

The United Nations (UN) and International Energy Agency (IEA) said AI and its data centers already use more power than many countries and project that by 2030 their global energy demand will exceed all but five countries.



"The usage is definitely significant and it's growing."

Kim Lundgren
CEO, Kim Lundgren Associates (KLA)

IEA estimates AI/data centers could use 945 terawatts of electricity by 2030, double their current consumption. That could mean AI and its data centers will consume more power than countries (and big economies) such as Japan, Brazil, Germany and France.

Lundgren said AI's energy use raises concerns about power grids and utility rates, and is a top consideration for local communities weighing data center projects across the U.S.

'SPEED TO POWER'

AI data centers need significantly more power and bandwidth to fuel computing power and machine learning. That includes powering servers and other systems and cooling systems to keep them from overheating.

Andrew Denis, chief scientist and co-founder at ZON, a Delaware-based energy technology company that works with data center developers and users, described AI's power needs as "large and compounding."

"Average rack densities roughly doubled from 2021 to 2024, AI racks now routinely exceed 50 kilowatts, and next-generation systems are pushing toward 200 kilowatts per rack — with a further fourfold jump expected by 2027," Denis told Adams Multi-Media (AMM).

"Every watt of compute demands cooling on top of it, and training runs swing hundreds of megawatts up and down in seconds," he said.

AI's thirst for power entails a basic prompt requiring as much as 10 times the power of a traditional Google search and larger machine learning tasks needing even more electricity, according to the UN.

Britt Burt, vice president of power industry research at Industrial Info Resources (a Texas-based research and consulting firm), said power needs top the list of where new data centers are being proposed and planned.

"They are such a huge electricity user," Burt said. "The old mantra of location, location and location has really given way to speed to power."

Denis agrees. "It is now the defining constraint — not chips, not land, not capital. Roughly half of the data center projects slated to come online in 2026 face delays attributable to power availability," he said.

CONCENTRATED SURGES

Burt said an estimated \$6 trillion is eyed for investment in new data centers globally, with much of it targeted in the U.S. "About \$4 trillion of that is in the U.S.," Burt said.

Increases in data centers' electricity usage could be even more pronounced in U.S. states where new data centers are landing.

Virginia, which is already the top hub for data centers, could see energy use by technology facilities increase from approximately 25% to as much as 57% by 2030, according to Energy Power Research

Institute (EPRI).

The California-based group projects several other states could see big increases in the amount of power used by data centers.

Wyoming and Iowa could see data centers' power use triple to approximately 30% of total electricity consumption, respectively, by 2030, according to EPRI.

Ohio, Texas and New Mexico could see data centers' electricity usage go from single digits to 20% or more, respectively, by 2030.

HIGHER RATES?

Some worry whether the increased demands could result in high utility bills for residential and other business ratepayers.

Cardinal rules of market economies dictate that increased demand and/or gobbled-up supplies usually result in higher prices.

"Communities near major clusters in Virginia, Texas, and Georgia have reportedly seen electricity rates rise 8 to 15%," Denis said. "In the (Mid-Atlantic) region, data centers were blamed for over \$9 billion in added capacity costs as auction prices hit records; in Ireland, data centers already consume more than 20% of national electricity."

Several states, including Florida, Tennessee and Oregon, have passed new laws restricting utilities from passing on increased rates from data centers to other ratepayers.

Other states are considering similar moves.

Oregon's law includes a tariff and rate hike on big data center developers and hyperscalers aimed at counteracting higher utility bills for residential and other users.

POWER PLAYS

The AI surge also creates concerns over whether power grids can handle the added AI-driven loads.

Power infrastructure in rural areas and small towns, in particular, may need upgrades and new equipment.

"Much of our energy grid across the United States is 40 years old or older," Burt said.

Some AI data center developers and large hyperscalers are paying for upgrades to local and regional power grids or linking to older coal-fired, nuclear or energy plants.

"In a lot of cases they are footing the bill for upfront help for upfront infrastructure, for transmission lines and substations," Burt said.

Speed to market and the need for power are combining to compel developers and hyperscalers to build their own off-meter power plants and develop their own energy sources.

U.S. President Donald Trump has pushed for easing regulations and allowing new data centers to build and rely on their own power plants.

Trump says that will help the U.S. in the global AI race and ensure data center power demands don't have downstream impacts on other ratepayers.

But going off-meter has its own challenges, including financing, supply chain backlogs, inflation and regulatory approvals.

"Going off grid is not as easy as it might seem," said Parag Nathaney, a Washington-based energy and electricity markets analyst.

Nathaney said the energy equation requires cooperation between data center builders and utilities on power supplies, supply chain snafus and connectivity challenges.

"Data center load growth will be limited by how much new grid supply can be added," he said.

"Utilities also need to be nudged by regulators in sharing locations where there is large capacity on the grid available to integrate new load relatively quickly. This should allow for greater integration of data center load without straining the existing grid

DATA CENTERS

Five questions on energy

Artificial intelligence can be power hungry. Machine learning and its infrastructure could consume triple the energy of existing data centers by 2030.

1 What is inside data centers that accounts for their energy needs and consumption?

Computer servers that process and store data generally account for 60% of electricity demand in data centers, according to the International Energy Agency (IEA).

Cooling systems to keep servers and equipment from overheating and breaking down can comprise between 7% and 30% of power needs, according to the IEA. Storage systems, networking equipment and backup generators are also part of data centers' electricity footprints.

2 How much power do data centers use now?

In the U.S., data centers accounted for 4.4% of total energy use in 2023, according to the U.S. Department of Energy's Lawrence Berkeley National Laboratory. Globally, data centers use roughly 485 terawatt-hours (TWh) of electricity, 1.5% to 2% of the world's total generation, according to IEA.

3 How much energy are AI data centers projected to use?

Data centers' power needs could total 20% of all electricity use by 2030 or 2035, according to analyses by Penn State University and Bloomberg. IEA projects data centers' global energy consumption to total 945 TWh by 2030 and 1,200 TWh by 2035.

4 Why do new data centers require so much more power?

AI workloads require specialized hardware that consumes significantly more electricity than conventional servers and programs. Traditional CPU (central processing unit) servers are usually 300-500 watts per server, according to energy firm SolarTech.

By comparison, AI-oriented GPU (graphics processing unit) have a much larger capacity of 3,000 to 5,000 watts per server. AI training processors are even bigger with capacities exceeding 10,000 watts per server.

5 How much energy does AI require and use compare to other technology?

A single AI prompt can require 10 to 15 times as much energy as a Google search, according to estimates from IEA and OpenAI, which operates ChatGPT. Training a machine learning system needs data centers that have as much as 40 times more bandwidth than older data centers, according to the University of Virginia.

SOURCES: IEA, OpenAI, University of Virginia, Penn State University, JLL, Lawrence Berkeley National Laboratory, SolarTech

and raising rates for consumers.

Speed-to-market needs have hyperscalers and AI data center builders scrambling for energy options.

Where are they turning? That's next in our series. For more on this series, including digital discussions and coverage from across the country check out <http://datacenterdiscord.adamsmultimedia.com/>.

About this series: Digital forums

Adams MultiMedia (AMM) is hosting forums online featuring experts in the artificial intelligence (AI) data center space, as well as our journalists from across the country who have been covering projects and community concerns.

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