

## **FACTOR AFFECTING INDIA'S ENERGY DEVELOPMENT**

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### **ABSTRACT**

The world increasingly awared with time that fundamental changes will be necessary to meet the increasing demand for energy. Energy has a direct bearing on sustainability of growth and later on overall development of any nation. In the beginning energy problems were quietly kept out from the agendas of both industrialized and developing countries or even off them altogether. But in both developing and developed countries the main goals of reform, which have been introduced in the decade of 90s, are firstly, rapid and high level of sustainable economic development and secondly, efficient energy resources management. Because, Energy services enables basic human needs, such as food and shelter, to be met. They also contribute to social development by improving education and public health. During the early stage of development the absolute amount of per capita depends on it and it's a key contributor to human development thereafter. Therefore, there are many possible scenarios about what may emerge in the foreseeable future. The International Energy Agency modeled three scenarios for the year 2035 in the World Energy Outlook 2012 recently.

**Keywords:** Energy demand, Economy and demographics, Energy development, Factors affecting

### **INTRODUCTION**

India's growing economy and booming population mean that its energy demand is set to increase rapidly over the next few decades, according to a new report from the International Energy Agency (IEA). The IEA's forecasts are grim reading for climate activists. It estimates that coal will remain India's most used fuel, making up 49% of total energy demand in 2040. The IEA's forecast of a 6m-barrels-a-day increase in oil consumption is also the largest projected for any country. The rise can largely be explained by increased vehicle ownership: 260m passenger cars will be added to the Indian fleet over the next 25 years. Renewable and nuclear power will make up only a small slice of consumption, the IEA reckons.

## **ECONOMY AND DEMOGRAPHICS**

The pace of economic and demographic change is a vitally important driver of India's energy sector. Since 1990, India's economy has grown at an average rate of 6.5% a year, second only to China among the large emerging economies, and two-and-a-half-times the global average (if both these countries are excluded). This propelled India beyond Japan in 2008, to become the third-largest economy in the world, measured on a PPP basis. India alone has accounted for over 9% of the increase in global economic output since 1990.

Furthermore, although extreme poverty has been reduced, income inequality has increased in India, with the poorest quartile of society earning a smaller share of total income than they did in 1990. The services sector has been the major driver of growth in India's economy, accounting for around 60% of the increase in GDP between 1990 and 2013. This is rooted both in a robust increase in the supply of services but, crucially, also in the increasing share of high-value segments including financial intermediation, information and communications technology, and professional and technical services, which have enabled total factor productivity in the services sector to more than double. In 2014 announced the "Make in India" initiative, with the intention of increasing the share of manufacturing in GDP to 25% by 2022, creating 100 million jobs in the process. The extent to which this objective is realised will affect India's energy development in two ways. First, mining, oil and gas, renewables and power generation have all been identified as clusters for industrial development, so any success will have implications for energy supply. Second, any change in the share of industry in the economy, and the materials-intensity of future economic growth, will have profound effects on the levels of energy demand. Urbanisation and the build-up of a manufacturing base, including the necessary energy infrastructure, will require significant inputs from the basic materials industry, including steel, cement and chemicals, which are all highly energy-intensive.

Population growth is expected to remain high; India is set to overtake China as the most populous country in the world before 2025 (UNPD, 2015). India's large and growing population is often regarded as one of its major assets; it is relatively young, with almost 60% (around 700 million people) under the age of 30, a large and potentially very vibrant workforce. The large domestic market can also act as a natural driver for economic growth, with levels of private consumption currently around two-and-a-half-times as large as exports. The flip side of this demographic dividend is the likely strain on the country's infrastructure and resources. Water stresses that are already evident in some regions will be exacerbated and create new challenges in relation to food and energy security,

## **POLICY AND INSTITUTIONAL FRAMEWORK**

The direction that national and state policies take, and the rigour and effectiveness with which they are implemented, will naturally play a critical role in India's energy outlook. Clarity of vision for the energy sector is difficult to achieve in India, not least because of the country's federal system and complex institutional arrangements. However, the drive for a more coherent and consistent energy policy has been a long-standing priority, typified by the Integrated Energy Policy 2008, the National Action Plan on Climate Change and the co-ordination efforts of the Planning Commission (now the National Institution for Transforming India, [NITI Aayog]), all aided by consistent improvements in the quality of Indian energy data (Box 1.3). An energy scenario modelling exercise has also been launched, the India Energy Security Scenarios, overseen by NITI Aayog.<sup>15</sup> More recently, the submission of India's Intended Nationally Determined Contribution (INDC) on 1 October 2015 was a milestone in both India's energy and its environmental policy.

The administration in place since 2014 has given greater definition to many aspects of energy policy, while also seeking to give more rights and responsibilities to the individual states. Some key aspects of the emerging energy vision are:

A commitment to the efficient use of all types of energy in order to meet rapidly growing demand. In the power sector, the decision to increase the target for renewable to 175 GW by 2022 (including the expansion of solar generation capacity to 100 GW) has attracted a lot of attention; but there is also, for example, a volumetric target for India to produce 1.5 billion tonnes of coal by 2020. Efficiency gains as well as production increases underlie India's energy security objective of reducing reliance on fossil-fuel imports by 10%.

A sharpened focus on achieving universal access to modern energy, including the objective of supplying round-the-clock electricity to all of India's population. This is being accompanied by a reorientation of energy subsidy programmes, away from price controls and towards financial payments to the most vulnerable parts of society.<sup>16</sup>

A drive for market-oriented solutions and increased private investment (including foreign investment) in energy, both through some energy-specific reforms (e.g. to licensing regimes) and via a general drive to simplify and deregulate the business environment.

A pledge to pursue a more climate-friendly and cleaner path than the one followed thus far by others at corresponding levels of economic development. India's INDC includes the twin energy-related commitments to increase the share of non-fossil fuel power generation capacity to 40% by 2030 (with the help of transfer of technology and low cost international finance) and to reduce

the emissions intensity of the economy by 33-35% by the same date, measured against a baseline of 2005.

The risk of fragmented decision-making also applies at the national level itself, as there is no single body charged with formulating and implementing a unified energy policy. India has several ministries and other bodies, each with partial responsibility for aspects of energy policy and the related infrastructure (Figure 1.12). Effective co-ordination has been improved by the appointment of a single Minister for Power, Coal, New and Renewable Energy, although the individual ministries themselves continue to exist as separate entities. The institutional structure requires constant effort – not always successful – to achieve co-ordination and resolve disputes.

Main institutions in India with influence on energy policy.

## **ENERGY PRICES AND AFFORDABILITY**

### *Expenditure*

The relationship between income levels, energy prices and energy expenditure is fundamental to the evolution of India's energy system. As one would expect, energy consumption increases with income, with the wealthiest 10% of the population accounting for around a quarter of all household energy expenditure, although the poorest segments spend a greater proportion of their income on energy. But the level of consumption and the fuel choice are also affected by location: household expenditure on energy is, on average, almost two-and-a-half-times higher in urban centres than in rural areas, and the most affluent among the urban population spend more than eight-times as much on energy as the poorest,

The expenditure pattern across the income groups reflects both an increase in energy consumption as people become more affluent and a switch in fuels, away from bioenergy and kerosene and towards LPG and electricity. In urban areas, spending on bioenergy and kerosene decreases drastically higher up the income groups. Bioenergy and kerosene account for almost 60% of energy expenditure among the poorest income group, but only roughly 1% among the wealthiest group in which 85% of energy expenditure is for electricity and transport fuels.

The pattern is different in rural areas. Here, spending on bioenergy increases as income increases (for all but the wealthiest 20%), driven by a rise in consumption, but also because the poorer segments of society typically collect fuel wood rather than pay for it. Across income levels, rural spending on electricity accounts for around 20% of energy expenditure (compared with almost 40% in urban areas). Rural expenditure is constrained by a lack of access, particularly among the poorest segments of rural communities.

### ***Energy prices***

India has made significant moves towards market-based pricing for energy in recent years: gasoline (in 2010) and diesel (2014) prices have both been deregulated, and successive governments have made efforts to ensure that electricity and natural gas prices better reflect market realities. End-use electricity tariffs for most consumers nonetheless remain below the cost of supply. Reform of kerosene and LPG pricing has been much slower, reflecting the role that these fuels play in providing lighting and cooking fuels to the poorest segments of society. As a major consumer and importer of oil, India has also been one of the main beneficiaries of the fall in the oil price since 2014.

As noted in the electricity section, average end-use electricity tariffs in India do not adequately reflect the cost of electricity supply, with government subsidies covering a part of the gap and the rest being absorbed as losses by state-owned distribution utilities (Figure 1.15). According to national policy guidelines, the state electricity regulatory bodies are supposed to set tariffs within a 20% range of the average cost of supply, but this is rarely the case. As of 2010-11, with the exception of three states (Gujarat, Maharashtra and West Bengal), average tariffs for consumers were less than 80% of the cost of supply.

The consumption changes spurred by the recent increase in diesel prices relative to those of gasoline reflect the conventional wisdom that higher prices can act as a brake on demand, spurring consumers to switch fuels, reduce their consumption or opt for more efficient technologies. The inverse relationship, where low tariffs lead to inefficient use of both electricity and water, is evident in the agricultural sector, which accounts for more than one-fifth of final electricity consumption but only 8% of revenue for the utilities.

## **SOCIAL AND ENVIRONMENTAL ASPECTS**

### ***Local air pollution***

Rapid economic growth and urbanisation create a number of pressures on communities and the wider environment. These can originate from the need to meet growing demand for energy and minerals that increase competition for land, water and other resources, as well as the polluting by-products of the subsequent growth. India is burning more fossil fuels and biomass than it has at any other time in the past, releasing more pollutants, including fine particulate matter (PM<sub>2.5</sub>)<sup>18</sup> and sulphur and nitrogen oxides, into the air.

In addition to the problem of indoor air pollution linked to the traditional use of biomass as a cooking fuel, the deteriorating air quality in growing urban centres is becoming an alarming issue for India.

Of the 124 cities in India for which data exist, only one, Pathanamthitta (with a population of 38 000), meets the World Health Organization guideline for PM<sub>2.5</sub> concentrations. Delhi exceeds this guideline by fifteen-times. India has 13 of the world's 20 most-polluted cities and an estimated 660 million people in areas in which the government's own national air quality standards are not met. It is estimated that life expectancy, as a result, is reduced by 3.2 years for each person living in these areas.

### ***Carbon-dioxide emissions***

India's CO<sub>2</sub> emissions can be seen through two lenses. Calculated on a per-capita basis, emissions are extremely low, standing at just one-quarter of China's and the European Union's and one-tenth the level in the United States (Figure 1.17), while India also accounts for only a small share of cumulative historical GHG emissions. On the other hand, India is the third-largest country in volume terms of CO<sub>2</sub> emissions in the world, behind only China and the United States. Heavy dependence on coal for power generation and the use of inefficient subcritical plants to burn it push up the carbon intensity of India's power sector to 791 grammes of carbon dioxide per kilowatt-hour (g CO<sub>2</sub>/kWh), compared to a world average of 522 g CO<sub>2</sub>/kWh.

### ***Investment***

Since 2000, we estimate that investment in energy supply in India has increased substantially, reaching almost \$77 billion on average since 2010 (Figure 1.18). The power sector absorbs the largest share, spurred by the rapid increase in demand as encouraged by the liberalisation agenda launched by the landmark Electricity Act in 2003. Maintaining a rising trend in infrastructure spending, especially energy sector spending, is a major government policy priority. India's government aims to increase investment in infrastructure (broadly defined, including communications, road, rail and energy networks, as well as social areas such as schools and hospitals) to 8.2% of GDP, from roughly 7.2% in 2007-2011. More than a third of this \$1 trillion in infrastructure spending is to go to electricity, renewable energy, and oil and gas pipeline projects, with around half from private investment.<sup>19</sup> Relieving infrastructure bottlenecks, particularly those related to poor road and rail infrastructure, inefficient ports and unreliable electricity supply, is widely recognised as essential to meet India's economic growth and development ambitions (IMF, 2015).

As the Indian government has recognised, public funds sufficient to support the necessary investment projects in the energy sector cannot be taken for granted, in the face of increasing competition from other areas of public spending (including healthcare, pensions, education, etc.). So meeting the country's investment needs will require the mobilisation of increasing amounts of private capital, including foreign direct investment (FDI). Access to such investment

opportunities by the private sector though is uneven across the Indian energy economy and a number of broader impediments to attracting investment persist, such as the complex regulatory environment, in relation to which the World Bank has ranked India 142 out of 189 countries in terms of ease of doing business. Despite these impediments, India's vast potential puts it high on the list of prospective destinations for foreign investment, ranking third behind China and the United States. Furthermore, 2014 saw a significant increase in FDI inflows, which rose by 22% compared to the previous year, to a total of over \$34 billion (UNCTAD, 2015). Preliminary numbers for FDI in 2015 show a further substantial increase.

### ***Land***

The welfare of India's rural population, which is 850 million strong and accounts for almost 70% of the total population, is closely linked to the amount of land they have available for productive use. Land acquisition for public or private enterprises wishing to build infrastructure, from roads and railways to power plants and steel mills, is therefore an issue fraught with social and political sensitivity. Legislative changes introduced in 2013 introduced stringent procedural requirements for land acquisition, defining compensation payments and rehabilitation and resettlement benefits and stipulated that potential developers in the private sector would need to secure the consent of 80% of affected families in the case of land acquisition (70% for acquisitions by public-private partnerships). There have since been attempts to amend this legislation, but finding an appropriate balance between the drive to push ahead with infrastructure projects, on the one hand, and the rights of local communities, especially farmers, on the other, is proving difficult. In the absence of a resolution to this issue, obtaining the required statutory clearances related to community rights, environmental protection and sustainable development has been a major cause of delay. At end-2014, infrastructure projects valued at around 7% of GDP were stalled for these reasons (OECD, 2014). Projects in the energy sector are particularly susceptible to delay: detailed analysis of projection applications showed that the clearance process for some 40-60% of projects in thermal power, hydropower, coal mining and nuclear power sectors went beyond the statutory time limits.

### **CONCLUSION**

Since the late 1990s, steps have been taken to deregulate the oil and gas sectors, notably successive bidding rounds held under the New Exploration Licensing Policy, which have been open to a range of private players. However, these two sectors remain dominated, in practice, by a handful of state concerns and the process of opening the coal sector to private investment is only just beginning. The power generation sector has been open to private participation for some time and the government has offered a range of fiscal incentives to increase the attractiveness of projects. Since 2006, 6 GW out of every 10 GW of net capacity added to the grid has been

financed by private investors, whose share of generation has increased quickly, to reach more than one-third of the total (Figure 1.19). Private sector involvement in the distribution side of the power system is much more limited. Presently the distribution utilities are largely state-controlled and administered, and the priority given to regional social sensitivities often contributes to the under-recovery of costs across the sector.

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