

The missing link in 24-hour clean energy

Recently, tenders for 40 gigawatt (Gw) of solar power were not awarded due to market conditions and surplus energy during daytime hours. This has raised alarm among the renewable energy (RE) community, which includes project developers, investors, and energy planners. Electricity has to be provided 24 hours a day, *as and when needed*. Due to the lack of storage, any extra RE generation beyond demand has to be curtailed, while evening and nighttime demand is met through coal-based power or wind power.

To avoid curtailment and promote RE even further, the storage capacity for RE needs to expand from the current 200 megawatt (Mw) to 30,000 Mw by 2032, to store RE when solar power is available and use it when it is not. This is a huge challenge. A steady policy of planning storage for every additional Gw of RE power is needed. The grid-scale storage goals need to be announced along with the goals of RE power. The RE storage can be a mix of short-term grid-scale battery energy storage systems (BESS), which can provide up to four hours of storage, and pumped hydropower storage for a longer timescale, extending to nighttime or seasons.

Fortunately, the landscape of BESS technology has evolved rapidly over the past two years globally and in India. Through competitive bidding, storage has transitioned from conceptual or pilot projects to commercial-scale deployments in India. Between 2023 and 2025, there has been a sharp decline of 30 to 35 per cent in global lithium-ion battery prices. Moreover, a search for better project designs, sizes, new materials, and contractual risk allocations is progressing rapidly. With the growth in storage capacity, capital expendi-

ture may reduce due to economies of scale.

Battery storage projects are now increasingly defined by the magnitude, extent, and frequency of battery cycling. Systems designed for multiple charge cycles per day deliver a lower effective cost per unit of energy, because the same investment provides more energy units over time. Revenue maximisation needs to be balanced against maintaining long-term performance over 12 to 15 years.

First, non-monetary benefits help. Maharashtra State Electricity Distribution Company Ltd offered cheaper land to developers and 33 Kv connectivity at the substation level. This resulted in a tariff of around ₹1.65 lakh per Mw per month. Thus, the state and central governments can be proactive in facilitating the reduction of execution risks in a variety of ways.

Second, bring innovation to power purchase agreements (PPA). Currently, RE PPAs are offered with

a 100 per cent guaranteed purchase over their lifetimes. As more producers enter the market, power available only during specific times cannot be purchased. Therefore, the prices in the power market vary from ₹0.3 to 3 per Kwh during the day and ₹8 to 11 per unit in the evenings.

About 15 per cent of power is traded, while 85 per cent is supplied under predefined PPAs. The new PPAs may be offered with less than a 100 per cent purchase guarantee, say 80 per cent to start with, so that parties may have the freedom to benefit from the market prices, as they fluctuate. The buyers can rearrange the load for some period and buy at a more convenient time to save on bills. The sellers can decide to sell at

higher prices at peak-load times. Both parties may have some freedom to decide for their benefit.

Third, expand the production-linked incentive (PLI 2.0) scheme to include battery manufacturing, Battery-pack integration, raw material processing, and component manufacturing to build a resilient domestic supply chain that reduces import dependence and shields the sector from global price fluctuations.

Fourth, permit the entry of battery power as standalone power. These prices point to the need for charging BESS regularly at certain times or summoned at peak times. The difference between peak and off-peak power prices ensures economic feasibility. Technological advances have brought down battery costs to ₹1.5 to ₹2.8 per kwh.

Fifth, access to transmission should be ensured for grid-scale installation — whether generating units or storage. That need not necessarily be free access. Modest charges for a reliable transmission service need to be factored in.

Sixth, emphasis on domestic cell manufacturing and recycling, and research and development efforts for sodium-based batteries are crucial for long-term energy security and to reduce dependence on imported cells and critical minerals, the main strategic gap. However, battery pack assembly, power conversion systems, inverters, transformers, control software, containers, and balance-of-plant equipment are mostly manufactured or integrated within India.

The expansion of RE needs to be accompanied by growth in storage as RE is available for limited hours. With timely action on the storage front, we can still cover the lost ground fast.

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