

Artificial Intelligence: Inputs, Infrastructure and Investments

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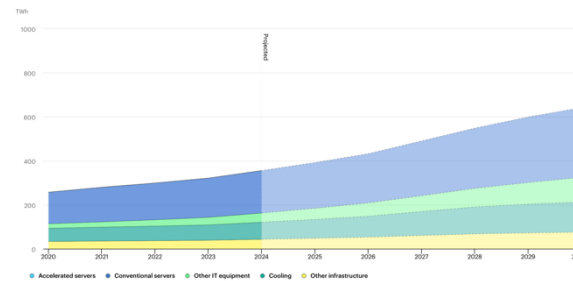
Introduction

For the current expansion of Artificial Intelligence (AI), the bottleneck of this trend is not the algorithms or lines of code; it is the physical infrastructure that is required for AI operations. Although AI is a digital technology, its expansion is constrained by electric power, data centers, cooling capacity, a physical grid, and land. As the large “hyperscalers” and tech companies develop their AI models, these models must be trained using processors and other computing facilities. Despite the market turmoil in January 2025 due to *DeepSeek’s* supposed efficiency gains, the rising demand for cloud services and (generative) AI content is still expected to trigger immediate surges in energy and data center demand. A *Goldman Sachs* report from February 2025 forecasts an increase in demand from data centers of 50% (compared with 2023) by 2027 and up to 165% by the end of the decade. In order to meet this demand, increasing amounts of capital are being invested in the capacity of data centers, electricity generation, and other related infrastructure.

Growing Electricity Consumption

Data centers’ share of global electricity consumption was estimated at 1.5% in 2024, equivalent to 415 terawatt hours (TWh). The consumption volume has grown by 12% annually over the last five years. With accelerating AI deployment, more power is needed to run servers, storage systems, cooling systems, backup batteries, and network equipment of data centers. Compared to the energy consumption in 2024, data centers’ electricity consumption is set to grow by 130% in the US, 170% in China, and 70% in Europe by 2030. Serious constraints on energy availability could emerge, especially when combined with the increasing energy consumption of other sectors in the economy.

Figure 1: Electricity Consumption of Data Centers



Source: International Energy Agency

In recent years, tech companies have begun to reach agreements with energy providers for the purchase of electric energy. This reduces the dependency on the national grid and ensures availability of power at companies’ discretion. In 2010, *Google* became one of the earliest adopters of corporate power purchase agreements by signing its first contract to buy 114 megawatts (MW) of wind power in Iowa, US.

The availability of power becomes a strategic advantage of regions, states, and countries. The supply of electric power indeed attracts industry: When announcing the planned construction of a 1 gigawatt (GW) data center in Texas, *Meta* highlighted the “robust energy resources” of the location in El Paso, US. The investment, worth USD 1.5 billion, will support the growing AI workload and will finance investments in the grid and transmission lines.

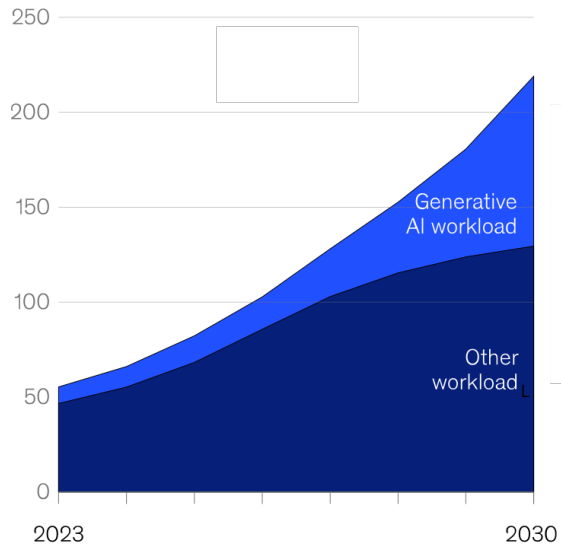
Especially nuclear energy has caught the attention of the likes of *Microsoft* and *Meta*. Clearly, nuclear energy is able to provide an uninterrupted flow of electric power with near-zero carbon emissions. That is why *Amazon*, *Meta* and others started to fund nuclear projects, and *Microsoft* joined the *World Nuclear Association* – often regarded as a lobbyist group. One of the noteworthy partnerships between nuclear energy providers and tech companies is *Meta’s* 20-year deal with *Constellation Energy*, according to which *Meta* will receive 1.1 GW of power starting in 2027.

Although the immediate demand for data center capacity would call for the immediate scaling of power supply, some tech conglomerates also take a long-term perspective on the matter with their bets on small modular reactors (SMR). SMRs promise to run at lower risks of meltdowns due to their cooler temperatures and smaller sizes. Despite being only in very early stages and, according to some critics, not financially viable, *Google* reached an agreement for 500 MW of electric energy with *Kairos Power*, a developer of fluoride salt-cooled reactors as a type of SMR.

Construction of Data Centers

At the heart of the AI infrastructure lie the data centers themselves. Those data centers were previously used primarily for cloud computing and storage workflows; these use cases are also likely to grow in the future. Meanwhile, the deployment of AI adds additional workload and is projected to require 27% of the overall data center capacity by 2027. Since the advance of AI depends on numerous factors, *McKinsey* forecasts a possible constant annual growth rate for data center capacity of 19-27%. Contrasted with the current demand of 60 GW, this would imply a global demand for data center capacity of 171-298 GW in 2030. As a midrange scenario, McKinsey estimates data center capacity demand of 219 GW, equivalent to an average growth rate of 22% per year.

Figure 2: Growing Data Center Capacity for AI Workloads



Source: McKinsey & Company

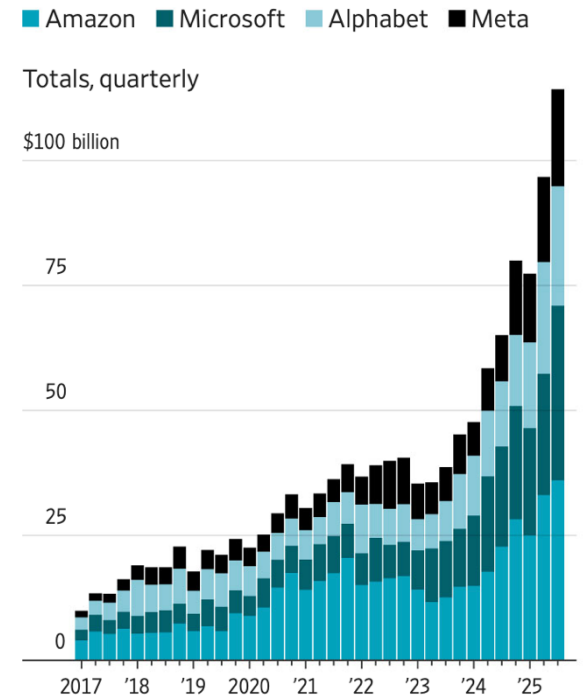
It is worth noting that a data center must fulfill the requirements of high computational power and power density for the use in AI workloads. This specification of data centers will be most sought after in the coming years, as around 70% of total demand will be for data centers that are able to host AI workloads, contrasted by around 40% in 2023. The pace of progress shifts the perceptions of scale. With the explosion of power consumption, data centers with a capacity of 200 MW are normal, whereas 30 MW was considered large just 10 years ago.

However, the energy supply is a serious obstacle for the construction of new data centers since transmission infrastructure cannot be built quickly enough, and data centers exert pressure on the electricity grids, both of which motivated Ireland to stop issuing new grid connections to data centers in the Dublin area until 2028. North America and the Asia Pacific region are the world's leaders in terms of data center supply – a metric that is influenced by both supply-related conditions and corporate demand. For example, Northern Virginia and Beijing are hubs with notable data center activity that supply 7% and 8% respectively of the current uninterruptible power supply. Amongst the capital expenditure plans of companies is *Microsoft's* plan to invest several billion US Dollars in AI cloud facilities in Wisconsin. In Europe, the Nordics see some data center activity; for instance, in Norway, where *OpenAI* pledged to install 100,000 Nvidia processors in its first investment in Europe. As part of *OpenAI's* Stargate program, USD 1 billion will be invested in a facility with access to renewable energy from hydropower production.

Investments and Capital Expenditure

To facilitate the AI expansion, large expenditures and investments are required. As shown in the figure below, capital spending by a selection of major US tech companies has entered a new, almost exponential phase. What had been a combined investment level of roughly USD 25-30 billion per quarter just a few years ago has now climbed toward USD 100 billion. The spike is broad-based across all four companies, but the steepest increases come from *Amazon* and *Microsoft*, reflecting the enormous build-out of AI data-center capacity, power supply, and cloud infrastructure by just the four companies.

Figure 3: Trend of Capital Expenditure by Tech Companies



Source: Wall Street Journal

Besides financing from companies' balance sheets, using private capital or infrastructure funds is an increasingly common alternative. Asset managers, such as Brookfield, BlackRock, or Blue Owl Capital, play an active role in financing these large-scale investments. In November 2025, Brookfield launched a USD 100 billion AI infrastructure fund deploying capital across every stage of the AI value chain. Many data center campuses, e.g. OpenAI's Stargate Norway, are being built through joint ventures. For alternative asset managers, private debt issuances are interesting opportunities to inject private capital. For example, Meta's project in Louisiana was the firm's biggest private capital deal. Under a special purpose vehicle, Meta retains a 20% stake in the project, while the project is under control of Blue Owl Capital with an 80% equity stake. Without any direct impact on the debt on Meta's balance sheet, Meta could sell bonds worth USD 27 billion to big bond buyers, such as Pimco or BlackRock.

Outlook

AI's advance is often seen as a competition for better models, but the real competition is unfolding in the physical world. Given the role of energy in the deployment of AI, it is clear that the redundant capacities of affordable electric energy are strategic advantages for the build-out of AI infrastructure. Companies and countries that can finance and create AI infrastructure and supply energy can be at the forefront of the technological leadership. Yet the trajectory is uncertain: breakthroughs such as DeepSeek's efficiency gains could rapidly alter compute demand and challenge today's infrastructure assumptions. Still, these shifts create commercial openings for data center operators, energy-infrastructure firms, as well as investors and funds positioned to finance the build-out.

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