It's time to get our heads out of the clouds on the energy costs of data centres

A 'datacentric' approach is needed that allows consumers and producers to make informed decisions about the growing impact of data use. **By Dasom Lee**

One of the most important ways for the world to tackle climate change is through renewable energy. However, the potential for renewables to bring about a sustainable future is threatened by the environmental impact of emerging technologies such as artificial intelligence. These technologies rely on data centres, whose incessant thirst for energy is challenging the ability of renewable sources to satisfy demand.

Meeting the energy challenge posed by data centres is essential to unlocking the true potential of renewable energy. This has led some to explore new ways to generate power, such as small modular reactors — smaller-scale nuclear reactors that are designed to be easier to assemble and transport to locations where extra grid capacity is needed. But a sustainable long-term solution will require a shift in the way energy producers, distributors and consumers think. Instead of constantly trying to satisfy an energy need that is growing exponentially, a move towards a 'datacentric perspective' would put considerations around data use at the heart of decisions around power generation and consumption. In other words, to ensure that renewable energy remains viable, the discourse about energy transition must include a focus on highlighting, regulating and limiting data-centre impact.

The technologies that are becoming part of daily life — such as large language models and automated vehicles — all require data centres to store vast amounts of information. These global data centres consumed about 1% of global electricity in 2024, or 460 terawatt hours, which is roughly half the electricity consumed by residential households globally. In the United States, which is estimated to have the largest number of data centres in the world, centres consumed around 4.4% of all US electricity in 2024, a figure expected to rise to as much as 12% by 2028.

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Electricity usage by data centres will continue to rise at an ever-increasing rate — and its global carbon footprint will follow. One 2022 study found that among information communications technologies, data centres are driving the fastest growth in the carbon footprint (D. Al Kez *et al. J. Clean. Prod.* **371**, 133633; 2022).

Several solutions have been proposed to help mitigate the impact of data centres. These include using more efficient computing; capturing and reusing heat produced by data centres; placing them in colder areas to reduce cooling costs; and integrating nearby renewable-energy sources to power them. These proposals are important, but they must be developed alongside regulatory and behavioural guidelines that seek to reduce reliance on data centres in the first place.

Moving towards this datacentric perspective differs from the usual approach to the transition to clean energy because it requires a model that accounts for the power consumed by data centres at all stages, from electricity generation to consumption. Transparency is central to this model, as it will give consumers the information they need to make informed choices around how data centres use and store their data. It will also prompt people to delete their own personal data as much as possible. Transparency is also important for energy producers, so data centres can be located in optimal locations and integrated with renewables where possible. Such a model can also incorporate regulations around data storage and deletion where necessary, to ensure that best practices are followed.

This type of approach enables the energy transition framework to evolve dynamically. It addresses both current and emerging energy challenges, thereby further refining and deepening the framework's scope and effectiveness. Most importantly, it includes consumers in the equation, and calls for a communication between producers and consumers. In this context, the datacentric perspective of the energy transition can be understood as a form of energy citizenship, where individuals are empowered to contribute to reducing emissions associated with data centres.

DATA FOCUS

A 'datacentric' perspective on the energy transition means the impact of data being at the heart of all decisions in the power cycle.

	Conventional model	Datacentric perspective
Production	Renewable energy production and battery storage planned according to general grid capacity.	Energy-demand models for data centres feed into capacity planning.
Distribution	Power generation distributed according to general demand.	Distribution aligned with the location of data centres, local climate, and nearby renewable-energy sources.
Consumption	Consumers practise general energy-saving activities.	Awareness of energy costs of data storage feed into behaviour and regulation.