

Article Overview

AI servers, especially GPU-accelerated systems, are driving rapid growth in data center electricity use, with global consumption projected to nearly double by 2030.

Current Energy Use

AI workloads are highly energy-intensive due to the computational demands of training and running large models. In 2023, AI-specific GPU servers consumed over 40 TWh globally, up from less than 2 TWh in 2017, reflecting a dramatic increase in energy demand . In the United States, data centers consumed about 4.4% of national electricity in 2024, with AI workloads being a major driver . Globally, data centers accounted for roughly 1.5% of electricity consumption in 2024, or around 415 TWh, with AI accelerating the deployment of high-performance servers .

Breakdown of Energy Use

Data center electricity consumption is distributed across several components:

- o Compute servers: The largest share, especially GPU-accelerated AI servers.
- o Storage systems: About 5% of total electricity, used for centralized data storage and backup .
- o Networking equipment: Up to 5%, including switches, routers, and load balancers .
- o Cooling and environmental control: Varies from 7% in efficient hyperscale centers to over 30% in less-efficient enterprise centers .
- o Backup power systems: UPS batteries and generators, rarely used but essential for reliability .

Per-Query and Model Energy

For inference tasks, a typical ChatGPT-style query consumes roughly 0.3 Wh, while daily AI workflows involving text, images, and short videos can reach 2-3 kWh . Training large frontier models can consume tens of gigawatt-hours, enough to power tens of thousands of homes for a year .

Future Projections

Global electricity consumption for data centers is projected to double to around 945 TWh by 2030, representing nearly 3% of total global electricity . In the U.S., AI-driven data center consumption could rise to 325-580 TWh by 2028, or 6.7-12% of national electricity generation . Growth is driven primarily by AI adoption, with the U.S. and China accounting for about 80% of the increase . Annual growth in data center electricity use is expected to be around 15% per year, far outpacing overall electricity demand .

Energy consumption of an AI server

Environmental Implications

High energy use from AI servers contributes to greenhouse gas emissions, water consumption for cooling, and electronic waste due to short hardware lifespans . Manufacturing GPUs and other high-performance components also requires rare earth minerals, adding to environmental impact . Without efficiency improvements, AI expansion could significantly strain power grids and exacerbate climate change.

Strategies for Efficiency

To mitigate energy consumption, the industry is focusing on:

- o Optimizing AI models to reduce computational requirements.
 - o Developing greener infrastructure, including more efficient cooling and power systems.
 - o Software and hardware co-design to improve energy efficiency per operation.
 - o Scenario-based planning to anticipate energy demand and integrate renewable energy sources .
- In summary, AI servers are a rapidly growing driver of electricity demand, with significant environmental and operational implications. Efficient hardware, optimized models, and sustainable data center practices are critical to managing this energy footprint.

Artificial intelligence has the potential to transform the energy sector in the coming decade, driving a surge in

AI workloads have sent data center emissions skyrocketing. An MIT expert details ways to reduce energy use and

Explore the key statistics on AI energy consumption and best practices derived from leading AI researchers and

Each facility is likely to consume the same amount of electrical power as tens of thousands of residential homes,

How much electricity does AI consume? It's not easy to calculate the watts and joules that go into a single Balenciaga

In AI data centers, approximately 60% of total electricity goes to IT equipment (primarily GPUs and servers), with the

Generative artificial intelligence uses massive amounts of energy for computation and data

Today, new analysis by MIT Technology Review provides an unprecedented and comprehensive look at how

much

What is energy used for at data centers? Most of the electricity used by data centers - about 60% on average, the

AI's energy consumption AI presents opportunities and challenges in the energy landscape.

The development and uptake of artificial intelligence (AI) has accelerated in recent years -

AI-driven data center power consumption will continue to surge, but data centers are not--in fact--that big a part of global energy

This guide explains how much electricity AI data centers really use, where that power goes, why grid access has

Researchers used advanced data analytics to create a state-by-state look at that environmental impact of the AI

Sensitivity analysis for AI server energy consumption, water footprint and carbon emissions considering uncertainties

How much energy does your AI prompt use? It depends Experts explain what

Web: <https://www.supremeacademicresearch.co.za>

