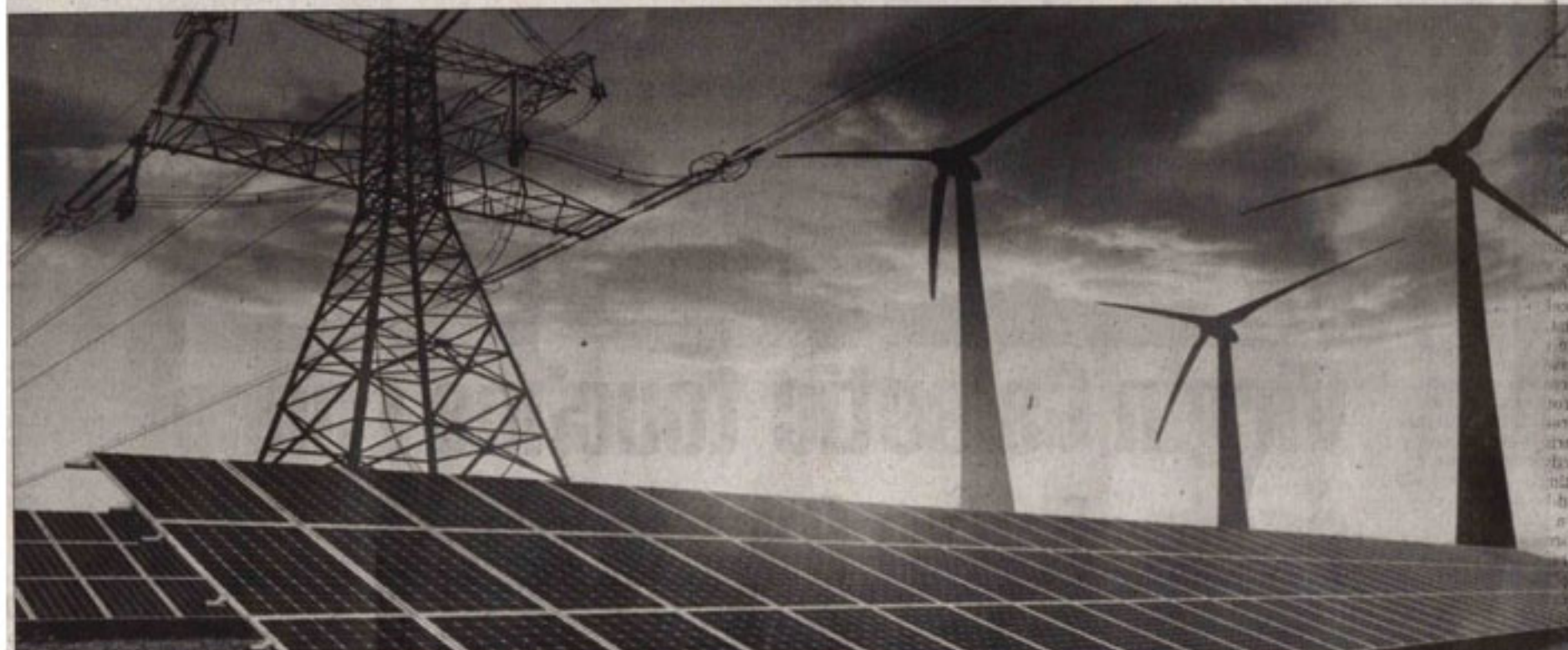


India: The road to leadership in clean energy



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With over 300 clear sunny days in a year, nearly a dozen perennial rivers and a coastline of more than 7500 kms, India is naturally endowed with immense potential as a major producer of renewable energy. It is but natural that our ancient scriptures extolled the virtues of the natural elements (including water and wind) and sun as great sources of energy and worthy of worship.

India's first Prime Minister, Pandit Jawaharlal Nehru while dedicating the Bhakra-Nangal Dam Project described it as the 'New Temple of Resurgent India'. However, except for hydro power the other two sources abundant energy, wind and solar, have remained untapped for the last decades, mainly due to lack of political will and unviable technologies. India, with its population of 1.3 billion, is also the world's fourth-largest carbon emitter with power sector being a major contributor to this.

The good news, thanks to the pressure of climate change, today we have a clear blueprint for an accelerated move towards tapping cleaner energy sources, reducing the dependence on fossil fuel for power generation and technologies and incentives to conserve power.

As a major signatory to the Paris Climate Accord, India has committed to reduce its carbon emission intensity - emission per unit of GDP - by 33-35% from 2005 levels over the next 15 years. It is also working towards generating 40% of its installed electricity capacity from non-fossil fuels by 2030 -- thus enabling a significant shift from coal-based power generation to renewable energy sources. To achieve these challenges, India has to produce 100 gigawatt from solar, 60 gigawatt from wind, 10 gigawatt from biomass and 5 gigawatt from small hydropower by 2022.

This can be quite a challenge because renewable energy in India is still evolving. According to the Union Ministry of Power, India's energy mix is evolving slowly with fossil fuels meeting 82% of demand; coal remaining the dominant fuel with a 58% share of total production now. However, the share of coal in the energy mix projected to drop to 50% by 2040, the share of renewables will

rise proportionately. Renewable energy is also expected to overtake gas and then oil by 2020 as the second largest source of energy.

According to the International Energy Agency's Renewables Report, Solar and Wind represent 90% of the country's capacity growth, which is the result of auctions for contracts to develop power-generation capacity that have yielded some of the world's lowest prices for both technologies.

Giving the depleting natural resources like coal and the rising demand for energy mainly driven by a growing population and economy, sources of energy like solar holds immense potential for a country like India.

Under the leadership of Prime Minister Narendra Modi, India is committed towards the development of renewable energy infrastructure. The 175 GW target for 2022 and the formation of International Solar Alliance, led by India and France is another example of the same. Apart from solar, the country is also exploring hydro power potential in the north-eastern states which are an abode to immense hydro power opportunities.

With an energy consumption growth of 4.2% a year that is faster than all major economies in the world, India is on the road to overtaking China as the largest growth market for renewable energy by late 2020s.

According to the University of Technology (LUT) in Finland, India has a huge potential to move into a 'renewable-only' electricity system by 2050, owing to an abundance of renewable resources. If we can leverage sophisticated technologies through collaboration with the industry, academia and energy innovation ecosystem, India can quickly become a world leader in affordable renewable systems.

This is significant given India's burgeoning electricity demand and the persistent demand-supply gap, the pursuit of cleaner energy sources will have a crucial role in enabling the country's transition to a fully sustainable energy system. However as things stands now, financing such an ambition continues to remain a challenge in India. The bankability of

renewable energy projects is also a challenge given that the end consumers of such energy sources are unable to pay for them.

Other policy level initiatives taken by the government like allowing utilities to scout for wind sites and choose wind turbine suppliers through competitive bidding and government's decision to auction 20,000 MW of solar capacity, (the largest block of capacity to be auctioned in a

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single tranche for the first time globally) will also move the country towards clean energy sources in the long run. Further the government's push for higher quality standards for imported solar photovoltaic (PV) modules, enforced through inspections will further help buyers get over 25 years of module life.

The future looks bright as nearly 293 global and domestic companies have committed to generate 266 GW of solar, wind, mini hydel and biomass-based power in India over the next decade. The initiative would entail an investment of \$310 billion-\$350 billion. For instance, the International Finance Corporation, the investment arm of the World Bank Group, is planning to invest around \$6 billion by 2022 in several sustainable and renewable energy projects in India.

The Indian power sector has an

investment potential of Rs 15 trillion over the next 4-5 years, which promises immense opportunities in power generation, distribution, transmission and equipment. While there is an abundance of capital chasing these opportunities in the renewable sector, there are also risks that must be addressed in quick time, including counter-party risks both in terms of developers and procurers.

The good news is renewable energy storage system market in India is expected to boom over the next decade, which will be mainly driven by the growing demand for electric vehicles in the country.

In December, when the Loy Yang coal power plant suddenly went offline, Tesla's 100MW Hornsdale Power Reserve battery system in South Australia delivered 100 MW into the national electricity grid in 140 milliseconds, instantly powering 1,70,000 homes. This testifies, why energy storage has become an essential complementary solution for renewable energy, which can be seasonal.

The emphasis on solar and wind projects have also increased the challenges in maintaining system stability, which is encouraging developers to support power grid networks with battery storage to help manage the variations in power supply. Renewable energy projects backed with battery technology could transform the energy scenario in India. However, the challenge is to develop a technology that is suitable for large renewable energy projects. According to industry reports, the deployment of energy storage is anticipated to grow over 40 per cent annually in the next 10 years, with the creation of around 80 GW of additional storage capacity. We have also commissioned proof-of-concept in battery energy storage systems, where large lithium-ion battery banks are being deployed in Delhi.

As India's leading renewable energy players with a gross generation capacity of 3,210 MW through clean non-fossil sources, Tata Power is committed to transform the sector in sync with the government's vision of promoting renewable energy by building a total capacity of 20,000 MW by 2025, of which 30-40 per

cent is expected be based on non-fossil fuel sources. The need of the hour is addressing the bankability of renewable energy projects which has always been an issue in India, owing to buyers inability to absorb power and pay for it.

Also power purchase agreement structures must to be strengthened further to make renewable energy projects more financially viable. Some states, that are financially-challenged, are not encouraging the 'must-run status' of renewables and are forcing such capacities to back down when wind velocities are not favourable. The government, therefore, should enforce must-run status as an obligation for all consumers to buy a good proportion of clean power. We also need to address some challenges faced by power producers which include high fuel supply costs, time overruns on new projects, and the limited paying capacity weak distribution utilities due to pre-defined RPOs in their PPAs.

Finally, in order to remain energy positive and to make the most of renewable energy sources, we will have to parallelly focus on aggressive promotion of energy efficiency practices in India. The World Bank, in its report titled 'Utility scale DSM (Demand Side Management) opportunities and business models in India', has pegged India's energy efficiency market at Rs 1.6 lakh crore.

Some recent steps taken by the government have already produced good results. Till now, over 28 crore LEDs have been sold across the country which has resulted in energy savings to the tune of 36,545 MU (million units) and avoided peak demand of 7317 MW. This has resulted in savings of around Rs. 14,618 crore. This will also provide a very good market for companies manufacturing energy efficient lighting and appliances as well as companies providing DSM solutions.

The future of energy is clearly moving towards clean, sustainable and efficient sources. India is uniquely positioned to make the best of this through its natural advantages and progressive policies initiated by the government that can ultimately propel the country to a leadership position in the clean energy space.

(The Author is the CEO & MD of Tata Power. The view expressed by him are his own and doesn't reflect the views of the organization)