

India's difficult transition from fossil fuels to net-zero emissions

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Challenges abound in reducing dependence on coal and oil but the greater use of gas in our energy mix could ease the way

Ironically, the coal crisis has forced the Indian government to ramp up domestic production and imports of coal, the dirtiest fossil fuel, while the world focuses on net-zero carbon emissions by 2050. This irony reflects the reality that power generation and hence our economy is heavily dependent on coal, followed by petroleum.

Power generation is the main source of carbon emissions. Estimates based on data from the International Renewable Energy Agency (IRENA) indicate that non-renewable fossil fuels account for 70% of the current (2020) generation capacity of 452,3038 MW, followed by hydro/marine power at 11%, solar and wind power at 6% each, nuclear power at 5% and bio-energy at 2% (bit.ly/3G2mWbh).

The big question is how do we move from such heavy dependence on fossil fuels to a net-zero carbon emission situation where the share of fossil fuels is virtually eliminated, and how long will it take us to get there?

A recent Council for Energy, Environment and Water (CEEW) report has highlighted many formidable challenges to India's transformation from a fossil-fuel-dependent economy to one based on renewable energy. First, there is the technological, managerial and regulatory capacity to manage this revolutionary transformation. Then there is the major constraint of finance. The transformation will involve massive high-cost, high-risk, long-gestation investments. There is little fiscal space for large public investment in renewables, while private investment in renewables at scale is just starting.

The willingness of developed countries, especially the US, to make available adequate low-cost finance and required technologies remains uncertain. India has negotiated hard to tie up access to such financing and technologies. The results are still awaited.

Another major constraint is access to land. The CEEW estimates that creating renewable power generation capacity for a net-zero economy could require between 4% to 6% of India's land mass. Managing the political economy of the transformation is yet another challenge. Tapering off of fossil-fuel-based power generation and closure of coal mines, oil wells and thermal or oil-based power plants will be resisted by the owners of these assets as well as thousands of workers employed at these establishments. If the cost of power based on renewables turns out to be higher than fossil-fuel-based power, even consumers will resist the transformation. Breakthrough technologies in carbon capture and storage (CCS) and hydrogen-based power could radically reduce the cost of power based on renewables. A few Indian conglomerates are also investing in renewable power and these technologies. However, the commercialization of these technologies at scale is still a work-in-progress.

The CEEW report has also explored the implications of a number of alternative net-zero scenarios. Whichever scenario plays out, it is quite clear that emissions will be rising for the next 30 to 50 years. A two-pronged strategy of accelerating renewable power generation and radically changing the composition of the fossil-fuel basket in favour of gas could significantly reduce that period of transition. Carbon dioxide and other emissions from gas are only a small fraction of emissions from oil, and especially coal. Global gas supplies have grown dramatically following the shale revolution, driven by hydraulic fracturing and horizontal drilling technologies. International Energy Agency projections indicate that gas will overtake coal as the second largest energy source after oil within this decade. Despite these developments, the share of gas in primary energy supply and power generation have been stuck at only 5-6% in India. The country is ranked 29th in global production at a little over 1 trillion MMcf per year and 14th in global consumption at around 2 trillion MMcf per year. Why has the shale gas revolution passed India by?

A recent collection of papers edited by Vikram Mehta, *The Next Stop* (Harper Collins, India, 2021), addresses this question and other aspects of the gas market in India and abroad. Though India may have gas reserves of over 100 MMcf, only about 40% of this is in accessible terrain and would be depleted within a couple of

decades. Given the high risks and costs of gas exploration and extraction, expected returns are low. These are further compromised by a completely distorted administrative pricing and taxation system, combined with a regulatory nightmare of multiple overlapping systems. Hence, neither public investment by GAIL nor private investment has been forthcoming.

However, other than development of our neglected domestic gas distribution system, energy investments should be entirely directed towards development of renewables. India's future gas requirements should be largely met through imports. This would largely be foreign exchange costs would be neutral, since gas imports would mostly replace imports of oil and coal. With planned pipelines from Central Asia having floundered, thanks to Pakistan, our gas imports are still mostly from West Asia, especially Qatar. But the global market for gas is being radically transformed.

Australia may soon displace Qatar as the largest liquified natural gas (LNG) exporter and may itself be replaced by the US in the future thanks to the shale revolution. US suppliers are also undermining the rigid, traditional long-term gas contracts with flexible market-based contracts. This diversification of supply sources and the emergence of active spot and futures markets is transforming the global gas market. Two recent technological developments, enabling liquefaction and re-gasification of LNG on board ships, will further disrupt the market and reduce costs. India therefore has a great opportunity to exploit these developments and strike excellent gas import deals.

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