

9. India: Meeting Energy Needs for Development While Addressing Climate Change



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India is undergoing structural urban and economic transitions and has set ambitious policy targets to meet its rising energy needs for development. Expanding coal and renewables are two important pillars of this undertaking and, since 2008, climate protection is of increasing concern. India's international engagements reflect these motivations of both energy security and climate change, where India is increasingly engaging in transfer of clean and efficient energy technologies to developing countries like itself.

India's energy sector: an introduction

The provision of energy has long been a central tenet of India's development planning – and in the country's current socio-economic context, energy planning is even more urgent and complex. This is in large part because India is in the midst of at least three transitions with significant implications for its energy use. Firstly, the country's urban population is projected to almost double between 2014 and 2050, and a projected 83 million people will be added to the middle class by 2025 (UNDESA, 2014). Secondly, around 10 million people are expected to enter the job market annually in the next two decades (FICCI & EY, 2013). Thirdly, an unprecedented expansion is projected in infrastructure, with estimates that two thirds of the building stock in 2030 is yet to be built (Kumar et al., 2010). All these trends imply higher energy demand to enable development.

Planning for this energy future is a challenging undertaking. Despite India's high GDP growth rate of 7.4 percent in 2014–2015, significant inefficiencies and inequities persist within its energy ecosystem (MoF, 2016a). Approximately 30 percent of the population

lacks access to electricity, and more than 70 percent still relies on traditional biomass for cooking (MHA, 2011). While India is the third largest consumer of energy globally, its per capita consumption is less than a third of the global average (IEA, 2015).

As Figure 1 illustrates, fossil fuels dominate India's electricity sector, with coal being the largest contributor in 2016 to the installed electric capacity of 305 GW. In terms of primary energy supply, coal and crude oil form the bulk at 51 percent and 37 percent respectively (TERI, 2015). However, these fossil fuels have constrained domestic availability, and imports now form a significant 40 percent of India's total primary energy requirements (MoSPI, 2016). High fossil dependence has also had adverse impacts on local environments, as marked by deteriorating air, water and land quality. Additionally, climate change compounds each of these pressures, since the energy sector accounts for approximately 77 percent of India's greenhouse gas emissions (MoEF, 2010).

Tackling energy concerns is thus at the heart of India's development and climate futures. The task is complex, given the energy sector's inter-relationships with

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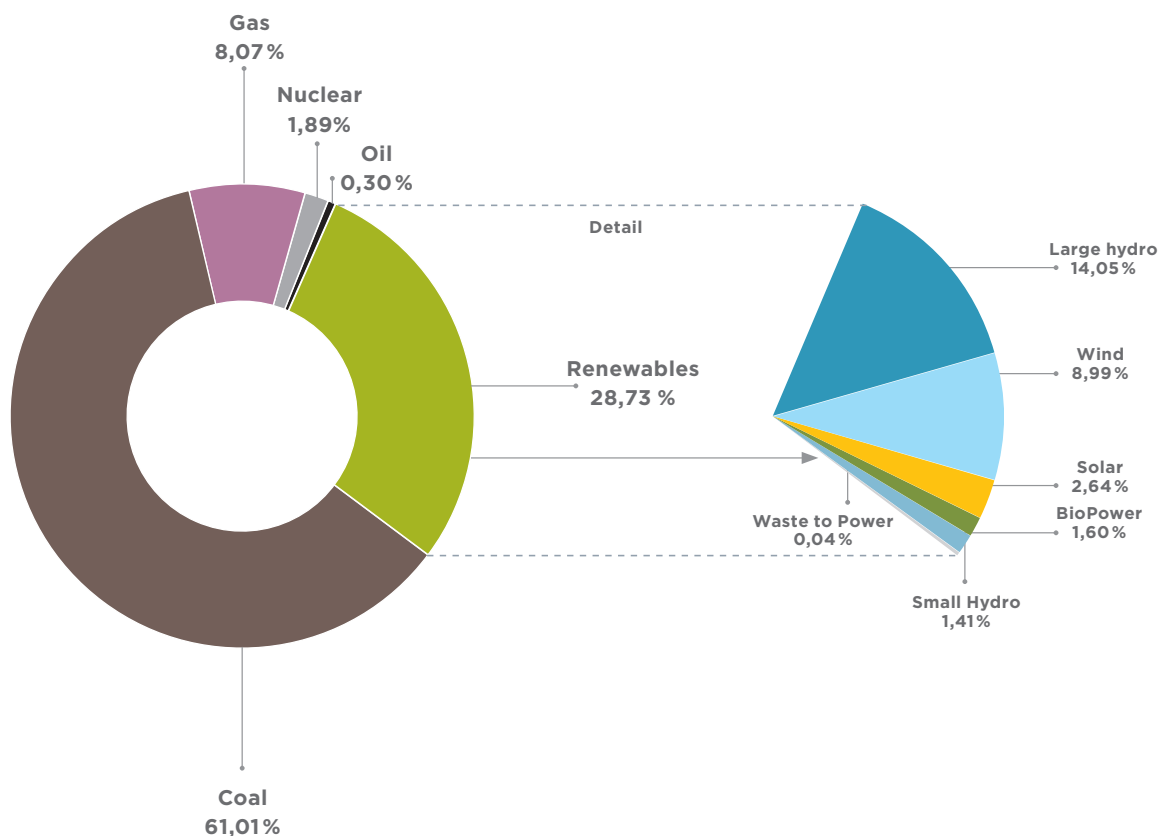
other socio-environmental aspects of the economy. Indian energy is increasingly grappling with objectives that are beyond those of pure energy growth, but rather include energy access, energy security and protection of the local and global environment. The road to a sustainable energy transition will hence depend on how well India negotiates these multiple – and at times competing – priorities.

Characteristics of an Indian energy transition

Any sustainability transition requires tackling the key issues that characterise India's energy sector: energy supply and security; access; energy demand; governance; and climate change.

Figure 1: Installed power capacity by fuel in India 2016

Source: Central Electricity Authority, 2016 and Ministry of Power and Ministry of New and Renewable Energy, 2016



Energy supply and security

Energy security was traditionally understood as the need to solve India's ubiquitous energy scarcity, aiming to reduce imports by increasing supplies across all sources – coal, oil, gas, nuclear, renewables, etc. This focus on the supply-side narrative continues, and is salient in current policies for coal and renewables. The government has a domestic coal production target of 1.5 billion tonnes by 2020 (aimed at reducing imports). For renewables, it plans to achieve 175 GW of installed capacity by 2022 (including 100 GW of solar), a five-fold increase in its ambitions since 2011. This target implies that, by 2030, India will add renewable capacity approaching the size of its current grid (Dubash & Khosla, 2015).

Both the coal and renewables targets are ambitious. The basis for promoting coal is often couched in its relative affordability, and most energy models predict a coal-dominant future for India. However, the coal requirement will vary under different scenarios, with projections ranging from 896 million tonnes to 1.22 billion tonnes by 2020 (Shegal & Tongia, 2016), up from the 910 million tonnes consumed in 2015–2016 (MoC, 2016). On renewables, India has dramatically increased its installed capacity to 44 GW, more than doubling capacity since 2011 (CEA 2016; 2015). In 2015, India ranked fifth globally in its annual investments in renewables, and fourth in total wind capacity (REN21, 2016). However, the actual requirements of coal and renewables to meet development needs will depend on resolving a variety of factors, including: socio-economic costs associated with coal; governance challenges in the electricity sector; climate and energy security considerations; the scale of future electricity demand; and the role of clean coal technologies.

Alongside the focus on coal and renewables, India has taken measures to rationalise fossil fuel subsidies in order to reduce fiscal burdens, supply leakages and distortions of demand. Petrol prices were deregulated in 2010, and diesel prices were incrementally raised in 2013. Coupled with rapidly declining crude oil prices, diesel was completely decontrolled in 2014.

Energy access

A second factor influencing India's energy transition is the provision of quality energy access. The govern-

ment has targets for the electrification of all villages by 2018, and affordable power for all by 2019. Further, a variety of programmes aim to improve access and penetration of modern cooking energy through liquefied petroleum gas (LPG). In 2015, a national programme to rationalise and target LPG subsidies through unconditional cash transfers (*PAHAL*, Direct Benefits Transfer for LPG), resulted in 163.6 million registered households and a subsequent 24 percent reduction in subsidy-linked leakages (MoF, 2016b) – the largest global cash transfer scheme. More recent schemes continue the trend and provide LPG connections to women from poor households (*Pradhan Mantri Ujjwala Yojana*), whereas the 'Give it Up' campaign asks more affluent customers to give-up their subsidy.

While there has been some progress, challenges remain in providing reliable, affordable service to all. Issues surrounding the cost and penetration of LPG supply in remote areas, and possible re-transition of households to easily available biomass need to be resolved to bring about lasting, affordable transition. At the same time, gains in electricity access could help in 'leap-frogging' to electricity-based cooking in rural areas. Specifically, increased electricity access has led to falling consumption of subsidised kerosene, used for lighting. A new pricing policy, through small monthly increases, seeks to reform kerosene prices by April 2017. In addition, a national cash-transfer programme for kerosene aims to reduce illicit supply leakages and target subsidies, although this faces operational challenges. Financial literacy and access to reliable banking facilities will be key to the success of such cash-transfer programmes.

Energy demand

Understanding demand will help determine the nature of India's future energy requirement. Indian energy planning has a supply-side bias, but this approach has not been successful in solving the sector's continuing pathologies. Instead, a focus on understanding – and thereby changing – consumption patterns makes managing energy supply easier. Furthermore, emphasis on the demand side can help avoid locking-in unsustainable consumption patterns for the decades to come, since the bulk of infrastructure in cities, buildings, transportation, etc. is yet to be built.

Several measures to improve the efficiency of demand sectors are underway. For example, the Perform Achieve and Trade scheme, launched by the Bureau of Energy Efficiency in 2012, helps reduce specific energy consumption with an associated market-based mechanism in 11 energy-intensive industries. The first cycle of this scheme has been fairly effective, with a high compliance rate. The Bureau's star-labelling programme aims to phase out inefficient household appliances such as refrigerators, air conditioners, etc. Similarly, fuel efficiency norms for vehicles aim to leap-frog to EURO VI standards by 2020, from EURO III in most parts of the country and EURO IV in major cities. While conceptually promising, a more serious and strategic focus on demand-side planning, to include technological improvements and behavioural shifts, could feed into managing and reducing future energy requirements.

Governance

Three key issues animate Indian energy governance discussions. Firstly, the need for introducing regulators and strengthening their independence has been articulated across areas (such as coal, nuclear, oil and gas). Secondly, resolving the pricing regimes of different energy sources is necessary. For example, there are multiple prices for natural gas in India. Thirdly, there is a need to integrate energy demand and supply considerations within the planning system.

A robust governance structure with a successfully functioning electricity sector is crucial for an energy transition. However, India is plagued with a distressed distribution sector. Power distributing companies experience financial losses due to inefficiencies of generation and distribution, below-cost-recovery pricing and the increasing cost of supplying power (Pargal & Banerjee, 2014). Energy tariffs are intended to be set by electricity regulators, but are often influenced by political considerations. The regulated tariffs are partly cross-subsidised by high-paying sectors, and partly by subsidies from state governments, payment of which is often delayed. A scheme (Ujjwal DISCOM Assurance Yojana) to improve the financial health and performance of power distribution companies was launched in 2015, and is considered significant to the sector's future governance.

Climate change

Historically, climate change has not been central to Indian energy policy. However, since 2007, India has begun focusing on the climate implications of its developmental policies. The launch of the National Action Plan on Climate Change (2008) centred on the theme of "co-benefits", i.e., actions that address developmental concerns but also have climate benefits (PMCCC, 2008). Subsequent state climate action plans and state- and city-led initiatives to develop climate-resilient green growth strategies further provide an institutional platform for mainstreaming climate concerns in development planning. This link between energy, climate and development was made explicit by India's climate pledge ahead of the Paris Agreement in 2015.

Policies such as energy efficiency schemes, a clean energy cess (Box 1) and domestic targets such as 100 GW of solar will play an important role in fulfilling India's commitments to reducing emission intensity from 33–35 percent over 2005 levels, and to achieving 40 percent of non-fossil-fuel-based power capacity by 2030 (MoEF, 2015). While these developments have stemmed from the missions begun under India's Climate Plan, they are primarily driven by the development objectives of growth, security and sustainability.

India and international energy cooperation

India's international energy cooperation has centred on two related objectives: energy security, focusing on access and supply; and climate change (Dubash, 2011a). As a large energy consumer, India's energy diplomacy was historically driven by the need to ensure supply and access to resources. Climate change, while secondary, has now also become an important motivator (Dubash, 2011b; Michaelowa & Michaelowa, 2012). In addition, geopolitical concerns play an implicit role in energy cooperation. Overall, Indian bilateral, regional and multilateral efforts for energy cooperation have seen mixed results, with some efforts materialising faster than others.

BOX 1: POLICY INNOVATION FOR PROMOTING CLEAN ENERGY: CLEAN ENVIRONMENT CESS

The Clean Energy Cess on coal, lignite and peat produced in the country was launched in 2011, at a rate of INR 50 per million tonnes. The cess was progressively revised upwards to INR 100/tonne in 2014–2015 and to INR 400 in 2016–2017. While originally initiated to help reduce emissions and fund clean energy, the cess was renamed in 2016–2017 to a Clean Environment Cess, to broaden its scope. The revenue generated is used for the National Clean Energy Fund to finance clean energy projects and environmental conservation. The polluter pays principle of the cess is a step in the right direction, but two concerns arise: its impact on the coal and electricity sector (Chakravartty, 2015), and its use for activities outside the mandate of the fund (Bhaskar, 2015). Greater clarity and study are required on the scheme's goals for its more efficient use.

Bilateral efforts

Bilateral efforts have strengthened Indian ties with energy supplying nations – historically the gulf countries, with a later expansion to other countries and agendas. Initially, fuel supply agreements, and transnational pipelines, although with limited developments, were seen as a means of securing supply and strengthening political relations. In a more mercantilist approach, acquiring access to energy resources (coal, oil and gas, uranium, etc.) in other countries is still central to Indian policy (De Oliveria, 2008). For instance, supported by diplomatic efforts, Indian oil and gas companies have acquired resources in 24 countries (MoPNG, 2015).

Over time, India's bilateral dialogues have evolved beyond fuel supply. Clean fossil technologies, renewable energy and technology transfers are now key, with a view to increasing trade and investment and deepening cooperation. Successful examples include the Indo–German Energy Forum (2006) to promote energy security, energy efficiency and renewable energy. This resulted in the Climate and Renewable Alliance, a technology, innovation and finance partnership emphasising co-benefits for affordable renewable energy access and initiating trilateral assistance programmes. Its other recent notable outcome is support for the Green Energy Corridors to link solar and wind sites with major demand centres (GIZ, 2015). Another example of bilateral success is the Indo–US partnership. Its recent feature, the Partnership to Advance Clean Energy (2009) has helped mobilise

USD 2.4 billion to finance clean energy projects, and includes a focus on solar, off-grid technologies, biofuels, energy efficiency, smart grids, energy storage and cleaner fossil energy (USDoE, 2015). Overall, bilateral efforts that involve open exchanges and develop concrete measures to address key challenges and support policies on the ground have been successful.

Regional initiatives

Energy cooperation is a focus area in the charter of the South Asian Association for Regional Cooperation, to which India is a party. The narrative is based on enhancing energy cooperation within the region, especially energy trade, leveraging member countries' comparative advantages (e.g., hydro capacity in Bhutan; India's expertise in solar, wind, oil and gas). Joint emergency response mechanisms, such as strategic petroleum reserves, sharing of energy infrastructure for mutual development, and enhanced energy security have also been discussed. In 2014, the countries signed a framework agreement for cooperation to eventually enable a regional electricity grid.

India's regional efforts have also boosted other sub-regional initiatives, such as a multi-modal transport route between India, Bangladesh and Myanmar, and developments on a sub-regional electricity grid between Bangladesh, Bhutan, Nepal and India. While regional efforts have achieved limited material gains, primarily due to historical political mistrust between countries, they have nevertheless fostered an energy dialogue.

International engagement

India's international energy engagement has received a stimulus through its participation in several multi-lateral forums, including the G20, International Energy Agency (IEA) and International Renewable Energy Agency (IRENA). Within these fora and organisations, India influenced discussions in two issue areas: nuclear energy and technology transfer.

India's nuclear energy diplomacy, motivated by energy security and emissions reductions, was pursued in both bilateral and multilateral efforts (Grover, 2006). Specifically, the India–US Civil Nuclear Agreement of 2008 lifted the de facto embargo on nuclear power technology, and the uranium trade with India. Since then, India received clearance from the International Atomic Energy Agency for its civil nuclear plants and for importing uranium in the 2008 Nuclear Suppliers Group (to which India is campaigning for a permanent position). While the extent to which nuclear energy might play a role in the energy future remains to be seen (Joshi, 2015), geopolitically it remains an important factor.

India's stance on the need for technology transfers for developing countries has played an important international role. It informed the development of the Technology Mechanism in COP15, and subsequently the Technology Executive Committee and Climate Technology Centre and Network (UNFCCC, 2010). More recently, at COP21, India was instrumental in setting up the International Solar Alliance (ISA). Conceived as a coalition of solar-rich countries, the alliance aims to promote, disseminate and deploy solar energy, facil-

itating clean energy transitions for developing countries through technological and financial support. The alliance will supplement the efforts of existing multi-lateral bodies and be headquartered in India, with the UN as a strategic partner. Under the UN target of providing sustainable energy for all by 2030 and increasing the share of renewables, the alliance aims for a platform to enhance solar cooperation (ISA, 2015). In June 2016, the World Bank and the ISA signed an agreement that aims to mobilise USD one trillion in investment by 2030.

Lessons learned from India

Driven by the objectives of development, energy security and climate change, India has made initial progress towards a more sustainable energy future through ambitious cross-sectoral plans. Specifically, its policies on promoting energy efficiency in large industries, levies on coal, and expanded renewable energy capacity are noteworthy. These objectives are also reflected in its growing bilateral, regional and international energy engagement, which focuses on ensuring energy supply, fostering clean energy cooperation and on technology transfers. A useful lesson to emerge from India's transition is the importance of considering the linkages and synergies between development and climate planning and implementation – a concern that is relevant across developing countries. India's success in achieving a sustainable transition will ultimately rest on examining – and often untangling – the key characteristics of its domestic energy sector within the global context of progress toward low-carbon transitions.

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