Heat affects India's aim to move from coal to renewables

While power availability determines our ability to deal with heat waves, high heat affects what sources of power are available to use

DATA POINT

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In what many would have hoped was a Fool's Day joke, the India Meteorological Department (IMD) said on April 1 that India will have more than the 'usual' number of days with heat waves in the forthcoming summer. The forecast comes against the backdrop of an impending water crisis in the south, Lok Sabha polls, and rising food inflation.

Higher heat is bad for crop yield (to different degrees depending on the crop), agricultural workers' productivity, and the availability of water. **Maps 1A** and **1B** depict the probability of maximum and minimum temperatures, respectively, the IMD expects for April-June 2024. It predicted "above-normal" temperatures for the month, with a 55%-65% probability in one half of the country and over 65% in the other half. Very few parts are likely to record normal or below normal temperatures.

Heat increases power demand in urban and industrial centres; makes the consequences of outdoor work, especially at construction sites, deadly; overwhelms health service providers by its effects on the very young and the very old; and places a premium on access to clean, cool water, indoor ventilation, and indoor bathrooms. The availability of power undergirds our ability to respond to all these effects of heat (**Chart 2**). The chart shows the average evening peak-hour demand met in March across years. In March 2024, the peak demand reached a new high of 190 GW.

A lot of this power comes from coal-fired plants. Coal is easily stored and has a high load factor, and these plants meet both peak and off-peak demands. The government is targeting 500 GW of power generation capacity from renewable energy sources by 2030 and has committed to producing 50% of its power from non-fossil-fuel energy sources by the same year. A big chunk of this addition will be in the form of solar power. But because solar output is intermittent and power storage capacity is still being established, peak demand has been met with coal. **Chart 3** shows the gross electricity generated using coal in India and coal's share in total electricity generated. The latter has remained 70-74% since at least FY16.

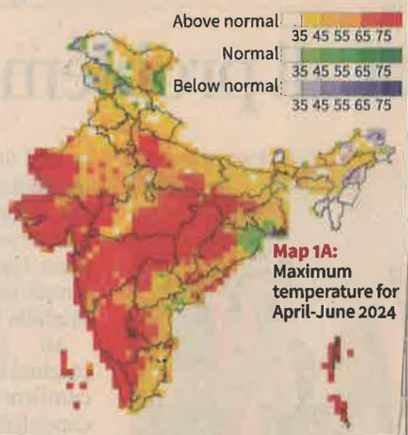
The most commercially viable forms of energy storage in India are currently battery-based storage and pumped hydro storage (PHS). PHS works like a hydroelectric power-generation facility in most respects except pumping the water from a lower to a higher elevation using off-peak power and running the turbines to load-balance the grid during peak power, among others. However, both hydroelectric and PHS facilities are undermined by water shortage – which is the case during periods of intense heat, when water demand for other needs is higher. **Chart 4** shows the gross electricity generated using renewable sources in India and the share of renewable sources in total electricity generated. The share of renewables (solar, hydro, wind, etc.) has remained 20-25% since at least FY16.

While the effects of climate change are hard to predict, especially at longer timescales and smaller spatial resolutions, concerns about the underperformance of dams India is building in the sub-Himalayas in the event of high heat and water stress persist for this reason. Thermal power isn't free of this necessity either: according to one analysis by the World Resources Institute, "India lost about 14 terawatt-hours of thermal power generation due to water shortages in 2016." All these challenges add to the multifaceted nature of extreme weather in India. Ready or not, the heat is on.

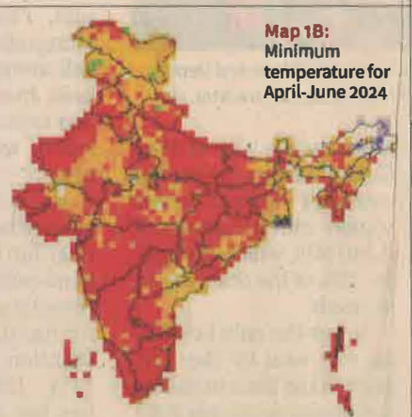
A (load) balancing act

The data were sourced from the Centre for Monitoring Indian Economy, GRID-INDIA and the India Meteorological Department

Map 1: Probability of maximum and minimum temperatures the IMD expects for April-June 2024



Map 1A: Maximum temperature for April-June 2024

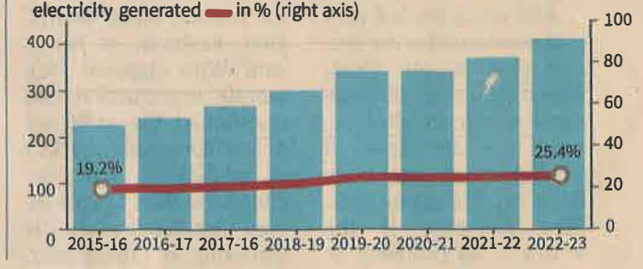


Map 1B: Minimum temperature for April-June 2024

Chart 2: The chart shows the average evening peak-hour demand met in March in gigawatt (GW), across years

Chart 3: The chart shows the gross electricity generated using coal in billion KwH (left axis) and its share in total electricity generated in % (right axis)

Chart 4: The chart shows the gross electricity generated using renewable sources in billion KwH (left axis) and its share in total electricity generated in % (right axis)



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