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Data centers and energy poverty in the United States: Assessing distributional implications of rapid load growth in an era of artificial intelligence

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Constantine Spandagos

Edited by Karikari Achireko and Tina Zhang

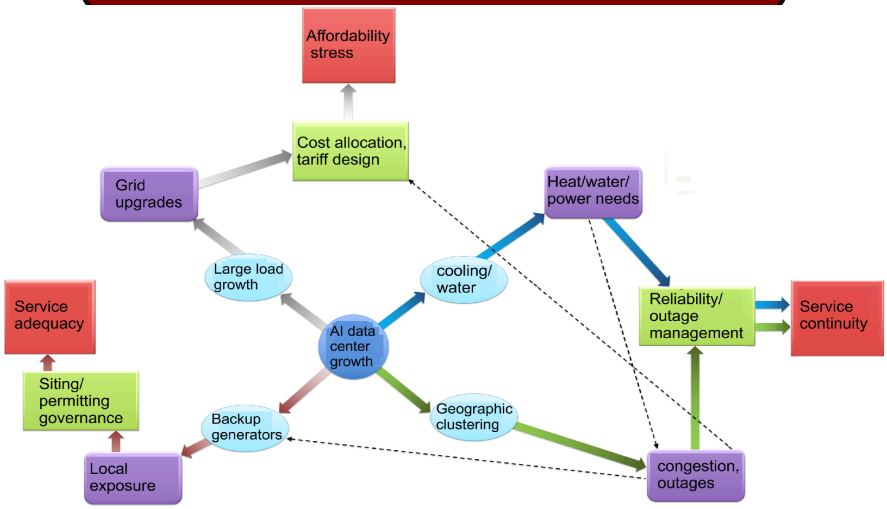
Executive summary

- Accelerated by the current surge in artificial intelligence (AI) and cloud computing applications, the expansion of data centers is now a significant driver of electricity demand growth in the United States, where almost half of the world's data center electricity consumption occurs. While data centers support important digital infrastructure, their large, geographically concentrated, water-dependent, and backup generator-enabled operations may shift costs and risks onto vulnerable households, potentially exacerbating energy poverty. Policy responses focusing on cost allocation and tariff design, interconnection and reliability planning, transparent reporting of electricity and water use, and environmental oversight may help address this issue.

Scope of the problem

AI-driven data center expansion, especially when it occurs in or near already burdened areas, may be linked to energy poverty risks through four interconnected mechanisms concerning:

- Cost pressures
- Reliability constraints
- Water-related peak stress
- Localized backup generation exposure



Potential mechanisms connecting AI data center growth to energy poverty risks. Cyan, purple, green, and red nodes represent data center features, mechanism stressors, system mediators, and energy poverty manifestations, respectively.

Policy option #1: Cost allocation based on causation

Cost allocation and rate design approaches could reduce the risk of shifting data center-related grid costs onto residential consumers.

Policy option #2: Reliability planning

Large load interconnection standards and reliability management procedures could be strengthened where data center growth is concentrated.

Policy option #3: Transparency and oversight

Transparent reporting and local oversight of data center electricity use, water demand, and backup generation could be expanded in overburdened areas.

READ THE FULL ARTICLE: HTTPS://DOI.ORG/10.38105/SPR.KDPDT52Z9O