MIT Climate Policy Center

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Data Centers and the Grid

Concern

The surge in electricity use from data centers is outpacing most other forms of demand growth, creating new challenges for grid management and climate targets.

Utilities forecast escalating energy demand to power data centers that are powering the rapidly growing AI economy (The Post) with annual energy use that could reach 6.7%-12% of total U.S. electricity consumption by 2028 (Reuters).

Where things stand

Where things stand: Data centers currently operate at ~80% utilization, leaving ~20% of capacity that could be used to provide grid flexibility. Utilities are increasingly concerned about peak load strain. Policymakers are interested in whether data center-driven load growth will accelerate or hinder decarbonization.

Stakes & relevance

Flexible demand has the potential to lower costs, improve reliability, and accelerate decarbonization by shifting demand from high-demand hours to low-demand hours.

Zooming out

Data center flexibility interacts with grid conditions and can influence generation investment, storage build-out, and the retirement timeline for coal and nuclear.

Key challenges

1. Flexibility saves money everywhere, but doesn't automatically cut emissions. In regions without strong renewable penetration or policy, flexible loads may increase reliance on existing fossil plants.

2. Market signals today do not always incentivize shifting demand to cleanest hours.

Clearing the air

This MIT working paper clarifies that flexibility is not inherently green, it depends on the grid mix. The paper shows that 12-hour shifting of 60% of workloads delivers most of the benefit, full 24-hour flexibility isn't required. Regions like Texas (with ~54% renewable generation) see up to 40% emissions reductions from flexible data centers. Lower-renewable regions may see small emissions increases (~3%) even as costs fall.

MIT study insights

Policy Signals: 1. Align incentives so data centers shift to clean hour, not just cheap hours (e.g., real-time carbon signals). 2. Pair flexibility requirements with renewables expansion, not as a substitute for it.

Industry Practices: 1. Data centers can play a proactive role by participating in demand response and co-locating with renewables.