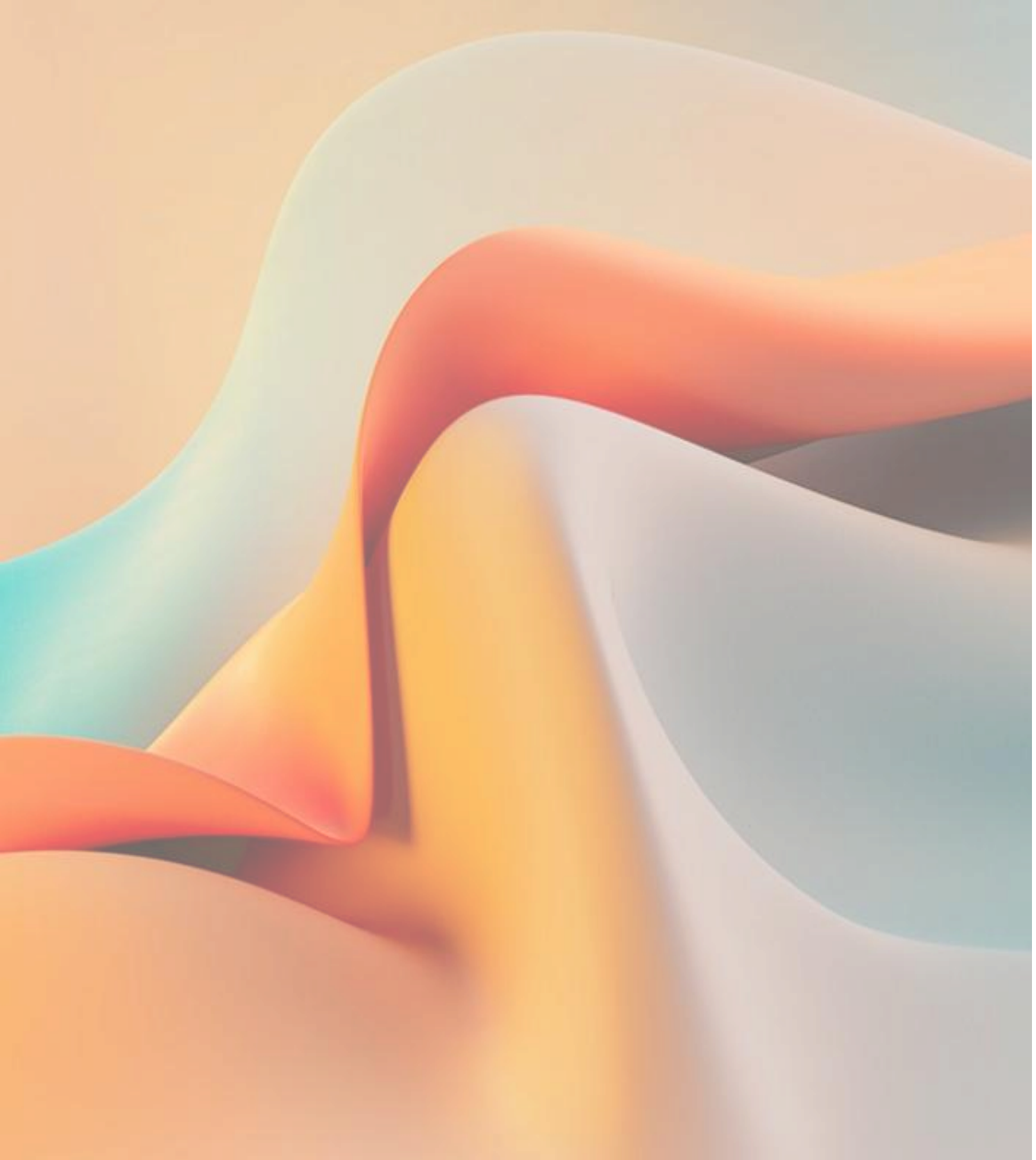


Powering artificial intelligence in the context of the energy transition

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Agenda

1. **The AI–Energy Nexus**

   How artificial intelligence is reshaping electricity demand

2. **Challenges for the Grid and Consumers**

   The impact of data centres and AI on power systems and bills

3. **Policy Dilemmas**

   Why balancing growth, fairness, and sustainability is difficult

4. **Options for Action**

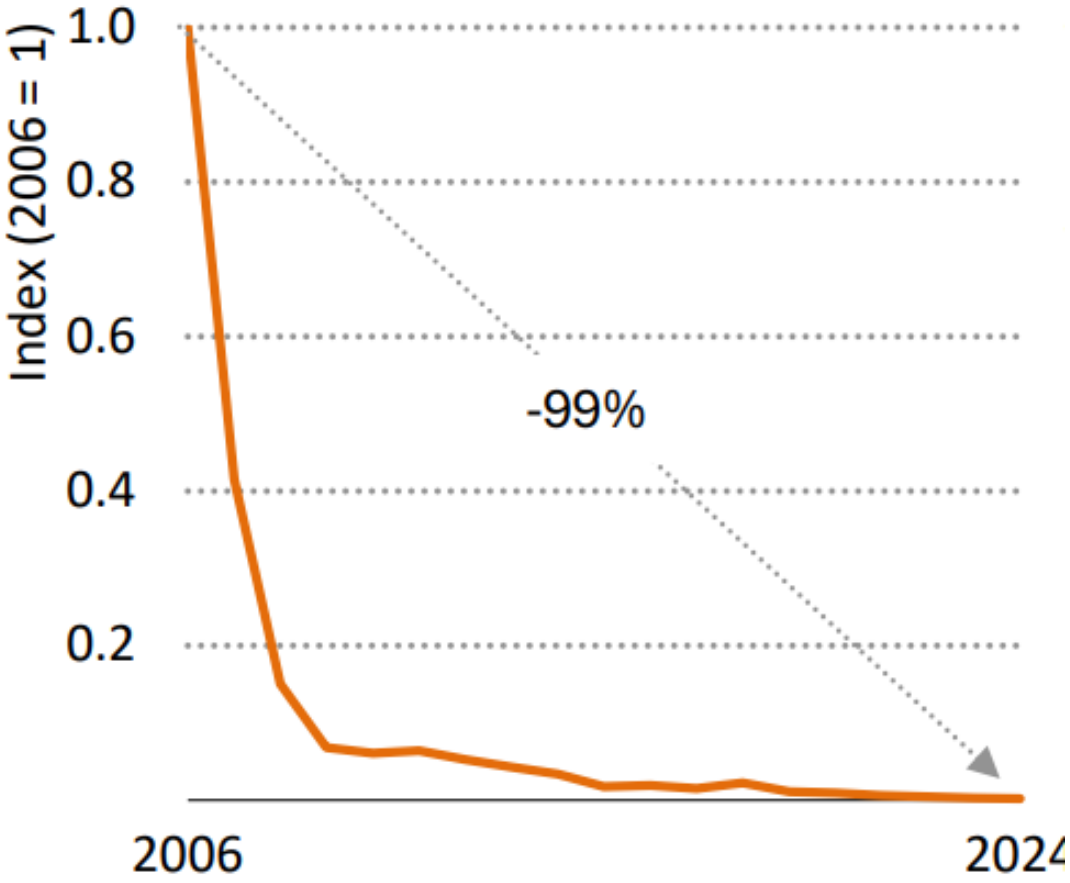
   Policy levers to manage data centre impacts on the grid

5. **Discussion**

   Which path should we take?

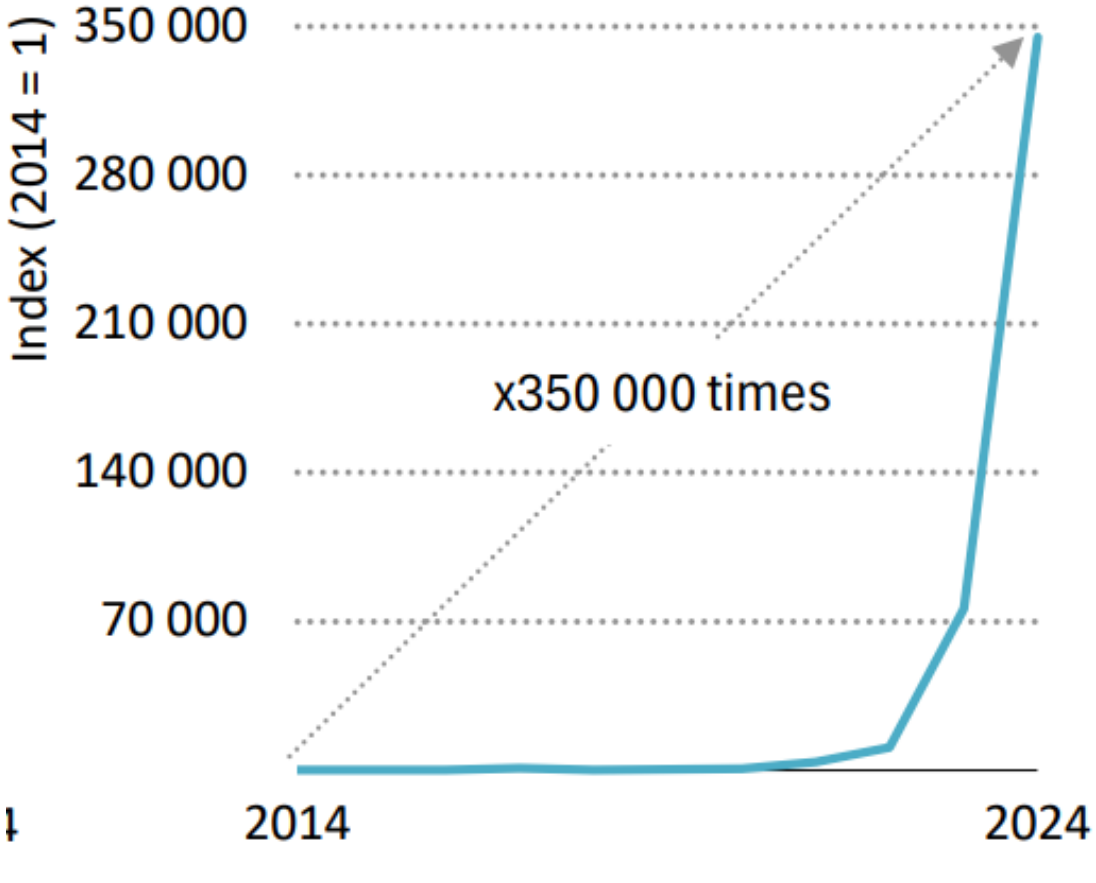
In the past decade, cheaper computing, exponentially more data and research breakthroughs in model design have turbocharged AI models

The GPU computation cost index has drastically decreased (by roughly 99%) in the last 20 years



International Energy Agency (IEA) (2025) Energy and AI. Paris: IEA. Available at: https://www.iea.org/reports/energy-and-ai/

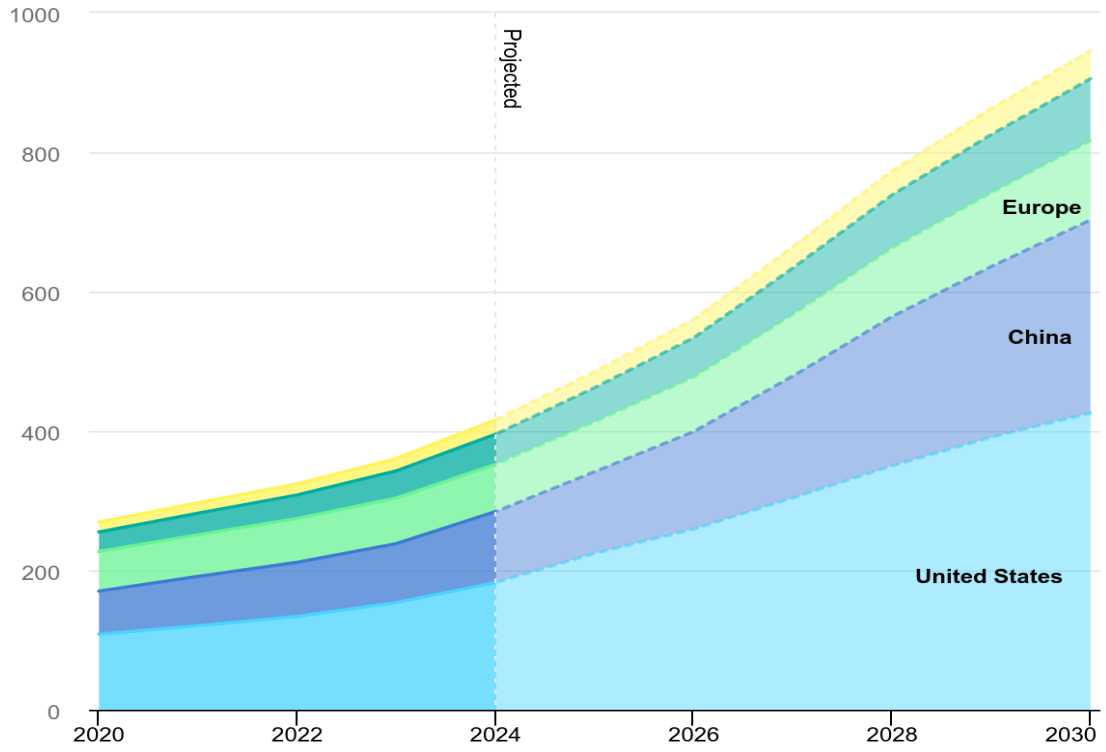
The model training size index has increase over 350 000 times in the last decade



International Energy Agency (IEA) (2025) Energy and AI. Paris: IEA. Available at: https://www.iea.org/reports/energy-and-ai/

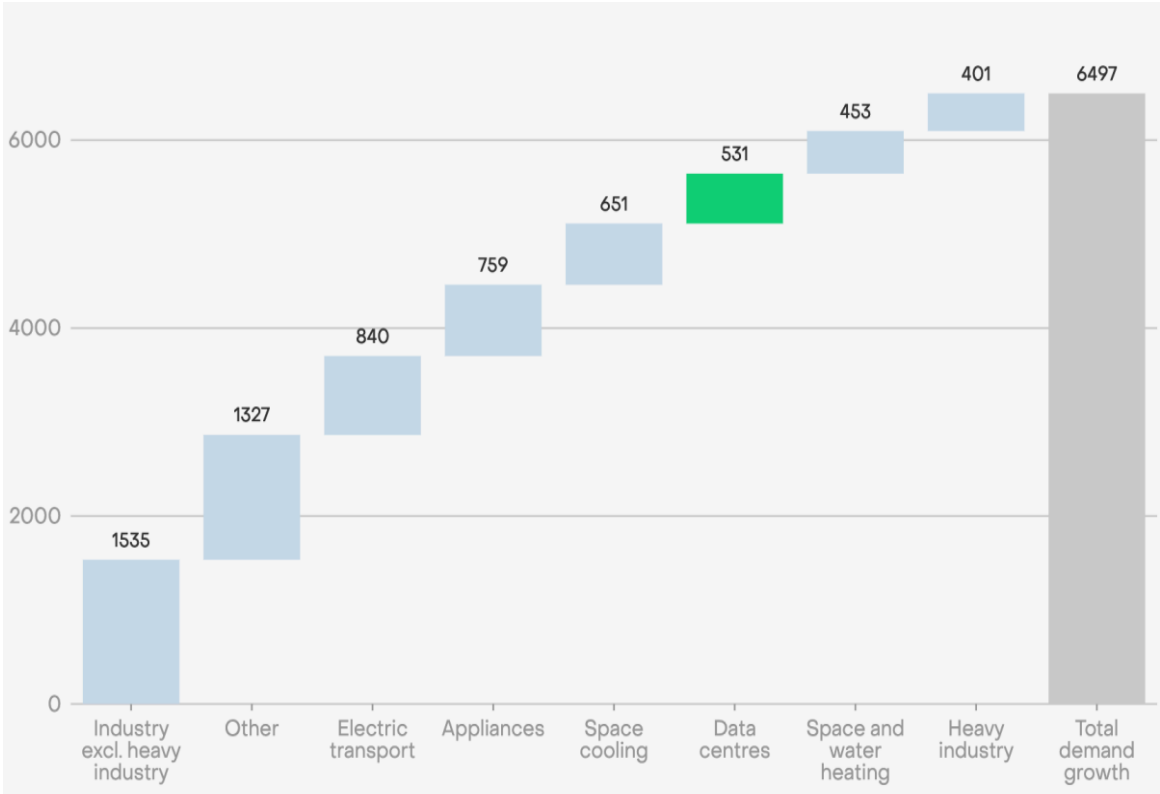
The share of global electricity consumption attributed to data centres is expected to double by 2030, surpassing heavy industries

Data centres accounted for around 1.5% of the world's electricity consumption in 2024, or 415 terawatt-hours (TWh)



International Energy Agency (IEA) (2025) Energy and AI. Paris: IEA. Available at: https://www.iea.org/reports/energy-and-ai/

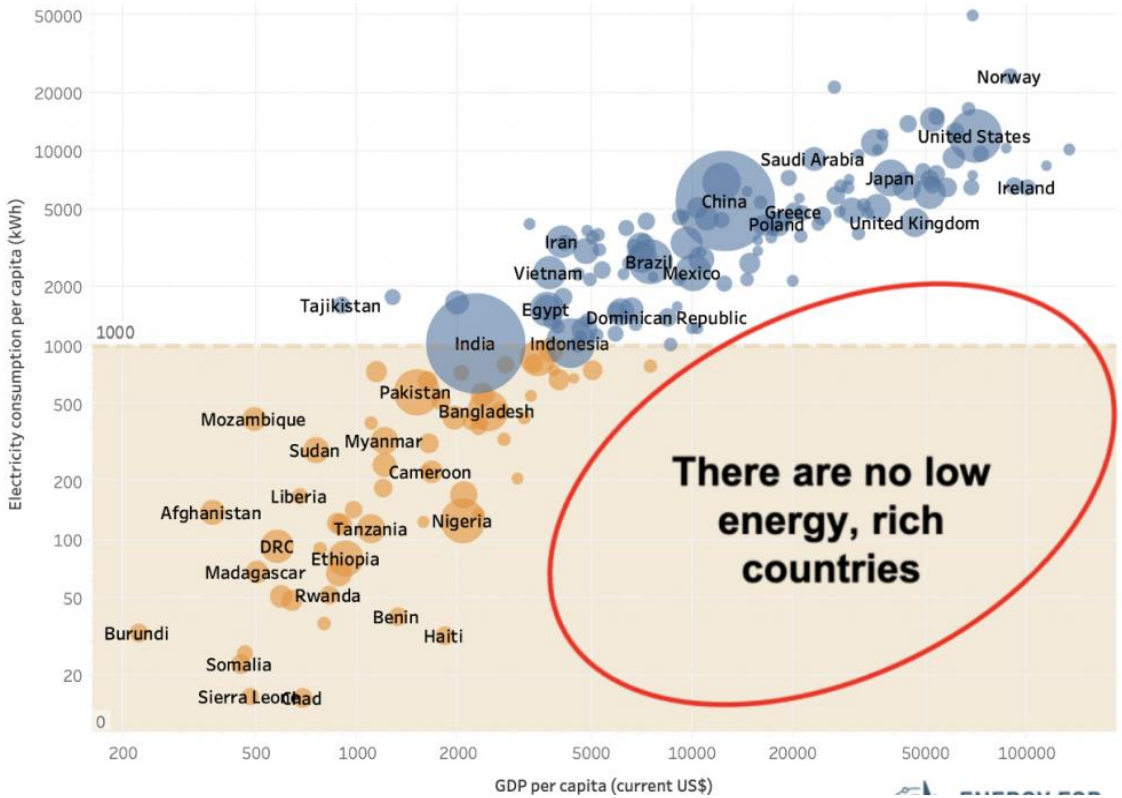
Data centres are projected to add more to global electricity demand growth than heavy industry or domestic heating



International Energy Agency (IEA) (2024) Electricity 2024: Analysis and forecast to 2026. Paris: IEA. Available at: https://www.iea.org/reports/electricity-2024

The key challenge in leading on AI development is keeping the electricity affordable in the context of the energy transition

The GDP per capita and the electricity consumption are tightly correlated. There are no low energy, rich countries



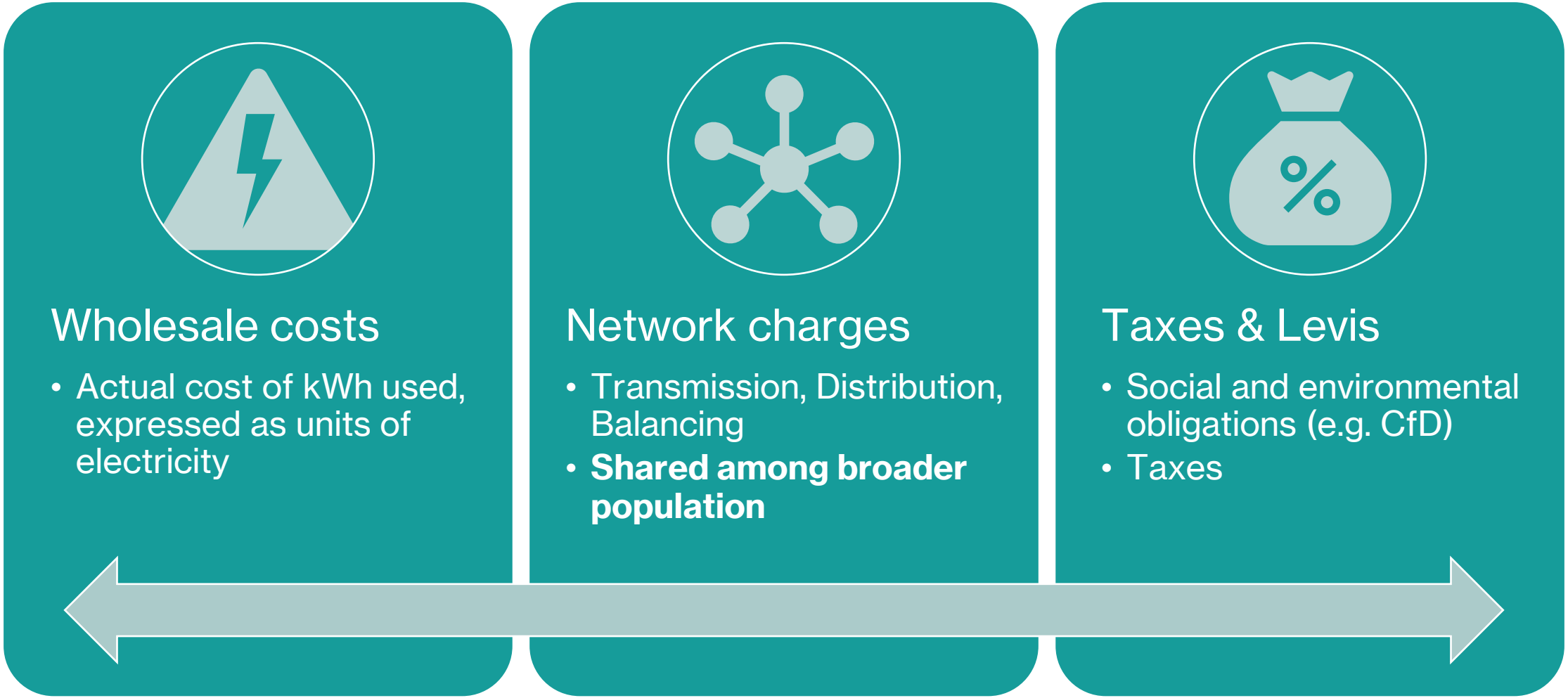
Ritchie, H., Roser, M. and Rosado, P. (2024) Energy. Our World in Data. Available at: https://ourworldindata.org/energy

Reaching net-zero emissions by 2050 required a significant increase in spending on physical assets ($b)



McKinsey & Company (2022) The net-zero transition: What it would cost, what it could bring. Available at: https://www.mckinsey.com/capabilities/sustainability/our-insights/the-net-zero-transition-what-it-would-cost-what-it-could-bring

For any electricity consumer, the cost component of the electricity bill is composed of the wholesale costs, the network charges and taxes

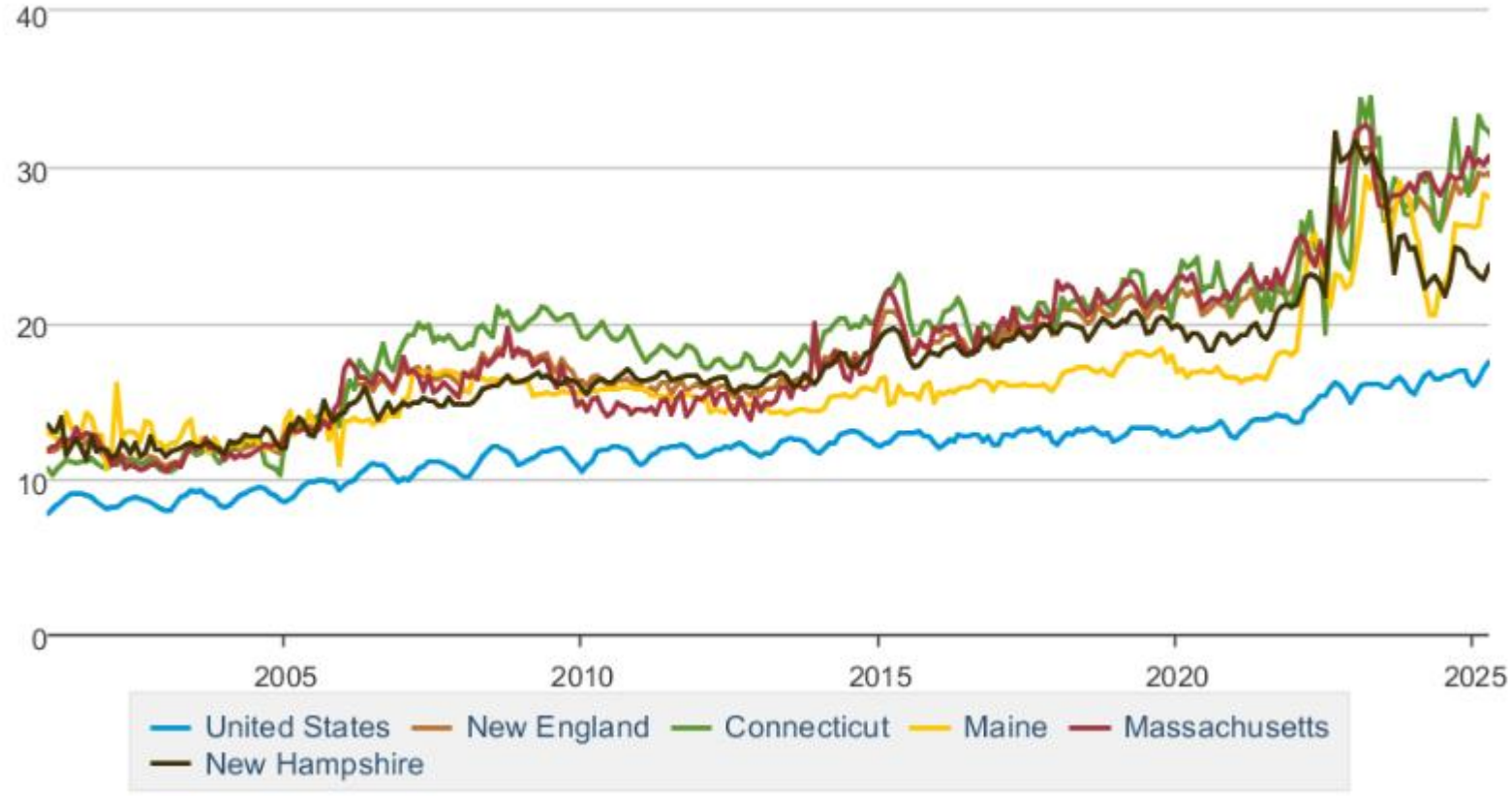


For a data centre, the cost of connecting to the network and the cost of network charges are shared through the utility's customer base

Electricity costs are shared / (or influenced) with / (for) the public

When	Type	Shared with public?
CAPEX	Power infrastructure	No
	Network infrastructure	**Yes**
OPEX	Wholesale electricity	No, but affecting
	Network charges	**Yes**
	Taxes and levy	No, but affecting

In the US, the primary driver of price (p/kWh) increase in the US is the increase in demand, with data centres soaring the demand requirements since the boom of AI



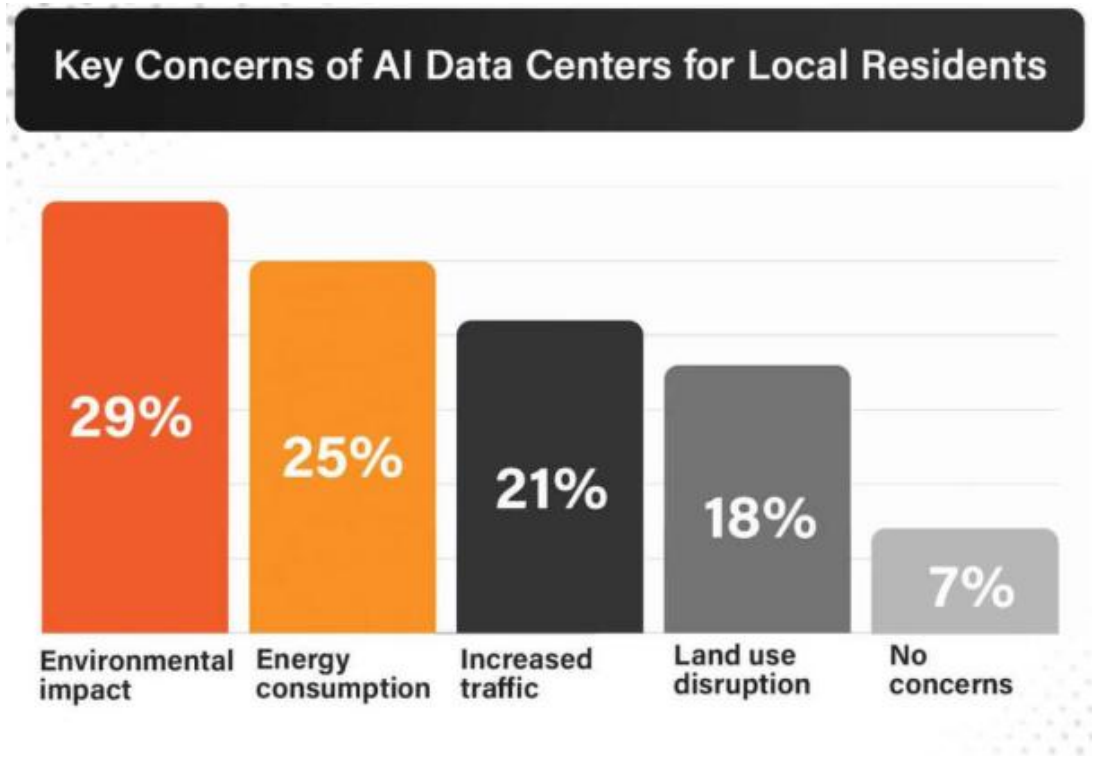
U.S. Energy Information Administration (EIA) (2025) Electric Power Monthly: Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State. Available at: https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a

The deployment of data centres impacts all electricity bill component costs for the broad public, which can slow down public appeal for AI

Data centres accounted for around 1.5% of the world's electricity consumption in 2024, or 415 terawatt-hours (TWh)

Cost type	How?
Wholesale electricity cost	• Peak demand • Locational pricing
Network charges	• Network congestion costs • New infrastructure • Balancing costs
Taxes & levy	• Economic incentives • New climate obligation costs for investment of renewable generation due to increase in demand

Not in my backyard: 93% of Americans Support AI Data Centres, But Not Locally

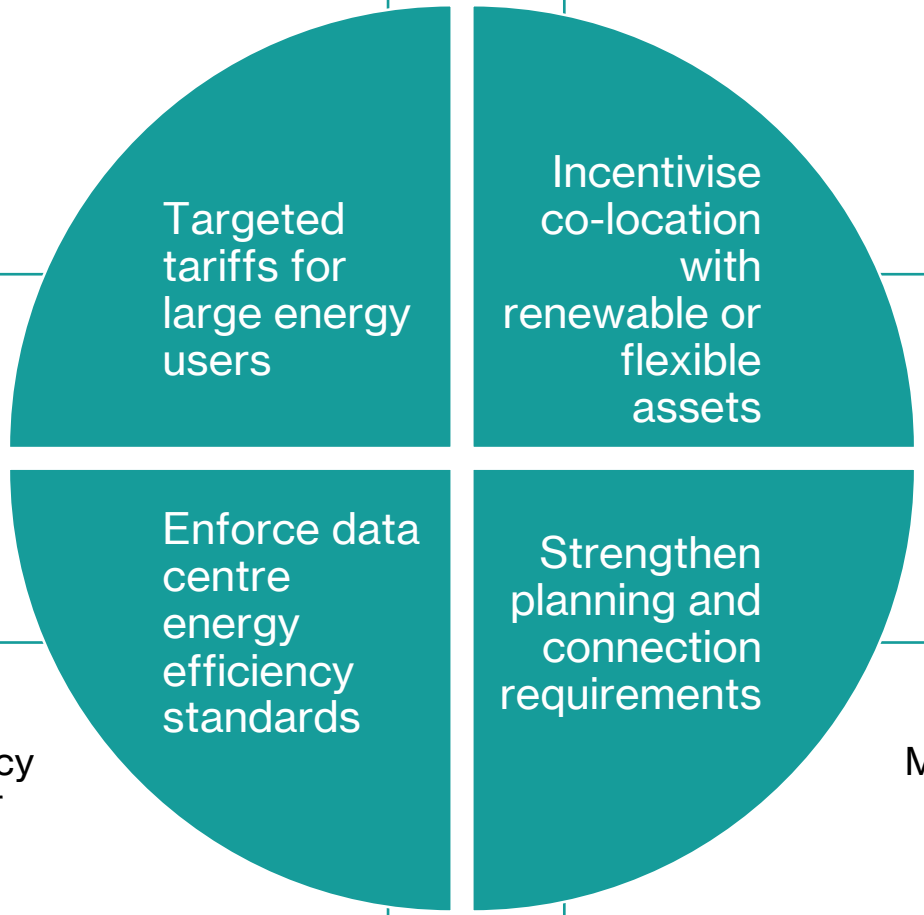


HostingJournalist (2025) 'Survey: 93% of Americans support AI data centers, but not locally'. Available at: https://hostingjournalist.com/news/survey-93-of-americans-support-ai-data-centers-but-not-locally

Policy interventions for managing data centres on the grid must balance growth and fairness for both the public and developer

Implement electricity tariffs that reflect the true cost and grid impact of large users like data centres

Encourage or require new data centres to be built near renewable generation (e.g., wind, solar) or to include on-site storage/flexibility



Set mandatory minimum energy efficiency standards for data centres (e.g., Power Usage Effectiveness, or PUE targets)

Make grid impact assessments, sustainability criteria, and community consultation mandatory for new data centre connections

Generally speaking, in policy development there is no right solution. In this case, we must balance public benefits with business conditions

Policy Option	Benefits	Drawbacks	RAG
1. Targeted Tariffs for Large Energy Users	• Ensures large users contribute fairly to grid upgrades and congestion. • Reduces cross-subsidisation by ordinary consumers. • Encourages more efficient energy use.	• May deter investment in certain regions, deferring job formation. • Complex to design and implement equitably. • Risk of companies relocating to areas with lighter regulation.	Forecasting to raise prices for end consumers
2. Incentivise Co-location with Renewables or Flexible Assets	• Supports grid decarbonisation. • Reduces transmission losses and local congestion. • Improves grid resilience.	• Limits flexibility in site selection. • Higher upfront costs. • Incentives may require public funding or tax relief. • Requires large regulatory changes (wholesale market)	Balances public benefit (cleaner, more resilient grid) with business incentives.
3. Strengthen Planning and Connection Requirements	• Aligns projects with national energy and climate objectives. • Reduces risk of local grid overload. • Increases transparency and public trust.	• Can slow down project approvals. • May deter investment if requirements are too stringent. • Requires robust regulatory capacity and enforcement.	Good for public interest, but can be burdensome for developers if not proportionate.
4. Promote Data Centre Energy Efficiency Standards	• Reduces overall energy use and emissions. • Encourages innovation. • Can lower long-term operational costs.	• Higher upfront costs, especially for retrofitting older sites. • Requires effective monitoring and enforcement.	Generally fair, raises standards for all, but benefits both sides in the long term.

Which one would you choose?

Thank you very much for listening.

Any questions?

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