Navigating the Data Center Landscape

The data center sector has experienced remarkable growth in recent years, given the increasing adoption of artificial intelligence (AI) and cloud-based solutions that require vast storage capacities. This expansion has fueled a surge in financing, as hyperscale and colocation operators seek cost-effective financing solutions to meet growing demand. As a result, capital markets are playing an important role in funding infrastructure developments through project and structured finance offerings (see related publications section). As far as asset-level performance, vacancy rates are at record lows owing to strong absorption levels despite the increasing supply. Given the strong fundamentals and continued institutional investment, capital market financing is well-positioned for growth in the coming years. This KBRA report highlights what is driving demand, as well as the potential constraints faced by the industry.

Key Takeaways

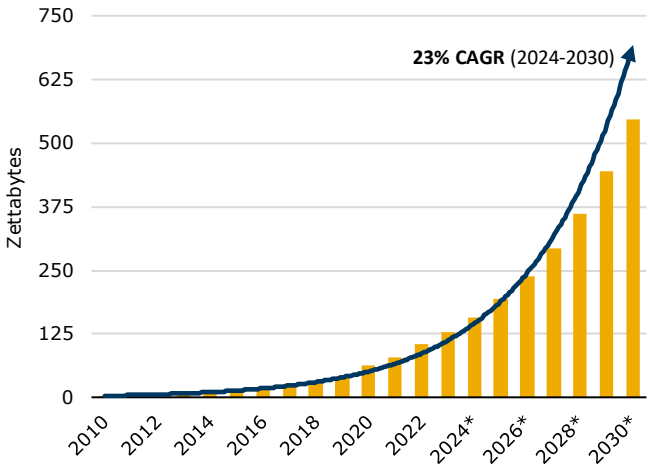
- Data center power demand is projected to increase 160% by 2030, driven by the adoption of cloud-based solutions and AI technologies. These AI technologies including machine learning, deep learning, and autonomous systems are expected to account for 19% of data center power demand by 2028.
- The sector is facing supply pressures related to power and land availability, as well as regulatory hurdles.
- In the Americas, the power capacity under construction has increased approximately 2,866MW or 82.6% year-over-year (YoY) in 1H 2024. Amid rapid development, the total data center capacity in operation added 2,383MW from year-ago levels.
- In many primary markets, substantial capacity expansions have been matched with solid absorption levels, leading to record low vacancy rates of below 1.5%.
- The accelerated growth in the data center industry has translated into a surge in new issue activity in the capital markets. Data center issuance increased nearly 7.4x since 2018, rising at a 39.7% compound annual growth rate (CAGR).

Data Center Demand

Data center infrastructure has become the backbone of today's economy, powering everything from search engines to e-commerce to cloud computing and AI. With the amount of data created and stored to support these technologies experiencing exponential growth and expected to rise at a 23% CAGR through 2030 (see Figure 1), the demand for data center capacity has also increased rapidly.

As interest in the deployment of cloud computing continues to rise, many organizations are steering away from traditional, on-premises IT infrastructure to cloud-based solutions to achieve flexibility, scalability, and cost efficiency, as it enables businesses and individuals to access data and software remotely without the need for local servers or personal hardware. This migration has increased the demand for data centers, as cloud services offered by platforms such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud, and others need increased data center capacity to fulfill their clients' needs.

Figure 1: Global Volume of Data Created Annually



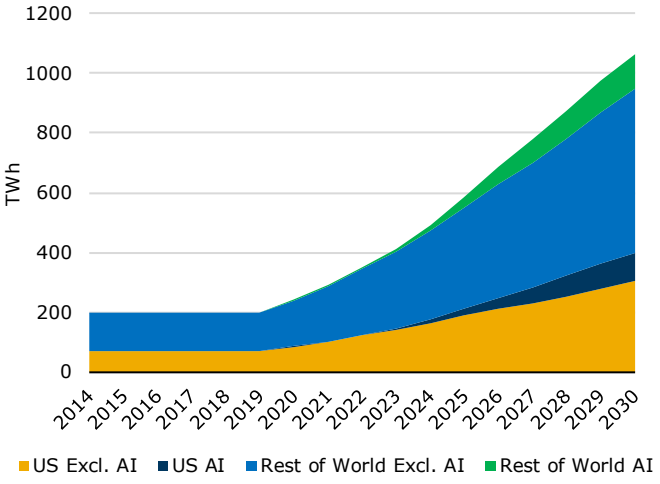
Note: One zettabyte (ZB) is equal to one trillion gigabytes, which can store about 200 trillion songs of 5 megabytes (MB) each.
* Denotes an estimate.
Sources: KBRA, JLL Research, IDC

The increasing adoption of AI technologies—particularly machine learning, deep learning, and autonomous systems—has also contributed to the insatiable demand for data center capacity. Unlike traditional cloud computing tasks, such as basic storage, hosting, or standard processing, AI workloads often require massive storage and robust real-time data processing capabilities to train AI models. The case of Waymo's autonomous driving system, highlighted in a recent Green Street data center webinar, helps illustrate the vast storage and processing capacity required for AI technologies.[1] Each driverless vehicle generates so much data during a day of operation that it cannot be transmitted through conventional fiber optic cables. Instead, a server must be physically removed from the vehicle and taken to a nearby data center for processing on a daily basis.

[1] Green Street, August 13, 2024: Industry Leaders: Data Centers, A Global Perspective.

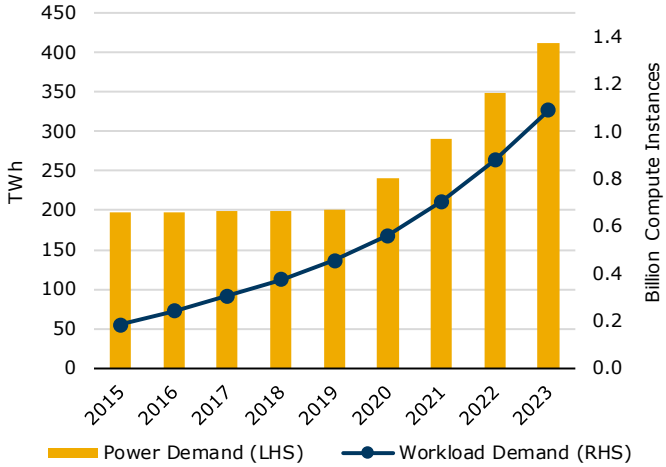
With the adoption of these technologies, data centers have seen a significant rise in workloads, which nearly tripled between 2015 and 2019. However, data center power consumption remained steady at around 200TWh per year during this period, largely due to data centers becoming more efficient in their power consumption. As efficiency advancements have slowed since 2020, power consumption has followed an upward trend thereafter (see Figure 2 and Figure 3). A May 2024 report by Goldman Sachs Research noted a 160% increase in data center power demand by 2030, largely driven by the AI revolution, with the annual increase in power demand estimated at 200TWh.[2] The report further projected that AI would account for 19% of data center power demand by 2028, and that the share of global electricity consumed by data centers is expected to rise from 1%-2% in May 2024 to 3%-4% by 2030.

Figure 2: Data Center Power Demand



Note: Power demand for 2023-2030 are estimates.
Sources: KBRA, Masanet et al. (2020), Cisco, IEA, Goldman Sachs Research

Figure 3: Power and Workload Demand



Note: Power demand for 2023 is an estimate.
Sources: KBRA, Masanet et al. (2020), Cisco, IEA, Goldman Sachs Research

Data Center Supply

As data center power demand grows faster relative to the development of infrastructure required to support it, energy availability remains one of the most critical challenges globally. To put data center electricity consumption into perspective, consider DataBank's ATL5 data center located in Atlanta, which has 48MW of power capacity. Given that a U.S. household consumes 10,500kWh per year on average, or approximately 1.2kWh continuously, this data center would power approximately 40,000 households. Power shortages have become a major concern in some European markets, including Frankfurt, London, and Amsterdam, as securing energy for new developments is becoming increasingly difficult. In U.S. primary markets (i.e., Northern Virginia, Chicago, Dallas, Silicon Valley), known for their established network infrastructure and connectivity for efficient data transmission, operators are aiming for delivery times of two to three years.

However, many operators are facing more than five-year delivery times for future power, according to the most recent Cushman & Wakefield data center update.[3] In markets where power could not be delivered in the desired timelines, the report states that some operators signed agreements with energy companies to develop alternative solutions. Some of these efforts included power delivery through transmission lines, substations, or sourcing micro-grid power. Other efforts consisted of partnering with third-party developers focused on sustainable solutions who are currently accelerating projects involving wind, solar, battery storage, natural gas, nuclear, and even geothermal energy. Land availability is another major issue, particularly in primary markets where space is increasingly limited. Northern Virginia—the largest data center market globally—is facing land scarcity in important counties such as Loudoun and Prince William, according to Q1 2024 CBRE research.[4] In Northern Virginia, public cloud providers and AI companies have leased most of the available space, resulting in a record-low vacancy rate of 0.9%. The Chicago market faces the same issue in core areas, with high demand from hyperscalers, enterprise users, and financial services companies pushing the vacancy rate to a record-low 1%. As land becomes increasingly scarce, both markets face affordability challenges as development costs continue to rise. Regulatory challenges add another layer of complexity. In Amsterdam, stricter environmental and zoning regulations are making it harder to build new data center facilities amid growing demand.

[2] Goldman Sachs, May 14, 2024: AI Is Poised to Drive 160% Increase in Data Center Power Demand.
[3] Cushman & Wakefield, September 3, 2024: Americas Data Center 1H 2024 Update.
[4] CBRE, June 24, 2024: Global Data Center Trends 2024.

Emerging markets as well as U.S. and European secondary markets are becoming increasingly attractive as primary hubs struggle to keep up with demand. Multiple cities in South America such as Queretaro (Mexico), Santiago (Chile), and Sao Paulo, along with Asia-Pacific markets including Hong Kong and Tokyo, are gaining attention from operators due to increased data center availability. Although secondary and emerging markets generally have greater availability, they face challenges like those observed in primary markets, which relate to energy supply and inadequate infrastructure to support large-scale data center power demand.

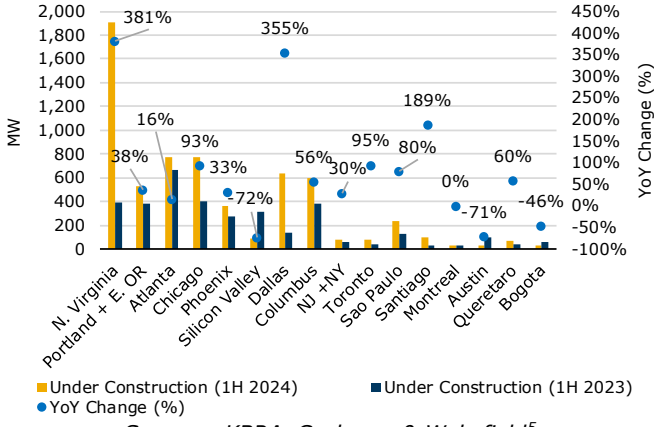
Data Center Key Indicators for the Americas

The data center sector is making significant progress to expand its capacity despite the significant supply headwinds. In the Americas, the power capacity under construction has increased by approximately 2,866MW or 82.6% YoY, in the first half of 2024 based on Cushman & Wakefield's 1H 2024 data center update. Notably, new developments in Northern Virginia, reflecting 1,509MW, represent nearly 53% of the overall YoY increase. We observe that Dallas, Santiago, Toronto, and Chicago have also experienced sizable increases in new developments, each exceeding 90% (see Figure 4).

Recent developments noted in Cushman & Wakefield's most recent Data Center Update include Google's additional $1 billion investment in its Virginia data center and a commitment to purchase 1.5GW of solar power from Energix for delivery by 2030. Google is also investing $2.3 billion to develop three data center campuses near Lancaster, Ohio, in the Columbus area, supplementing the $4.4 billion it has already invested there. Meanwhile, Microsoft has announced plans for a 500,000 sf data center in Arcola, Virginia, and is expanding its Leesburg campus with two new data centers. In addition, the company has signed a nuclear power purchase agreement (PPA) with Constellation to supply its Boydton data center campus in Virginia. In Atlanta, Microsoft purchased 161 acres in Tyrone in April 2024 for the construction of two single-floor data centers totaling nearly 500,000 sf. The hyperscaler has also acquired 506 acres in Plano, Illinois, as part of its expansion strategy beyond its Hoffman Estates campus in the Chicago market.

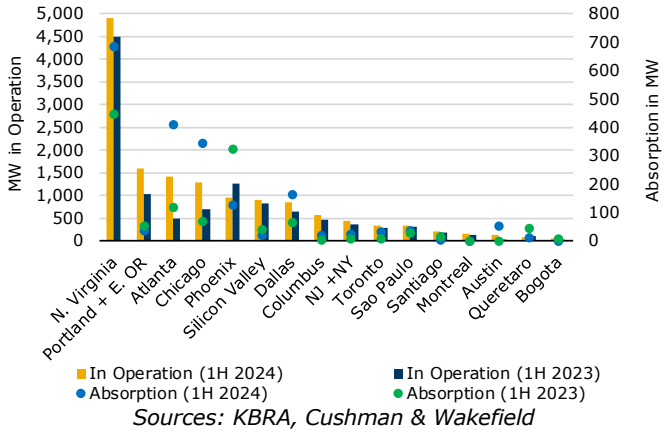
Amid rapid development, the total data center capacity in operation added 2,383MW from year-ago levels in 1H 2024, pointing to a YoY increase of 25%. Austin (Texas), Atlanta, and Chicago's supply increased 240%, 194%, and 86%, respectively, and 12 out of the 16 markets analyzed experienced a supply increase of more than or equal to 10%. With soaring demand fueled by the significant needs of cloud providers and AI companies (i.e., Amazon Web Services, Microsoft, Meta, Google, and Databank) looking to secure extensive pieces of land and large power loads, primary markets have quickly absorbed the additional supply. The Atlanta, Chicago, and Northern Virginia markets lead the pack with absorption levels rising above 238MW YoY. Although Phoenix has seen a YoY decline in absorption, the market posted solid absorption figures at 126MW in 1H 2024. Other key markets such as Dallas and Austin also showed significant YoY increases in absorption figures, further underscoring the growing need for data center space in these regions (see Figure 5).

Figure 4: Data Center Under Construction (MW)



Sources: KBRA, Cushman & Wakefield[5]

Figure 5: Data Center in Operation (MW)



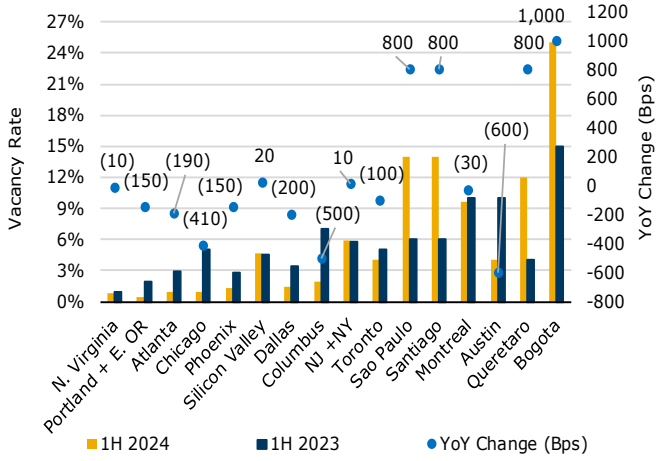
Sources: KBRA, Cushman & Wakefield

Building on this momentum, vacancy rates have reached record lows across multiple primary markets. Except for Montreal and Latin American markets, all vacancy rates remain below 6% in 1H 2024, with new YoY lows in eight out of the 10 U.S. and Canada markets included in the analysis. Vacancy rates in primary markets including Northern Virginia, Portland and Eastern Oregon, Atlanta, Chicago, Phoenix, and Dallas remain below 1.5%. Northern Virginia's already low vacancy rate dropped even further to 0.8% from 0.9%, while Austin saw the largest YoY decrease of 600 basis points (bps), followed by the 500-bp YoY decline observed in the Columbus area. Chicago also logged a notable decrease, with its vacancy rate

[5] Data compiled from Cushman & Wakefield reports: Americas Data Center 1H 2024 Update and Americas Data Center 1H 2023 Update.

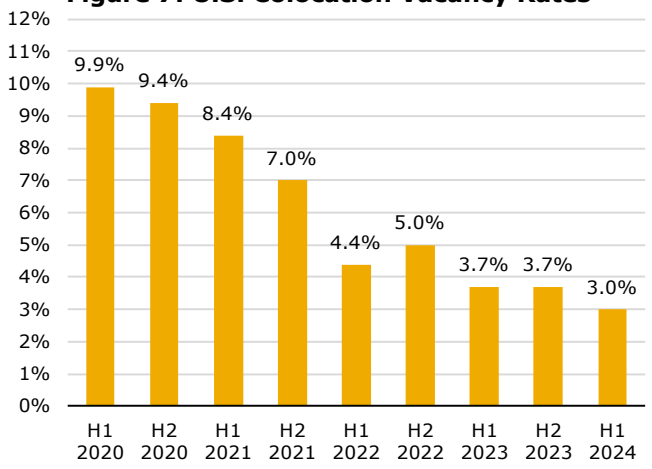
falling 410 bps YoY to 1% from 5.1% (see Figure 6). Despite substantial capacity expansions in many primary markets, strong absorption levels have kept pace with the increased supply, pushing vacancy rates to record lows. According to a recent JLL Research report, U.S. colocation vacancy rates have shown a steady decline since 1H 2020.[6] The decrease was largely driven by pre-leasing activity, as 84% of capacity under construction is already pre-leased due to limited immediate capacity. Assuming continued heightened demand and elevated pre-leasing activity, the report concludes that vacancy rates should approach 0% in the coming years (see Figure 7).

Figure 6: Data Center Vacancy Rates (MW)



Sources: KBRA, Cushman & Wakefield

Figure 7: U.S. Colocation Vacancy Rates



Sources: KBRA, JLL Research

Data Center Financing

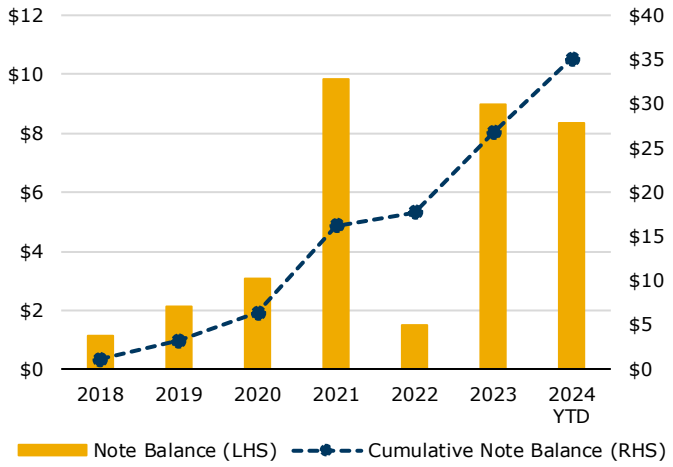
The accelerated growth in the data center industry has translated into a surge in need for financing solutions, driven by increasing demand for hyperscale and colocation data centers. With data center capacity under construction rising 2,224MW (51%) YoY in primary markets (i.e., Northern Virginia, Portland and Eastern Oregon, Atlanta, Chicago, and Phoenix), capital markets have played a key role in these markets, offering various types of solutions ranging from project finance to green and ESG-linked loans to securitization. Notably, financing played a crucial role in Northern Virginia where capacity under construction increased 1,509MW YoY—the largest supply increase across primary markets.

Issuers are increasingly turning to asset-backed financing to find cost-effective solutions to finance the development of data center infrastructure. Data center issuance increased nearly 7.4x since 2018, growing at a 39.7% CAGR (see Figure 8). Vantage Data Center's VDC 2018-1 paved the way for data center asset-backed securitization (ABS), issuing $1.125 billion in securitized notes to fund its expansion in the Santa Clara (California) and Ashburn (Virginia) markets. In 2021, Flexential completed a $2.1 billion transaction—the largest data center ABS issuance to date—in order to deploy greater data center capacity in its existing and new markets (see Figure 9 and Figure 10). Despite headwinds presented by elevated interest rates, 2023 and 2024 saw strong ABS new issue activity, with Switch and CyrusOne data centers raising $1.7 billion and $1.4 billion in 2024, respectively.

As the demand for construction capital continues to expand, it is likely that banks will look to the project finance market to issue long-term debt that includes some development risk. Currently, banks are providing construction loans to developers with the intent of refinancing these loans in the institutional market once commercial operations are achieved. However, KBRA believes that project finance structures will likely start to incorporate varying degrees of construction risk, given the constraints on bank capital. Solid fundamentals in the data center sector, along with the ability of the capital markets to meet financing needs, will also position this sector to contribute significantly to the supply of structured products in the coming years. The following graphs and chart depict securitized issuance dating back to the Vantage securitization in 2018.

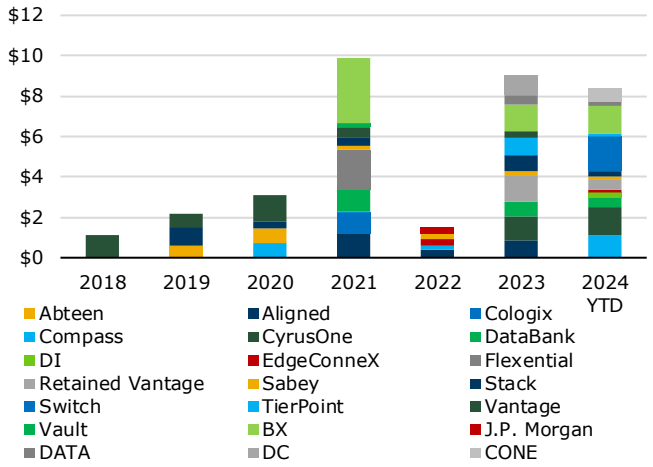
[6] JLL, August 27, 2024: U.S. Data Center Report - Midyear 2024.

Figure 8: Note Balance by Year (Billions)



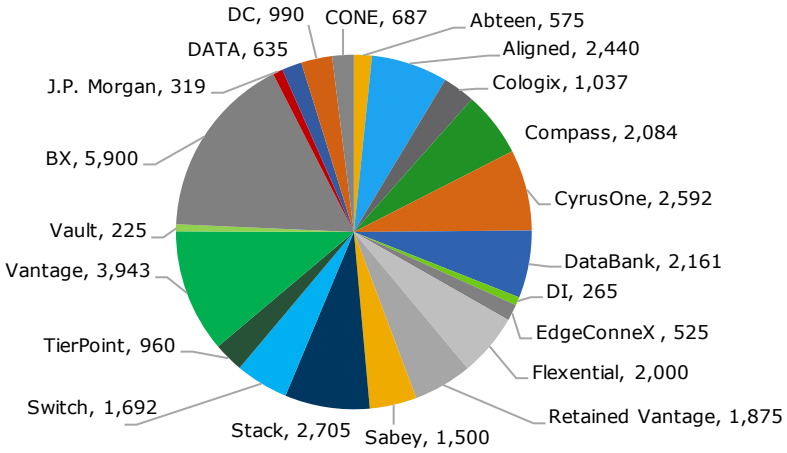
Sources: KBRA, Asset & Commercial Mortgage Alert Database

Figure 9: Note Balance by Issuer (Billions)



Sources: KBRA, Asset & Commercial Mortgage Alert Database

Figure 10: Note Balance by Issuer Through YTD 2024 ($Millions)



Note: Reflects total issuance from 2018 to YTD September 2024.
Sources: KBRA, Asset & Commercial Mortgage Alert Database

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