Energy transition in India: moving towards self-reliance and sustainability

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As the green shoots of an economic recovery start to emerge, India's energy demand is expected to pick up in the near future. Currently, per capita energy consumption is only 0.6 tonnes of oil equivalent (toe) as compared to the global average of 1.8 toe per capita[1] .Over the past decade, India has witnessed a steep increase in energy demand, on the back of strong economic growth. As per the International Energy Agency (IEA), India's total fuel consumption increased by 50 per cent in the ten years leading up to 2017[2] resulting in an increase in total primary energy supply from fossil fuels, primarily coal and oil. Over 80 per cent of India's oil demand is met through imports, while ~25 per cent of coal is met through imports[2]. Therefore, in the near-term, India faces the daunting task of meeting its fast-growing energy demand while reducing its carbon emissions and ensuring energy security for the future.

Transition towards reliable, affordable and sustainable energy mix

India aims to reduce emissions intensity of its gross domestic product (GDP) by 33 per cent to 35 per cent by 2030 from 2005 levels and increase the share of non-fossil fuels to 40 per cent of total electricity generation capacity, as part of the goals set under the Paris agreement within the United National Framework Convention on Climate Change. Further, India has set targets of achieving 175GW of renewable energy by 2022, and then increasing it to 450GW by 2030[3]. In this backdrop, the following key themes have emerged in recent years:

- **Increase in renewable energy integration**

  Over the last decade, India has made significant progress towards improving energy access while increasing integration of renewable energy. Although, India has achieved 100 per cent household electrification[4], providing affordable, reliable, three phase power supply remains a challenge. The government of India has consistently supported schemes for setting up centralised and distributed renewable energy (RE) sources. The schemes have been successful in demand creation, and along with improvements in technology and economies of scale have led to a significant reduction in prices. Solar tariffs in India have reduced from about 10 U.S. cents/kWh in FY15 to about 3.57 U.S. cents/kWh in FY20[5].

  Improvements in network infrastructure and power markets have aided integration of RE in India. In order to further increase RE integration, markets should slowly transition away from long-term power purchase agreements (PPAs) towards term ahead contracts in order to unlock more flexibility. Technical interventions such as investment into storage assets, hybridisation of thermal plants with RE, flexibilisation of thermal plants are essential for the long-term sustainability of the sector.

- **Focus on improving energy efficiency**

While RE generation has increased, fossil fuels continue to account for over 60 per cent of the total installed generation capacity in India[6]. Therefore, it is essential to focus on improving energy efficiency for meeting the increasing demand. These measures are implemented across the entire value chain including energy supply and demand. India's transmission and distribution losses have declined from ~34 per cent in 2002 to about ~21 per cent in 2017[7]. This is significantly higher than advanced economies where such losses are in the range of 6 per cent to 8 per cent[8]. In the near term, India should transition towards 'smart grid' and also deploy digital solutions such as Internet of Things (IoT) to enable predictive maintenance of network components and achieve further improvements.

- **Electrification of other sectors**

  The key to achieving energy security and ensuring sustainability lies in reducing and/or substituting the use of fossil fuels across sectors such as transport and industry. Most importantly, the focus should be towards reducing our reliance on imported oil and shifting towards electricity. Transition to electric vehicles is a key imperative for India, both from an energy security and sustainability standpoint. India needs to strengthen its EV charging infrastructure network with fast chargers while the utilities should focus on augmenting the network for handling the demand from electric vehicles.

India's path forward

All these measures have set the ball rolling in the right direction towards the overarching goal of sustainable, reliable and affordable energy access. The fact that India's emissions intensity of GDP reduced by 20 per cent in 2018 compared to 2005 levels[9], is a testament to the effectiveness of these measures. To further capitalise on the progress made over the past decade, India needs to focus on the following key areas:

(i) **Aligning energy markets to efficiently meet India's energy demand**: Measures such as privatisation/franchising of retail supply operations, separation of content and carriage would enable competition by allowing for multiple licensees and encourage innovation to improve supply and pricing efficiency. Further, market mechanisms including recently introduced real-time markets, and innovative contracting structures such as flexible schedulable contracts need to be adopted for providing utilities with a greater degree of flexibility to manage a portfolio dominated by renewable energy sources.

(ii) **Improving capabilities in technology research and development and ramping up domestic manufacturing**: India needs to focus on improving its capabilities in research and development of new technologies especially energy storage and ramping up domestic manufacturing of solar cells and modules. Until now, India has met most of its RE developments through low-cost imports.

From the standpoint of energy security, the Indian government's vision of 'Aatmanirbhar Bharat' underscores the importance of moving away from being a 'consumption centre' and truly becoming self-reliant for energy needs.

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