

Demand Spike: Harnessing renewable energy to combat surging peak power needs

July 18, 2024



By Deepesh Nanda, Chief Executive Officer and Managing Director, Tata Power Renewable Energy Limited

India's recent record peak power demand of 250 GW calls for urgent attention. As global temperatures soar, the role of renewable energy in managing peak power demand becomes ever more crucial. The increasingly severe summer heatwaves are not just evidence of climate change but also a stark reminder of the fragility of our current energy systems. To mitigate these challenges, we must integrate renewable energy sources such as solar and wind, enhancing grid stability and reducing our dependence on fossil fuels. This dual strategy is essential for meeting immediate power consumption spikes while working towards long-term environmental sustainability.

India's heatwave challenge

India offers a compelling case study in the urgent need for renewable energy solutions. Its northern regions have recently experienced temperatures exceeding 50 °Celsius, fuelling a dramatic increase in power demand. According to the National Centre for Disease Control, there have been 60 heat-related deaths since March 1, 2024, a likely underreported statistic. Over the past 50 years, India has endured over 700 heatwave events, resulting in more than 17,000 deaths. This year, surging temperatures have pushed power demand to nearly 260 GW, as projected by the Ministry of Power. The widespread use of cooling equipment, even with air conditioners being present in only a quarter of households, highlights the escalating energy requirements. While coal and gas can meet this demand, their environmental ramifications are significant, underlining the need for sustainable energy solutions.

Strategic integration of renewable energy

Renewable energy can effectively address peak power demands during extreme heatwaves. Grid-scale energy storage systems and firm and dispatchable renewable energy (FDRE) models are crucial for ensuring reliable 24x7 power supply. In fiscal year 2024, FDRE accounted for 17 per cent of over 69 GW of renewable energy tenders, surpassing the government's target of 50 GW. These systems mitigate the variability of solar and wind energy, providing stability during peak demand periods.

Recent trends show a shift in peak demand hours to the daytime, when solar energy is most abundant. Additionally, peak demand is now aligning with periods of high wind power availability, highlighting the importance of integrating these renewable sources into the grid. The government's exploration of innovative tendering processes to ensure round-the-clock renewable energy availability is further facilitating this integration, enhancing capacity utilisation.

Balancing renewable and conventional energy

A hybrid approach that balances renewable energy with conventional sources ensures stable and reliable power supply. This method leverages solar and wind power during peak availability and relies on conventional sources during periods of low renewable output. This strategy provides continuous energy, particularly during high-demand periods such as summer heatwaves, reducing strain on coal-based plants and preventing blackouts.

Economic and social advantages

Solar energy is becoming increasingly cost-effective. During peak demand periods, electricity costs can surge, but solar power helps stabilise these costs, making energy more affordable for consumers. Diversifying energy sources reduces India's dependence on imported fossil fuels, enhancing energy security — a critical factor during heatwaves, when energy reliability is paramount. Additionally, large-scale solar installations can mitigate the urban heat island effect by providing shading and reducing heat-absorbing surfaces.

Technological and infrastructure benefits

Modern renewable energy technologies, including solar and wind farms, can be integrated with battery storage systems. These systems store excess energy generated during peak production times and release it during peak demand periods, enhancing grid stability. Within the solar sector, the uptake of rooftop solar systems by both residential, and commercial and industrial consumers is increasing, driven by falling solar panel costs and government incentives such as PM-Surya Ghar: Muft Bijli Yojana. As of May 2024, the total grid-connected rooftop solar capacity is 12.46 GW. This segment, too, holds immense potential to help the country meet peak power demand without over-depending on fossil fuels.

The way forward

Investment in renewable infrastructure and technologies is essential for addressing peak power demand during extreme summer conditions, as evidenced in India. By reducing greenhouse gas emissions and providing reliable and sustainable energy supply, renewable energy builds resilience against extreme weather events. Integrating energy storage systems and adopting innovative tendering processes are key steps towards a cleaner, more resilient energy future. As global temperatures rise and climate change effects become more pronounced, the urgency of renewable energy adoption grows manifold.

The shift towards renewable energy is not merely an environmental imperative but a strategic necessity. The path ahead is clear: embrace renewable energy to secure a sustainable and resilient future.

