooking access; Expanding CBG ecosystem; Promoting decentralised biodiesel; Enabling local biomass value chains; Supporting farm-level cold chains; Empowering community energy systems
Pillar III: Affordability	Mobilising blended green finance; Operationalising carbon markets; Implementing time-of-day pricing; Embedding affordability safeguards; Protecting vulnerable consumers

Pillar IV: Appropriate Sustainability	Enabling decentralised resource planning; Shallow geothermal cooling; Strengthening biomass value chains; Enabling coordinated energy governance; Energy transition missions; Lifecycle governance and circular economy alignment; Emerging energy sources; Leveraging indigenous technologies; Transitioning to 2G biofuels; Exploring white hydrogen and geothermal resources; Adopting zero-waste integrated biorefineries; Indigenous storage manufacturing; Just transition fund; Investing in green skills with equity targets; Just transition planning for coal districts; Social impact assessment for energy infrastructure; Participatory governance at the community level

Implementation Horizon

The path forward requires India to move beyond siloed, fuel-specific policies toward a systems-integrated energy architecture, one that treats biomass, coal, waste streams, and renewable electricity not as competing priorities but as complementary feedstocks within a unified national energy ecosystem. The framework proposed in this brief provides the strategic foundation for that transition, anchored in India's indigenous resource strengths and aligned with its long-term development and climate commitments.

Table 2 Implementation Horizon

Time Horizon	Priority Areas
Immediate (0–3 years)	Strengthening core infrastructure (grid, pipelines, storage); scaling renewables and decentralised energy; improving coal efficiency and initiating gas transition; expanding clean cooking and bioenergy; piloting CCUS, hydrogen, and emerging technologies; establishing carbon markets and green finance frameworks; launching governance reforms and just transition mechanisms
Medium-term (3–10 years)	Scaling low-carbon technologies (renewables, hydrogen, nuclear, storage); expanding CCUS and circular economy systems; strengthening domestic

	manufacturing; integrating smart grids and demand management; deepening biomass and biofuel value chains; operationalising carbon markets; advancing coordinated energy governance and affordability mechanisms
Long-term (10–20+ years)	Transitioning to a low-carbon, diversified energy system; phasing down unabated fossil fuels; achieving deep renewable integration with storage and hydrogen; establishing circular industrial systems; scaling indigenous technologies globally; ensuring full cost-reflective pricing with social safeguards; embedding just transition and adaptive governance frameworks

The pathway has been outlined, the policy instruments have been identified, and the sequencing framework has been established. Going forward, stronger inter-ministerial coordination and a shared commitment to govern India's energy ecosystem as a unified and integrated national system may be essential for effective implementation.

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[i] https://ppac.gov.in/download.php?file=rep_studies/1737011904_Snapshot-of-Indias-Oil-and-Gas-Data_WebUpload_December-2024_compressed.pdf

[ii] Press Information Bureau, Government of India. "Electrification of Households under Saubhagya Scheme." https://www.pib.gov.in/PressReleasePage.aspx?PRID=2157549

[iii] Press Information Bureau, Government of India. "Pradhan Mantri Ujjwala Yojana (PMUY) Completes Nine Remarkable Years." https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154355&ModuleId=3

[iv] Press Information Bureau, Government of India. "India's Renewable Energy Capacity Achieves Historic Growth in FY 2024-25." https://www.pib.gov.in/PressReleasePage.aspx?PRID=2120729&lang=2

[v] Institute for Energy Economics and Financial Analysis (IEEFA) and JMK Research. "Green Power Transmission Development in India." September 2025. https://ieefa.org/articles/transmission-expansion-trails-renewable-energy-growth-india

[vi] Institute for Energy Economics and Financial Analysis (IEEFA). "Flexible Generation: A Role for India's Stressed and Stranded Gas-based Power Plants?" October 2022. https://ieefa.org/resources/flexible-generation-role-indias-stressed-and-stranded-gas-based-power-plants

[vii] Press Information Bureau, Government of India. "Coal Imports During FY 2024-25 Drops by 7.9%." https://www.pib.gov.in/PressReleasePage.aspx?PRID=2131632

[viii] Press Information Bureau, Government of India. "Year End Review 2024 – Ministry of Petroleum and Natural Gas." https://www.pib.gov.in/PressReleasePage.aspx?PRID=2090844

Note: Given the complexity of the topic in the structural environment of policy making and implementation today, wide ranging consultations across a much larger number of stakeholders is warranted for effective outcomes.

Note: The supplementary document for this Policy Brief is available here: https://insaindia-my.sharepoint.com/:b:/g/personal/cstip_insaindia_onmicrosoft_com/IQC4xyFmwmQHSLzgF0Jet6fMAUdlQmHUrXGKVidRLG-Rilo

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