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A COST-EFFECTIVE WAY TO POWER GENERATION

Relevant for: Indian Economy | Topic: Infrastructure: Energy incl. Renewable & Non-renewable

India has been aggressively expanding its power generation capacity. Today's installed capacity of 358 GW is about four times of what it was in 1997-98, which shows a doubling of capacity in each of the past two decades — or about 75 MW per day. By India's historical standards, these are astonishing numbers indeed. In recent years, the major growth drivers have been renewable energy sources such as solar and wind power, and investment from the private sector. The private sector accounts for almost half the installed generation capacity. For the last three years, growth in generation from renewables has been close to 25%. India aims to have a renewables capacity of 175 GW by 2022 and 500 GW by 2030. Solar and wind power plants would account for much of the targeted capacity from renewables. How can this be achieved?

Today, thermal generation capacity accounts for about two-thirds the installed generation capacity in the country. This shows that though there is increasing awareness about the environmental impact of fossil fuels, the reliance on thermal plants is unlikely to end any time soon. (Table 1 underlines the two major advantages that thermal power plants enjoy relative to solar and wind power plants). Thermal plant capacities are large and therefore targeted capacity additions can be achieved by constructing fewer such plants. On average, it would take 18 solar or wind projects to generate the same quantity of power as one thermal plant. For the same reason, switching from fossil fuel to renewables will remain challenging as the administrative overheads that would have to be incurred in setting up the multiple projects could significantly add to the cost.

Not surprisingly, infrastructure projects have an inverse relationship between size and unit cost, indicating economies of scale. As the capacity of power plants increases, the average cost of power per MW reduces. The average cost per MW for a thermal plant is about 25% lower than that of a solar plant. In order to surmount the cost advantages that large thermal plants enjoy today, we must focus on developing larger solar and wind power plants that can also exploit similar economies of scale.

The next point is that of ownership. Over the last two decades, 63% of the total planned generation capacity has come from the private sector. Private investment has been even more pronounced in renewables, accounting for almost 90% of investment in wind and solar projects. So has private investment helped?

Table 2 has the answer. Private sector plants have an average cost per MW that is 12-34% lower for all categories except solar. Lower capacity cost has a direct impact on electricity tariffs. Electricity tariffs broadly consist of two components: fixed capacity costs and operation and maintenance costs, which include fuel expenses. In general, capacity costs account for more than 90% of the levelised cost of electricity, irrespective of the fuel type. If we are able to create additional capacity at lower cost, then it will play a big role in keeping electricity tariffs low. Private investment in the power sector has not only helped in augmenting capacity but has also helped in lowering cost.

Even as total capacity in generation has been growing, the cost of installing additional capacity has fallen (Table 3). The reasons for the decline could be as follows: First, advances in technology have resulted in the construction of larger power plants. Compared to the 15-year period before 2013, power plants installed in the past six years have on average been significantly bigger, even twice as large in the case of hydel power. The economies of scale in power generation appear to have been dramatic. The second point could be the increasing

share of private sector investment. The share of private sector in capacity creation has been 70% in the last decade as compared to 46% in the decade before that. And, as indicated previously, private sector capacity has lower costs.

Falling marginal costs suggest that retiring some existing high-cost capacity plants with newer plants could be explored.

With economic growth, the demand for power in India is only going to increase further. To put things in perspective, China added generation capacity that was equal to a third of India's total installed capacity in 2018. As India continues to ramp up capacity, it is imperative to create generation assets with the lowest unit cost by optimising plant capacities and encouraging private sector investment. Declining marginal cost for capacity provides opportunities for replacing existing capacity with newer capacity that are more efficient. However, the challenge of replacing fossil fuel-fired plants with renewables prevails.

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