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El Nino 2026 Could Strain India's Power Grid

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WHY IN NEWS

> *In early July 2026 (reported around July 6 to 7), the Centre for Research on Energy and Clean Air (CREA) released an analysis warning that a developing El Nino between July 2026 and June 2027 could open a power-generation gap of nearly 18 terawatt-hours (TWh) in India, most likely filled by coal.*

For UPSC, this is an energy-security story rather than a purely climatic one. It shows how a natural climate cycle in the Pacific Ocean can ripple into India's electricity planning, carbon emissions and net-zero commitments, testing the resilience (https://ujiyari.com/vocab/resilience/) of a grid that has just touched record demand.

WHAT THE CREA ANALYSIS SAYS

The **Centre for Research on Energy and Clean Air (CREA)** modelled the likely impact of the forecast transition from La Nina to El Nino on India's power sector across the window of **July 2026 to June 2027**. Its central finding is a "double squeeze": El Nino tends to suppress the monsoon and wind speeds, cutting clean generation, while raising temperatures that push up cooling demand.

The mismatch works out to a total shortfall of about **18 TWh** in the most likely scenario, made up of three moving parts.

DRIVER	EFFECT ON THE GRID	APPROXIMATE SIZE
Rising temperatures	Higher cooling and air-conditioning demand	Demand up by about 10 TWh
Weaker monsoon	Lower reservoir inflows cut hydropower	Hydropower down by about 2.9 TWh
Slacker winds	Lower wind-turbine output	Wind generation down by about 4.9 TWh
Net gap	**Extra firm generation needed**	**About 18 TWh**

The added cooling demand alone (around 10 TWh) is comparable to about a quarter of Delhi's annual electricity use. CREA warns that the gap would most likely be filled by ramping up **coal-fired power**, adding roughly **17 million tonnes of carbon dioxide (CO_2)**. In a **severe scenario**, the extra coal generation could reach up to **24 TWh**, which is close to half of India's entire increase in coal burn in the previous year.

This comes against the backdrop of one of India's hottest recent summers, when peak power demand touched an all-time high of about **270 GW**.

UNDERSTANDING EL NINO AND ENSO

El Nino is the abnormal warming of the central and eastern Pacific Ocean surface waters off the coast of South America. It is the **warm phase** of a larger climate see-saw called the **El Nino Southern Oscillation (ENSO)**, a coupled ocean-atmosphere phenomenon that swings between three states.

ENSO PHASE	OCEAN STATE	TYPICAL IMPACT ON INDIA
El Nino (warm)	Central and eastern Pacific warms abnormally	Often a weaker or deficient monsoon; hotter conditions
La Nina (cool)	Central and eastern Pacific cools	Often a normal to above-normal monsoon
Neutral	Near-average Pacific temperatures	No strong ENSO signal

The key link for India is that El Nino years are statistically associated with weaker south-west monsoons. A weaker monsoon means less rain feeding hydropower reservoirs and, often, calmer winds, both of which cut renewable output exactly when heat is driving demand up.

WHY THIS IS AN ENERGY-SECURITY RISK

The CREA analysis reframes climate variability as a direct threat to **energy security** (https://ujiyari.com/terms/energy-security/), not just to agriculture. Three structural tensions stand out.

The cooling-demand challenge

As incomes rise and heatwaves intensify, air-conditioner ownership is climbing steeply. Cooling is becoming one of the fastest-growing sources of electricity demand, and it peaks precisely during the hottest, driest El Nino conditions. This is why **heat-action plans** and energy-efficient cooling are now central to both public health and grid planning.

Renewable intermittency and grid resilience

Hydropower and wind are clean but weather-dependent. El Nino exposes the risk of **renewable intermittency**: when the sun, wind and rain underperform together, the grid needs firm, dispatchable backup. Today that backup is overwhelmingly coal, which is why a clean-energy shortfall paradoxically raises emissions.

The coal lock-in versus net-zero

India has pledged **net-zero by 2070** and targets **500 GW of non-fossil-fuel capacity by 2030**. Yet events like an El Nino can deepen the **coal lock-in**, forcing the grid to lean back on thermal plants. The durable exit route is **battery and pumped-hydro storage**, which can store surplus solar power for use during evening peaks and lean-monsoon months, smoothing out exactly the kind of gap CREA describes.

ANALYSIS AND WAY FORWARD

The lesson is that decarbonisation (https://ujiyari.com/vocab/decarbonisation/) and reliability must advance together. In the near term, India should keep coal plants efficient and well-maintained as a managed backstop while scaling **battery energy storage systems (BESS)** and grid upgrades so that surplus solar generation can cover evening and lean-season peaks. Demand-side measures matter as much as supply: aggressive energy-efficiency standards for air-conditioners, expanded heat-action plans and time-of-day tariffs can shave the cooling peak. Strengthening weather and ENSO forecasting would let planners pre-position coal, hydropower and imports before a shortfall hits. The broader point for answer-writing is that climate variability is now a permanent variable in energy planning, and resilience, not just capacity addition, is the real test of India's transition.

UPSC RELEVANCE

GS Paper 3: Conservation, environment and climate change; energy security and India's energy mix; infrastructure and the challenges of the clean-energy transition; disaster and climate-risk management.

Prelims pointers:

- **El Nino** is the abnormal warming of the central and eastern Pacific Ocean; it is the **warm phase** of the **El Nino Southern Oscillation (ENSO)**.
- El Nino is generally associated with a **weaker Indian monsoon**; **La Nina** is generally associated with a normal to above-normal monsoon.
- The **CREA** analysis projects a power gap of about **18 TWh** (July 2026 to June 2027), likely filled by coal, adding about **17 million tonnes of CO2**.
- Break-up: demand up about 10 TWh; hydropower down about 2.9 TWh; wind down about 4.9 TWh; severe case up to 24 TWh of extra coal.

- India's peak power demand recently touched an all-time high of about **270 GW**.
- India targets **500 GW of non-fossil capacity by 2030** and **net-zero by 2070**.

Mains question: "Climate variability such as El Nino is emerging as a direct energy-security risk for India." Discuss with reference to the impact on the power grid and suggest measures to build grid resilience. (15 marks, 250 words)

FACTS CORNER

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The report: CREA (Centre for Research on Energy and Clean Air) analysis, early July 2026, on the impact of a developing El Nino (July 2026 to June 2027) on India's power grid.

Projected gap: About 18 TWh total; cooling demand up about 10 TWh, hydropower down about 2.9 TWh, wind down about 4.9 TWh.

Emissions impact: The gap, if filled by coal, could add about 17 million tonnes of CO_2; a severe scenario needs up to 24 TWh of extra coal generation.

Record demand: India's peak power demand recently touched an all-time high of about 270 GW.

El Nino: Abnormal warming of the central and eastern Pacific Ocean; the warm phase of the El Nino Southern Oscillation (ENSO), which also includes La Nina (cool phase) and a neutral phase.

India-monsoon link: El Nino years are generally associated with a weaker south-west monsoon.

India's targets: 500 GW of non-fossil-fuel capacity by 2030 and net-zero by 2070; battery and pumped-hydro storage are key to smoothing renewable intermittency.

Sources: Down to Earth (https://www.downtoearth.org.in/), The Hindu (https://www.thehindu.com/), CREA (https://energyandcleanair.org/), The Tribune (https://www.tribuneindia.com/)

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