Dimensional

PERSPECTIVES

AI Data Centers and Emissions Q&A Pt. 2: Impact on Carbon Footprint

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In Part 1 of this two-part series, Michael Gillenwater, the executive director, dean, and co-founder of the Greenhouse Gas Management Institute, explained the basics of carbon accounting and the challenges in estimating emissions from energy purchased for a company's own usage, known as scope 2 emissions.[1] In Part 2, we explore how the growth in energy usage by AI data centers will be reflected in a company's carbon footprint.

Dimensional: There has been a lot in the news about how there isn't enough energy to supply the increasing power needs of AI. What's your take on the growth in demand?

Gillenwater: Data centers are obviously a very hot topic now. Over the last 10 to 15 years in the US, we saw first natural gas and then renewables begin to replace coal as energy sources, but the overall energy demand was relatively static.

More recently we've seen a boom in demand for power. According to some estimates, US data centers are projected to account for 90 gigawatts of additional grid demand by 2030, or 55% of all demand growth over the next five years.[2] The growth of data centers has coincided with the shift to electric vehicles and heat pumps, and all of these stacked on top of each other are driving growth that is perhaps a bit faster than what we've seen in other growth periods.

Spikes in energy demand are not unprecedented—we saw similar spikes after World War II and then in the 1960s when air conditioning became more ubiquitous. But in some respects, the current growth in demand due to data centers *is* interesting and different. Historically, drivers of demand have tended to be widely distributed—for example, the growth in energy demand due to electric vehicles is happening all over the country. Data centers, on the other hand, are concentrated in specific locations. The increase in demand from data centers is also very choppy—the minute a new data center is turned on, electricity demand goes from "zero to 60," and the opposite when a data center is turned off, and there is a similar effect when data centers are ramped up or down. These features make the recent growth in demand from data centers quite different from prior spikes.

Dimensional: How do these differences in where and how energy is used present challenges in accounting for emissions?

Gillenwater: It definitely adds a layer of complexity and puts into sharp relief some of the inherent challenges of calculating scope 2 emissions. I mentioned in Part 1 that there has been a move toward using hourly grid averages rather than annual grid averages to calculate scope 2 emissions. When developing an hourly grid emission factor, there's a built-in assumption that things aren't changing that dramatically, so it's possible to have a reasonable prediction of the load profile per hour. But because demand from AI data centers can be choppy, data centers could potentially cause dramatic shifts in demand. So there's a question of whether methodologies and hourly estimates can catch up when data centers are turned on or off.

There's also a question of fairness. All companies in a particular location use the same grid average factor to calculate their scope 2 emissions, so if a data center's energy usage impacts the average grid factor in a particular location (e.g., by causing a ramp-up in gas-fired generation), then that will be reflected in the greenhouse gas (GHG) inventories of all the other companies in that location.

Dimensional: What about data centers that generate their own electricity on-site and companies that outsource their data centers to third parties? How do you think about those scenarios in the context of a company's carbon footprint?

Gillenwater: For data centers that are generating their own energy on-site, this would be reflected in the company's scope 1 emissions. This is not unique to AI. Technology companies have owned and operated data centers for the purposes of providing web services for many years. The difference around AI data centers is more a matter of degree: The companies that own and operate emissions-intensive data centers may see emissions from these data centers make up an increasingly large portion of their scope 1 emissions.

The same is true when it comes to outsourcing. Some companies have chosen to outsource their data centers to third parties, typically to companies known as hyperscalers—cloud providers that often operate massive global data centers. As with other outsourced activities, emissions associated with outsourced data centers would be reflected in a company's scope 3 emissions, rather than in its scope 1 or 2 emissions. Reporting scope 3 emissions comes with its own host of challenges, particularly a lack of comparability across companies, which I've written about as well.[3]

Dimensional: Perhaps a topic for future Q&A! Any final thoughts on the carbon footprint of companies using AI data centers?

Gillenwater: I think the main difference with AI data centers is that they're more energy intensive, so the numbers are getting bigger fast. As energy usage increases, it may make companies think a little harder about their carbon footprint. It's all the more reason to continue to examine whether carbon accounting standards are fit for purpose and provide companies and investors with decision-relevant information, particularly when it comes to the different methods of calculating scope 2 emissions. These questions are front of mind as the various standards governing the reporting rules undergo revision this year.

1. Scope 1 emissions are direct emissions from sources controlled or owned by a company. Scope 2 emissions are indirect emissions from energy that is purchased by a company for its own use. Scope 3 emissions include all other indirect emissions—emissions that are a consequence of a company's activities but occur elsewhere. Michael Gillenwater, through Greenhouse Gas Experts Network Inc., provides consulting services to Dimensional Fund Advisors LP.

2. John D. Wilson, Sophie Meyer, Zach Zimmerman, and Rob Gramlich, "Power Demand Forecasts Revised Up for Third Year Running, Led by Data Centers [PDF]," Grid Strategies, November 2025.

3. Derik Broekhoff and Michael Gillenwater, "Is Scope 3 Fit for Purpose? Alternative GHG Accounting Frameworks for Inventories and Intervention Impacts," Greenhouse Gas Management Institute, October 28, 2024.

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