REAL ESTATE RESEARCH

Data Centre Market View

Source: CBRE

Summary

Data centres are facilities which house IT infrastructure that process, store & transmit data. We focus on three main types of data centres: enterprise, colocation and hyperscale, with subtypes of colocation data centres being retail colocation and wholesale. Different data centre types may be associated with different lease terms (e.g., all-in, Gross + Electric or Triple Net).

Demand for data centres has been rising in recent years, driven by the growth in worldwide data creation and cloud computing. The rise of Artificial Intelligence ("AI") is expected to increase not just data centre demand, but also requirements as AI workloads are generally more power-intensive and may thus require advanced cooling technologies.

Listed industry leaders providing data centre services include Equinix, Inc. ("EQIX"), Digital Realty Trust, Inc. ("DLR") and Nippon Telegraph and Telephone Corporation ("NTT"), each of which is last known to have an ownership interest in or operates (or has a "footprint" of) more than 200 data centres.

To meet rising demand, data centre operational capacity has been rising across Americas, EMEA (or Europe, Middle East and Africa) and Asia Pacific in 1H 2024. As demand continues to exceed supply, rental rates have also been rising across geographic regions (Americas, EMEA and Asia Pacific). Common regional challenges include land and power availability, for which operators and developers have responded by expanding into peripheral markets (e.g., Indianapolis in Americas, Mainz in EMEA).

Contributor: Calvin Mau
(+65 6323 1788)

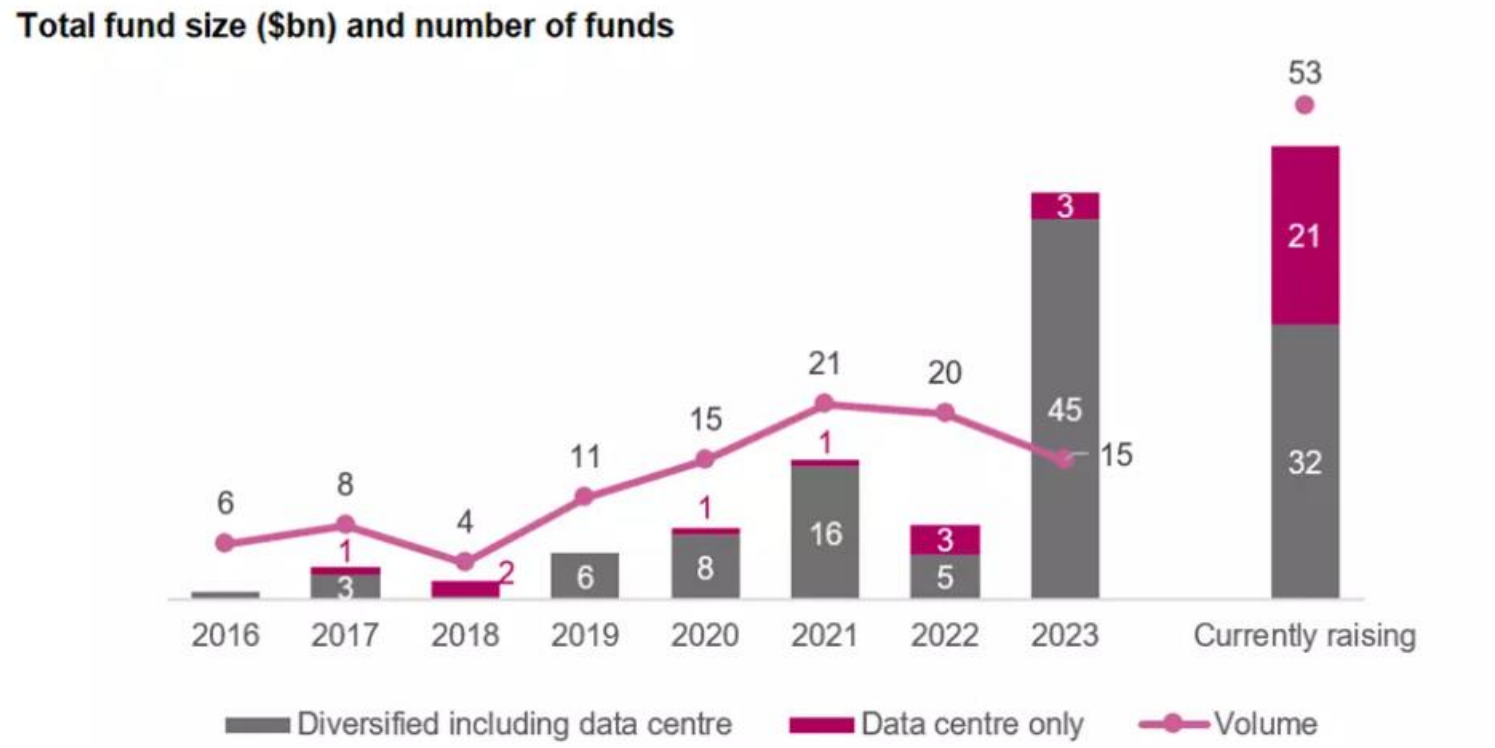
TABLE OF CONTENTS

INTRODUCTION TO DATA CENTRES

Demand for data centres has been rising in recent years. According to the Financial Times ("FT"), new U.S. data centre capacity announced from January to June 2024 exceeded the "entirety of 2023". According to Linklaters, a law firm, the amount of capital raised by real estate funds for data centre-related deals rose by about 2.8 times from around $17 billion ($16 billion diversified + $1 billion data centre only; currency unstated) in 2021 to around $48 billion ($45 billion diversified + $3 billion data centre only) in 2023 as shown in **Exhibit 1**.

In this report, we aim to provide readers with an understanding of the data centre industry. We begin by covering what data centres are, three main types of data centres, different lease terms, and data centre components & costs. Next, we discuss listed data centre companies as well as recent developments by industry players. We also cover demand sources for data centres and the impact of AI on the industry. Finally, we review developments across geographic regions as well as in specific areas like Virginia (Americas), Frankfurt (EMEA) and Johor (Asia Pacific).

Exhibit 1: Funds Raised for Data Centre-Related Investments



Source: Linklaters (dated October 2024)

(I) WHAT ARE DATA CENTRES?

According to IBM, a data centre is a "physical room, building or facility that houses IT infrastructure for building, running, and delivering applications and services, and for storing and managing the data associated with those applications and services". Amazon Web Services ("AWS") noted that data centre infrastructure generally comprises compute, storage and network. Compute relates to servers used to run applications; storage relates to devices (e.g., hard drives, solid-state drives) that store data; while network refers to devices (e.g., cables, routers) that provide connectivity across data centre components and to end-users. Together, these components process, store & transmit data and make the Internet, cloud computing and AI possible.

According to Dgtl Infra, a website on digital infrastructure, three main types[1] of data centres are enterprise, colocation and hyperscale. Dgtl Infra noted that subtypes of colocation data centres include retail colocation and wholesale. Dgtl Infra elaborated on each of them as follows:

1. **Enterprise data centres:** Enterprise data centres are "private facilities that are owned and operated by an individual organization to meet its own IT infrastructure requirements". They are "particularly well-suited for organizations that require customized networks or can benefit from economies of scale due to significant amounts of traffic or data being processed and managed" within the data centres. They may also be used to store "sensitive data like financial records".

2. **Colocation data centres:** Colocation data centres are "used by multiple organizations – often 20 or more – to house their computing hardware, servers, and supporting infrastructure, such as power, cooling, and networking equipment, in an off-site location". They are "particularly useful for organizations that lack the space or IT resources to manage their own enterprise data center, freeing up IT personnel and financial resources for other initiatives".

   Subtypes of colocation data centres include:

   a. **Retail colocation data centres:** Retail colocation data centres "provide a turn-key data center service that caters to customers with smaller power capacity needs within the same data halls", where the operator "manages day-to-day operations, power capacity, cooling, and security, as well as access to telecommunications carriers and internet service providers (ISPs)". Customers "are only responsible for maintaining their equipment within cabinets or cages". Requirements may range from 100 kW–1 MW and leases usually last 1–3 years.

   b. **Wholesale data centres:** Wholesale data centres are "facilities leased to a single customer, who is responsible for building out and managing the day-to-day operations of either a full building or data hall to create a fully functioning" data centre, where operators "offer only space and power without additional services". Customer requirements may range from 1–5 MW, and leases generally last from 5–10 years.

3. **Hyperscale data centres:** Hyperscale (or cloud) data centres are "massive, centralized, and custom-built facilities that are operated by a single company". They "support primarily cloud service providers (CSPs) and large internet companies with enormous compute, storage, and networking requirements". The facilities are designed to cater to requirements from 5–100 MW, and leases may range from 10–15+ years.

[1] Dgtl Infra identified five types of data centres. However, in our report, we will focus only on three main types.

To illustrate how data centre companies classify different types of data centres, we highlight an example of Digital Core REIT ("DCREIT"; SGX: DCRU), a data centre REIT.

DCREIT classified data centres into three types: colocation, fully-fitted and shell & core.

DCREIT's colocation data centres generally correspond with Dgtl Infra's retail colocation data centres; fully-fitted data centres generally correspond with Dgtl Infra's wholesale data centres; and shell & core data centres generally correspond with Dgtl Infra's hyperscale data centres.

DCREIT's classification of data centres is shown in **Exhibit 2**. We have also highlighted the components and associated lease terms for each type which we discuss in the next two sections.

Exhibit 2: DCREIT's Classification of Data Centres

	SHELL & CORE	FULLY-FITTED	COLOCATION
			
Infrastructure Requirements	▪ Building Shell & Core	▪ Building Shell & Core ▪ Electrical Systems ▪ HVAC / Mechanical Systems	▪ Building Shell & Core ▪ Electrical Systems ▪ HVAC / Mechanical Systems ▪ Colocation Fit-Out (Racks, cages, etc.)
Typical Size	▪ Entire building; can typically support 5+ MW	▪ Medium (300+ kW) to very large compute deployments (5+ MW)	▪ Small (one cabinet) to medium (racks) data center deployments
Time to Deploy	▪ Ground-up development can take 18 to 24 month	▪ Can execute a solution for medium to large deployment in weeks / months	▪ Provides agility to quickly deploy computing infrastructure in days
Contract Length	▪ 10+ years	▪ 5 to 10+ years	▪ 2 to 3 years
Contract Types	▪ Triple Net (single-tenant)	▪ Triple Net, Gross + E(lectricity)	▪ All-in (includes cost of electricity)
Customization	▪ Highly customizable; can be structured as a build-to-suit	▪ Customize data center environment to specific deployment needs	▪ Consistent designs and operational environment; limited customization
Staffing Requirements	▪ Customers supply own on-site staff	▪ Customers sometimes opt to have their own on-site staff	▪ Leverage optional skilled remote hands and on-site customer support

Source: DCREIT (published June 2023)

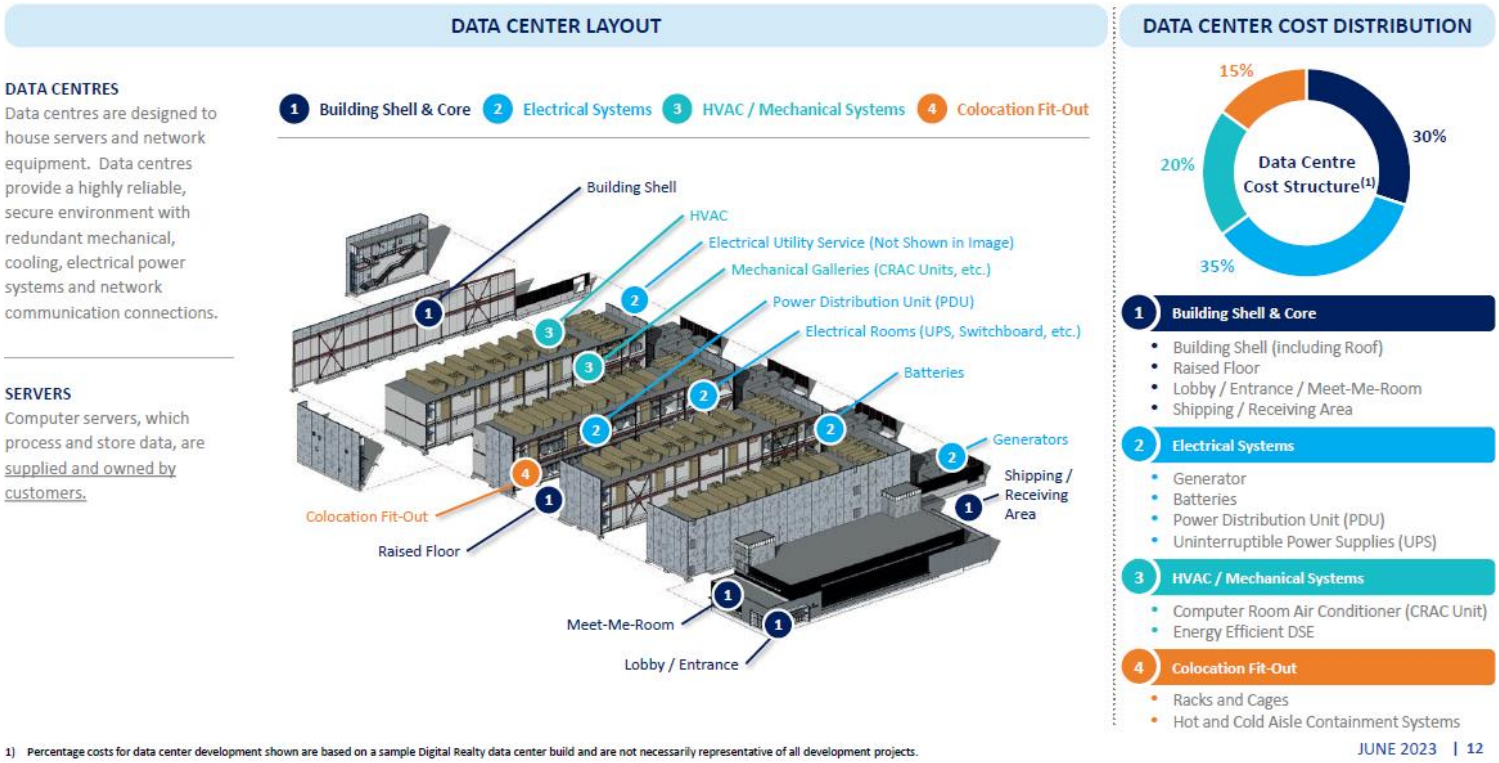
(II) BREAKDOWN OF A DATA CENTRE

DCREIT also provided elaborations on data centre components and costs.

According to DCREIT, a data centre generally comprises building shell & core, electrical systems, HVAC (Heating, Ventilation & Air Conditioning)/mechanical systems and colocation fit-out as shown in **Exhibit 3**. DCREIT's shell & core data centres comprise only building shell & core; fully-fitted data centres include electrical systems & HVAC/mechanical systems; and colocation data centres include colocation fit-outs (as shown in **Exhibit 2** on page 5).

Based on a "sample" data centre build, DCREIT noted that electrical systems comprise the largest percentage (35%) of costs.

Exhibit 3: Breakdown of a Data Centre



Source: DCREIT (published June 2023)

(III) LEASE TERMS

Data centre types may differ by their capacity. Different capacity requirements may correspond with different lease terms. DatacenterHawk noted the following lease terms based on customers' requirements:

- **50 kW and less:** Smaller requirements are often all-in leases, where the customer pays a "set price per month with little variation" and the price "includes both the rental rate and power cost".

- **50 kW to 5 MW:** Such requirements are usually Gross + Electric, where the customer pays a "set price per kW of data center infrastructure they lease per month, plus the cost of the power they use".

- **5 MW and higher:** Larger requirements are typically Triple Net (NNN), where the customer "pays the provider to use the space, but manages a larger portion of the operations and utilities themselves". Customers may also pay "some of the building operating costs that are usually provided by the data center operator themselves".

According to DatacenterHawk, a data centre platform, data centre capacity is "primarily measured in electricity consumption, not square footage", as a data centre may earn "double the revenue" by fitting "twice as many servers in their facility" in the same square footage. The supply of a market is thus determined by adding up the capacity that is "currently leased or is available to be leased" (or "commissioned power") of all the data centres in the market. The demand is measured by the capacity leased up in a specific period (or "absorption").

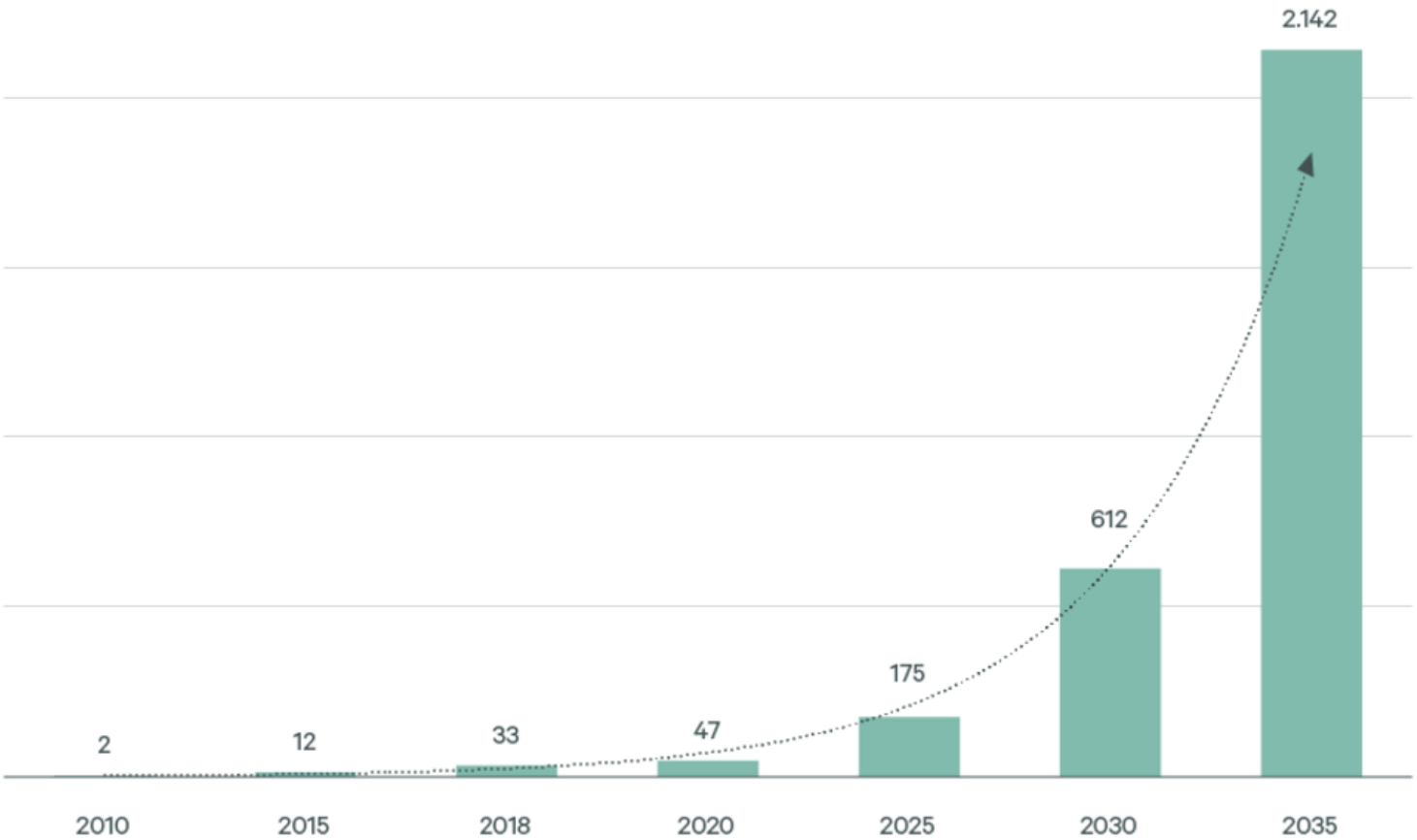
Based on DCREIT's classification of data centres as shown in **Exhibit 2** on page 5, colocation data centres are generally associated with all-in leases; fully-fitted data centres are generally associated with Gross + Electric or Triple Net leases; and shell & core data centres are generally associated with Triple Net leases. Electrical costs may thus be fully borne by tenants with sufficiently large capacity requirements who lease fully-fitted and shell & core data centres.

DEMAND SOURCES FOR DATA CENTRES

(I) RISING DATA CREATION AND CLOUD COMPUTING

According to CBRE, a real estate firm that researched on data centres, the amount of data created worldwide is expected to rise at a Compound Annual Growth Rate ("CAGR") of 29.0% from 47 Zettabytes (ZB, or 10^9 Terabytes) in 2020 to 2,142 ZB in 2035 as shown in **Exhibit 4**. CBRE noted that the "trajectory of data growth" fuelled expectations for data centre demand growth. In line with CBRE, IDC projected in 2023 that total storage capacity in data centres and endpoint devices will rise at a CAGR of 18.5% from 10.1 ZB in 2023 to 21.0 ZB in 2027. Thus, rising data creation is expected to increase data centre demand.

Exhibit 4: Worldwide Data Creation in Zettabytes

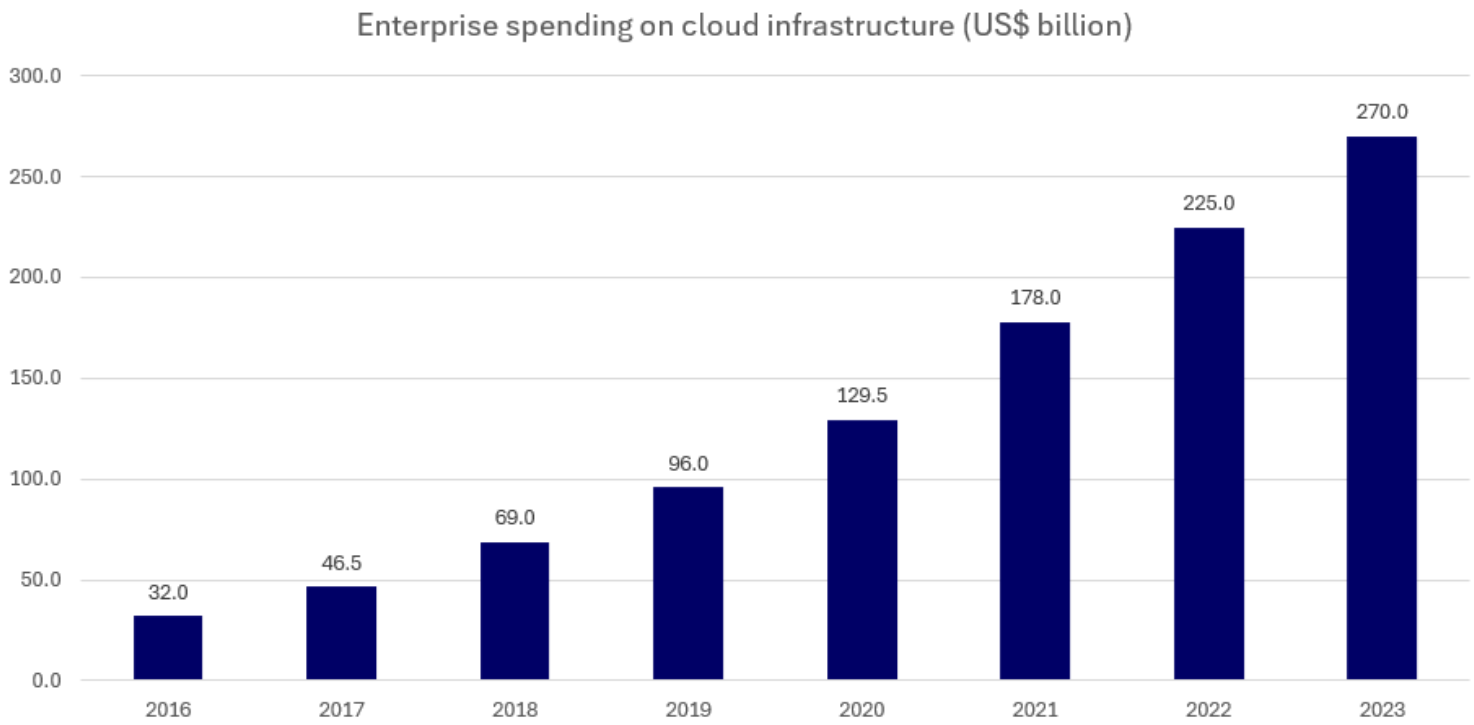


Note: While the original source (Statista) was published in 2019, the projections may still be relevant as both PGIM and CBRE cited the source in 2024.
Source: CBRE (published July 2024), Statista (published 2019)

In particular, cloud computing has been a major source of demand for data centres. According to Statista, enterprise spending on cloud infrastructure rose at a CAGR of 35.6% from US$32.0 billion in 2016 to US$270.0 billion in 2023 as shown in **Exhibit 5**. CBRE noted that cloud demand rose due to "increasingly evident advantages of hosting equipment off-site". CBRE also noted that hyperscalers (firms that sell cloud computing services) have been the largest purchasers of data centre capacity in Europe. Hyperscalers include AWS, Microsoft Azure and Google Cloud.

In line with strong demand from hyperscalers, PGIM noted that hyperscale is expected to be the fastest-growing data centre segment with a five-year CAGR of 22.6% as opposed to retail (CAGR of 6.5%) and enterprise (CAGR of 3.6%). Besides cloud computing, demand for hyperscale data centres is also expected to be driven by the rise of AI which we discuss in the next section.

Exhibit 5: Enterprise Spending on Cloud Infrastructure

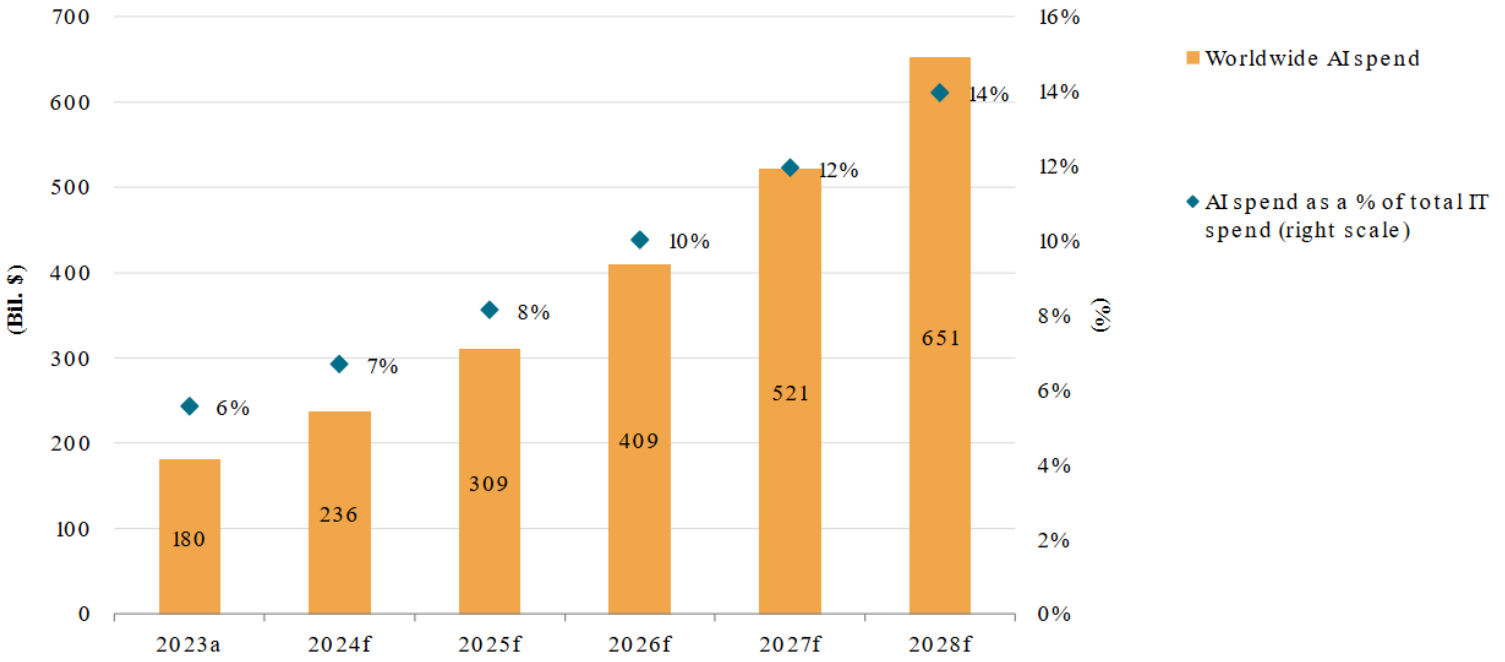


Source: Statista (published October 2024)

(II) IMPACT OF AI ON THE DATA CENTRE INDUSTRY

According to S&P Global Ratings, worldwide AI spending is expected to rise at a CAGR in the "high 20% range" from $180 billion (currency unstated) in 2023 to $651 billion in 2028 as shown in **Exhibit 6**. S&P Global Ratings suggested that ChatGPT has a greater potential to "transform and affect the broader economy and solve previously intransigent problems" than the iPhone as the smartphone industry took over 15 years to reach annual device sales of around $500 billion (currency unstated) and related mobile app sales of around an additional $200 billion (totalling $700 billion) whereas worldwide AI spending is projected to reach $651 billion in less than six years[1].

Exhibit 6: Projected Worldwide AI Spending



Source: S&P Global Ratings (published April 2024)

[1] Based on ChatGPT's paid plan launch date of 1 February 2023.

AI workloads are expected to raise energy demand for data centres. According to Goldman Sachs Research, data centre power demand (including AI) is expected to rise by about 2.5 times from around 400 TWh in 2023 to over 1,000 TWh in 2030 as shown in **Exhibit 7**. AI workloads as a proportion of data centre power demand are expected to rise from less than 5% in 2023 to 20% in 2030. Based on Goldman Sachs Research's projections, AI power demand alone is expected to rise at a CAGR of 50.4% from 12 TWh in 2023 to 209 TWh in 2030.

One reason for the more-than-proportionate projected rise in AI power demand (CAGR of 50.4%) as compared to the projected growth in worldwide AI spending (CAGR in the "high 20% range") may be that AI queries are more energy-intensive than search queries. SemiAnalysis, a research firm, estimated that OpenAI required around 3,617 HGX A100 servers to run ChatGPT. According to NVIDIA, each DGX A100 server has a maximum power consumption of 6.5 kW. By assuming that the power consumption of a DGX A100 server is similar to that of a HGX A100 server, OpenAI is estimated[1] to consume at most 564.3 MWh daily to run ChatGPT as follows:

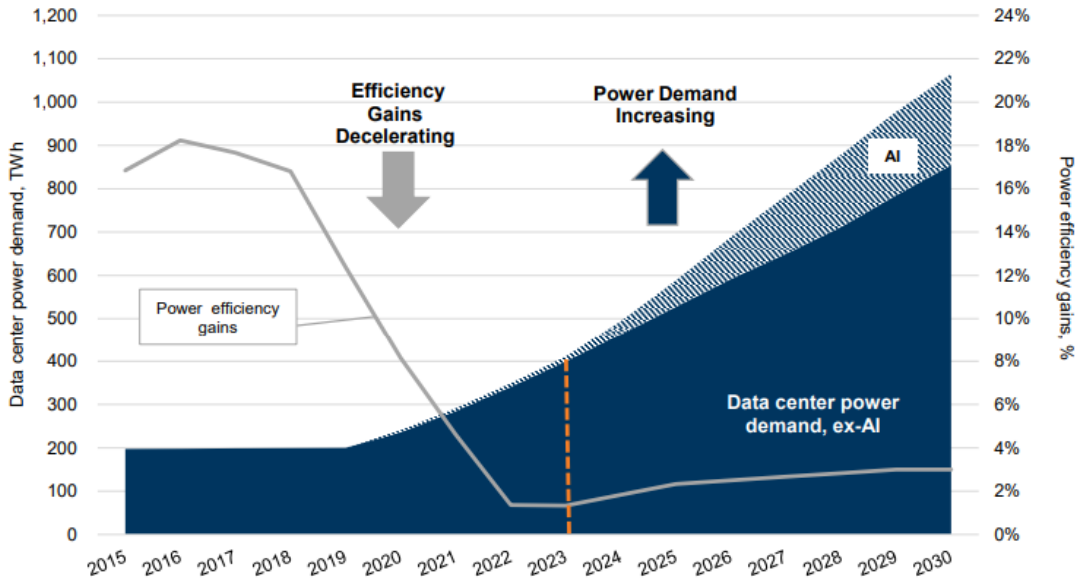
$$\begin{aligned}\text{Maximum daily power consumption} &= 3{,}617\ \text{A100 GPUs} \times 6.5\ \text{kW per HGX A100 server} \times 24\ \text{hours per day}\\ &= 564{,}252{,}000\ \text{Wh}\end{aligned}$$

Based on SemiAnalysis' assumptions, OpenAI receives around 195 million ChatGPT queries (15 queries per user × 13 million daily active users) per day. Accordingly, a ChatGPT query is estimated to consume at most 2.9 Wh per query as follows:

$$\begin{aligned}\text{Power consumption per ChatGPT query} &= \text{Maximum daily power consumption} \div \text{ChatGPT queries per day}\\ &= 564{,}252{,}000\ \text{Wh} \div 195{,}000{,}000\ \text{queries}\\ &= 2.9\ \text{Wh per query}\end{aligned}$$

In contrast, Google noted that a Google search consumes about 0.3 Wh. Therefore, a ChatGPT query is estimated to consume at most around 10 times more power than a Google search.

Exhibit 7: Projected Data Centre Power Demand



Source: Goldman Sachs (published April 2024)

[1] We follow the implicit method used by a journal article to estimate the power consumption of a ChatGPT query. The journal was cited by various sources including the International Energy Association and Goldman Sachs Research.

In line with the rise in power demand for data centres and from AI workloads, JLL, another real estate firm that researched on data centres, noted that the average rack density of hyperscale data centres is expected to rise from 36 kW per rack in 2023 to near 50 kW in 2027 and that rack density requirements for AI clusters are expected to rise to 80–100 kW.

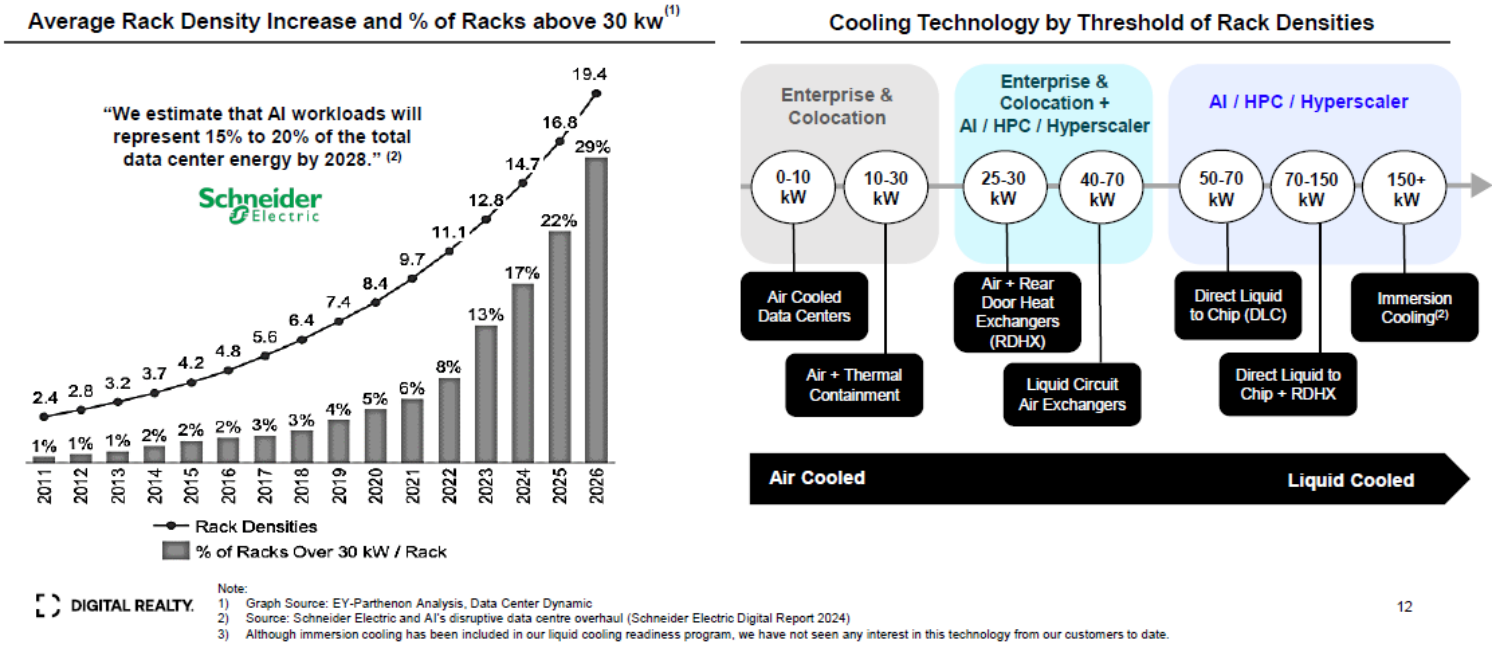
According to JetCool Technologies, a company that "designs and delivers microconvective cooling® technology for high-power electronics", power (or rack) density refers the "power draw of a single, fully populated server rack". Power density rises when users "want to cram more, higher power chips into the same amount of space".

Digital Realty ("DLR"; NYSE: DLR)[1], which IDC identified as a leader in the global "datacenter services" market in 2023, elaborated on how rising rack densities will impact data centre requirements for cooling technologies.

According to DLR, average rack density and percentage of racks above 30 kW are expected to rise as shown in **Exhibit 8**. Data centres may require more advanced cooling technologies as their rack density increases.

DLR noted that AI, HPC (High-Performance Computing) and Hyperscaler workloads involve rack densities of 25 kW and above. These workloads thus require cooling technologies that range from Rear Door Heat Exchangers (where fans pull air through racks to cool servers) to immersion cooling (where servers may be immersed in coolants).

Exhibit 8: Impact of AI on Power Density and Cooling Technology Requirements



Source: DLR (published September 2024)

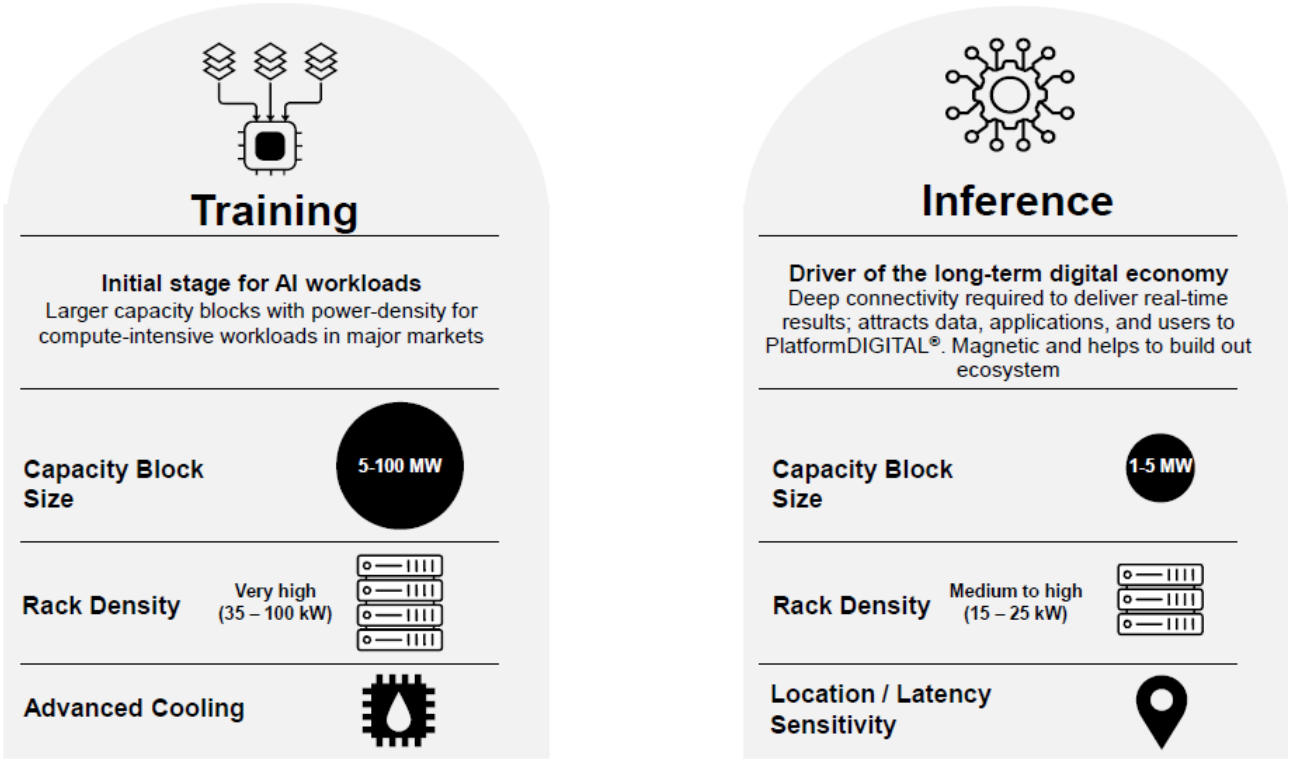
[1] DLR is also the sponsor of DCREIT.

DLR added that different AI workloads may have different cooling requirements. DLR identified two types of workloads: training and inference, as shown in **Exhibit 9**.

Training workloads require a larger capacity block size of 5–100 MW and "Very high" rack density of 35–100 kW. Thus, DLR noted that training workloads require more advanced cooling technologies (e.g., Liquid Circuit Air Exchangers or Direct Liquid to Chip as shown in **Exhibit 8** on page 12).

In contrast, inference workloads require a smaller capacity block of 1–5 MW and a lower rack density of 15–25 kW. Thus, inference workloads may not require liquid cooling technologies. Instead, inference workloads have higher latency sensitivity (which may therefore require the data centre to be located nearer to end-users or to major connectivity hubs).

Exhibit 9: Rack Density and Latency Sensitivity Requirements of AI Deployment



Source: DLR (published June 2024)

DATA CENTRE COMPANIES

(I) LISTED INDUSTRY PLAYERS

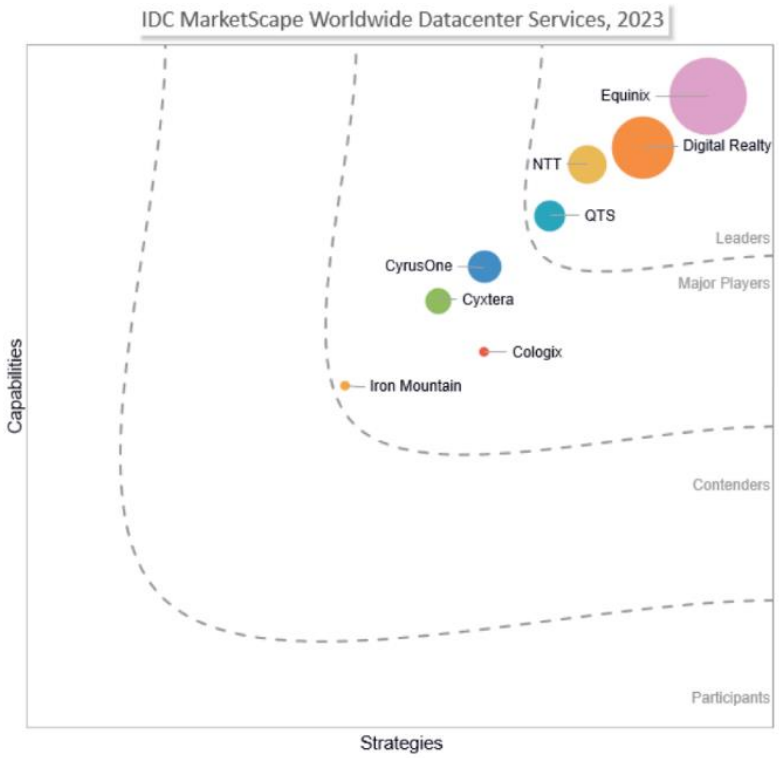
According to IDC, leaders in the global "datacenter services" industry in 2023 included[1] (in descending order): Equinix, Inc. ("EQIX"; NASDAQ: EQIX), Digital Realty Trust, Inc. ("DLR"; NYSE: DLR), and Nippon Telegraph and Telephone Corporation ("NTT"; TYO: 9432) as shown in **Exhibit 10**.

EQIX has ownership interest in or operates (or has a "footprint" of) 268 data centres as at 30 September 2024, of which it owns 163 (or 60.8%) of its data centres. It has the largest market capitalisation of US$90.4 billion as at 22 November 2024.

DLR has a larger footprint of 312 data centres as at 30 September 2024. We note that DLR is likely to have an ownership interest in all its 312 data centres as DLR stated that they "owned or had investments in properties, on a wholly-owned basis or through unconsolidated entities" (where 'properties' likely referred to data centres) as at 31 December 2023. It has a market capitalisation of US$64.2 billion as at 22 November 2024.

NTT has a footprint of 202 data centres as at 31 March 2024. It has a market capitalisation of US$84.2 billion as at 22 November 2024. NTT owns NTT DATA Group Corporation ("NTT DATA"; TYO: 9613), which has a greater focus on data centres. NTT DATA has a footprint of over 125 data centres as at 30 September 2024, and its market capitalisation is US$26.2 billion as at 22 November 2024[2].

Exhibit 10: Assessment of Industry Players



Source: IDC (published October 2023)

[1] IDC also included QTS Realty Trust, Inc. ("QTS") as a leader in the global "datacenter services" industry in 2023. However, QTS was acquired by Blackstone (NYSE: BX) in August 2021. Blackstone noted that it acquired QTS for "approximately $10 billion, including debt". We focus our discussion on listed data centre companies to serve as a starting point for readers who wish to conduct further investment research.
[2] Based on market capitalisation of JPY 4,044 billion and exchange rate (from Oanda.com) of USD 1: JPY 154.62 as at 22 November 2024.

The market capitalisation and footprint of selected listed data centre companies are shown in **Exhibit 11**.

Exhibit 11: Market Capitalisation and Footprint of Selected Listed Data Centre Companies (as at 22 November 2024)

Company	Stock Listing	Ticker	Listing Currency	Market Cap (billion)		No. of data centres[1]		
				Listing curr.	USD	Owned[2]	Leased	Total
Equinix ("EQIX")	NASDAQ	EQIX	USD	90.35	90.35	163	105	268
Nippon Telegraph and Telephone Corporation ("NTT")[3]	TYO	9432	JPY	13,022	84.22	n.a.	n.a.	202
Digital Realty ("DLR")[4]	NYSE	DLR	USD	64.19	64.19	312	-	312
Iron Mountain Incorporated ("IRM")[5]	NYSE	IRM	USD	34.95	34.95	≥ 14	≥ 5	28
NTT DATA Group Corporation ("NTT DATA")[6]	TYO	9613	JPY	4,044	26.16	n.a.	n.a.	125
Mapletree Industrial Trust ("MIT")[7]	SGX	ME8U	SGD	6.48	4.83	61	-	61
GDS Holdings Ltd ("GDS")[8]	HKG	9698	HKD	27.53	3.54	105	13	118
Keppel DC REIT ("KDCREIT")	SGX	AJBU	SGD	3.88	2.89	23	-	23
Digital Core REIT ("DCREIT")	SGX	DCRU	USD	0.79	0.79	10	-	10

Exchange rates (Oanda.com):			
	USD to	SGD	1.3438
	USD to	JPY	154.62
	USD to	HKD	7.7827

n.a. = not available.

(1) As at 30 September 2024 for all except NTT and GDS; as at 31 March 2024 for NTT; as at 31 December 2023 for GDS.

(2) Includes partial ownership of less than 50% and through unconsolidated entities.

(3) Note that the provision of data centre services is not NTT's main business as "Revenue from Data Centers (Outside Japan)" comprised only 14.1% of NTT's operating revenue in the financial year ended 31 March 2024. We included NTT as IDC noted that NTT was an industry leader (as shown in **Exhibit 10** on page 14).

(4) DLR stated that they "owned or had investments in properties, on a wholly-owned basis or through unconsolidated entities" (where 'properties' likely referred to data centres) as at 31 December 2023. Thus, we estimate that they are likely to have an ownership interest in all the 312 data centres they have in their portfolio as at 30 September 2024.

(5) Note that the provision of data centre services is not IRM's main business as its data centre-related revenue comprised only 9.8% of its total revenue in the nine months ended 30 September 2024. We included IRM as IDC noted that IRM was a major player (as shown in **Exhibit 10** on page 14).

(6) NTT DATA noted that they have around 125 data centres (including those under development) in service as at 30 September 2024.

(7) Note that data centres comprise only 54.7% (instead of 100%) of MIT's assets under management as at 30 September 2024.

(8) GDS noted that they had 105 "self-developed" data centres as at 31 December 2023, of which they operated 93.

Source: Yahoo! Finance, SGX Stock Screener, various companies' filings and presentations, Oanda.com, FPA

(II) RECENT DEVELOPMENTS BY INDUSTRY PLAYERS

Below, we list developments by industry players that have been reported or announced recently.

(a) Upcoming and potential listings

On 11 November 2024, Data Center Dynamics ("DCD"), an online publication on data centres, reported that HMC Capital Limited ("HMC"; ASX: HMC) will list DigiCo Real Estate Investment Trust ("DigiCo REIT"), a data centre REIT, on the Australian Stock Exchange. DCD noted that DigiCo REIT will have 13 data centres and 586 customers. HMC later announced on 21 November 2024 that DigiCo REIT will have an enterprise value of A$4.3 billion "of data centre assets in Australia and the United States" and that the Initial Public Offering ("IPO") was "fully underwritten" with a market capitalisation of A$2.746 billion. HMC also noted that the trading of new securities in DigiCo REIT is "expected to commence on a conditional and deferred settlement basis on 12 December 2024".

On 26 September 2024, The Business Times ("BT") reported that NTT has also been considering listing a data centre REIT in Singapore. BT noted that NTT may "raise as much as US$1 billion from the first-time share sale" and that assets included in the REIT could be "worth US$2 billion to US$3 billion". BT also noted that the listing "could take place as soon as late 2025" and that NTT was "working with financial advisers on the potential offering plans, including identifying the data centres for the Reit". However, BT remarked that deliberations were "preliminary and the company may still decide against pursuing a deal".

(b) Development of new data centres

On 19 November 2024, BT reported that EQIX "is building a sixth data centre in Singapore with an initial investment of US$260 million". BT noted that the data centre is expected to open in 1Q 2027 and will have 20 MW of capacity when fully built.

On 15 October 2024, Reuters reported that Blackstone planned to invest €7.5 billion to develop data centres in Aragon, Spain. BT noted that Blackstone will "develop the buildings by installing cooling machines and cable connections with the aim of leasing them to companies who will install computer servers".

(c) Acquisitions of interests in data centres

On 19 November 2024, BT reported that the manager of KDC REIT "proposed to acquire interests in two artificial intelligence-ready hyperscale data centres from a joint venture (JV) led by sponsor Keppel for S$1.4 billion". BT noted that the deal is "expected to be completed by end-2025" and will grow KDC REIT's assets under management "by 36 per cent to S$5.2 billion, with 25 data centres across Asia-Pacific and Europe".

On 9 September 2024, The Straits Times ("ST") reported that DCREIT "proposed to raise its stake in a data centre in Germany" by 0.2–40%. ST noted that DCREIT holds 49.9% of the data centre facility and that DCREIT will own between 50.1–89.9% if the proposed acquisition goes through.

(d) Acquisition of data centre company

On 3 September 2024, FT reported that Blackstone will acquire data centre firm AirTrunk for A$20 billion. FT noted that AirTrunk "is one of the region's fastest-growing technology companies and was considering a potential listing before the sale process kicked off".

DATA CENTRE MARKETS

Having covered some background on the data centre industry, we will now review developments in various geographic regions (Americas, EMEA and Asia Pacific) as well as in specific areas like Virginia (Americas), Frankfurt (EMEA) and Johor (Asia Pacific).

According to DC Byte, a data centre platform, global Live Supply[1] grew by 20 GW at a CAGR of 16.6% from 2018 to 2023.

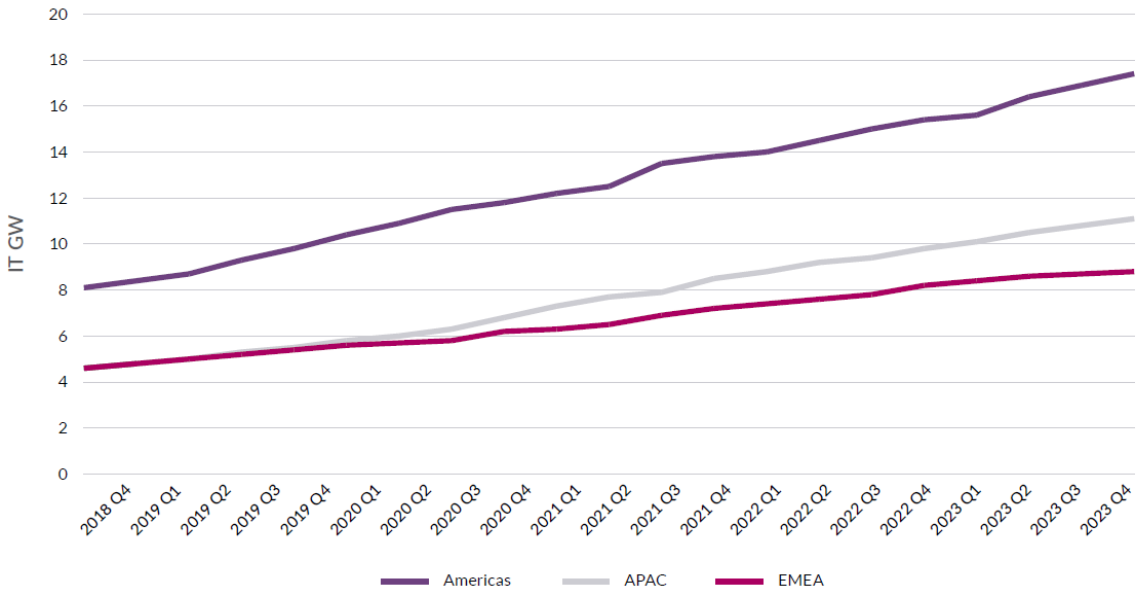
Americas had the highest Live Supply and grew at a CAGR of 16.7% from 8.1 GW in 2018 to 17.4 GW in 2023. DC Byte noted that data centre demand in Americas was driven by the "democratization" of AI which "fuelled the adoption of generative AI and Machine Learning (ML) applications". DC Byte also noted that the U.S. accounted for the "majority of capacity and data centre supply growth in the region as the home base of innovation and development".

APAC (or Asia Pacific) Live Supply grew at the highest CAGR of 19.1% from 2018 to 2023. DC Byte noted that developed markets like Australia, China, Japan and Singapore "each contributed more than 500MW to the 6.5GW of regional Live Supply growth" from 2018 to 2023. DC Byte remarked that emerging markets in South and Southeast Asia saw rising interest in recent years as the "highly populous and young demographics of these countries present strong untapped potential for data centre demand". DC Byte also noted that data centre demand may rise as political and economic environments are expected to "develop toward enabling digital infrastructure investments" in Asia Pacific markets.

Meanwhile, EMEA (or Europe, Middle East and Africa) Live Supply grew at a CAGR of 13.6% from 4.6 GW in 2018 to 8.8 GW in 2023. DC Byte noted that the Live Supply in "FLAP-D" markets (Frankfurt, London, Amsterdam, Paris and Dublin) had the "strongest growth" in EMEA and added on average 450 MW each, while the Live Supply in secondary markets (e.g., Belgium, Denmark and Spain) grew by over 100 MW each. DC Byte also noted that land and power availability issues as well as restrictive regulations limited Live Supply growth in EMEA.

DC Byte summarised the historical Live Supply of Americas, APAC and EMEA as shown in **Exhibit 12**.

Exhibit 12: Historical Live Supply of Americas, APAC and EMEA



Source: DC Byte (published April 2024)

[1] Defined by DC Byte as "IT power that is operational whether it is let out or not".

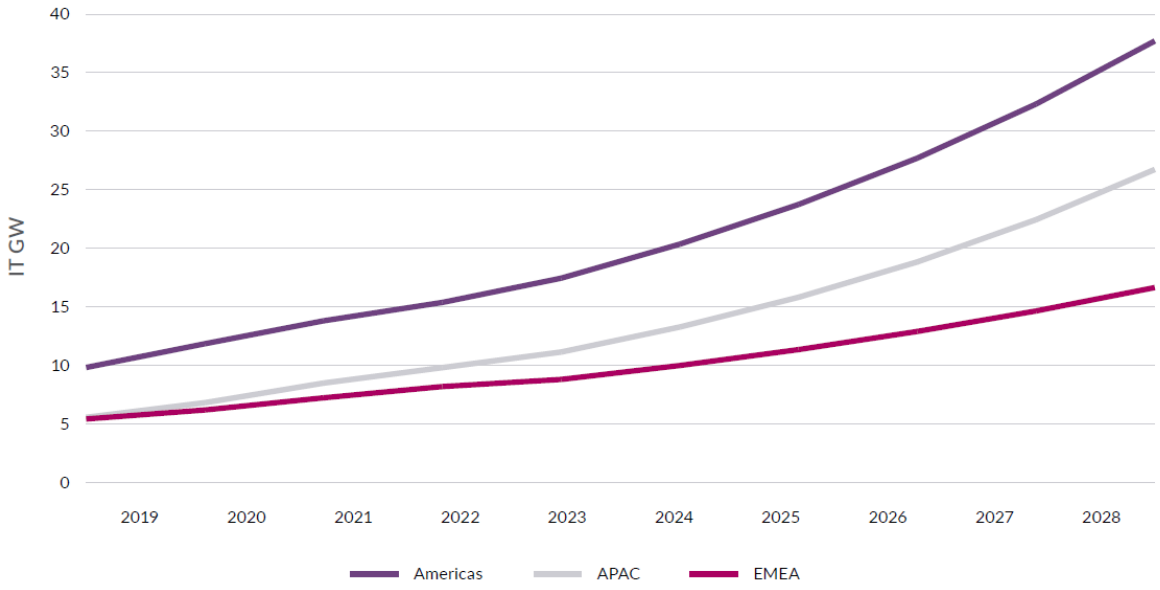
Should the Live Supply of Americas, APAC and EMEA continue to grow at their respective historical CAGRs of 16.7%, 19.1% and 13.6%, DC Byte projected Live Supply for each region to grow as shown in **Exhibit 13**.

DC Byte expected that Americas Live Supply growth will be "dampened" in the short term due to "delays in power generation and delivery". However, DC Byte noted that Live Supply growth will "accelerate" once power-related issues are fixed.

In contrast, DC Byte expected Live Supply growth in APAC to be faster than as projected in **Exhibit 13**. DC Byte noted that there is substantial Early Stage Supply[1] in developing APAC countries, and that the materialisation of these supply is dependent on operators securing an anchor tenant.

DC Byte also expected Live Supply growth in EMEA to be faster than as projected in **Exhibit 13**. For EMEA, DC Byte noted that EMEA had the highest growth of Pipeline Supply[2], and that supply growth will continue as major real estate funds and hyperscalers have been announcing "billions worth of investment into digital infrastructure".

Exhibit 13: Projected Growth in Live Supply of Americas, APAC and EMEA

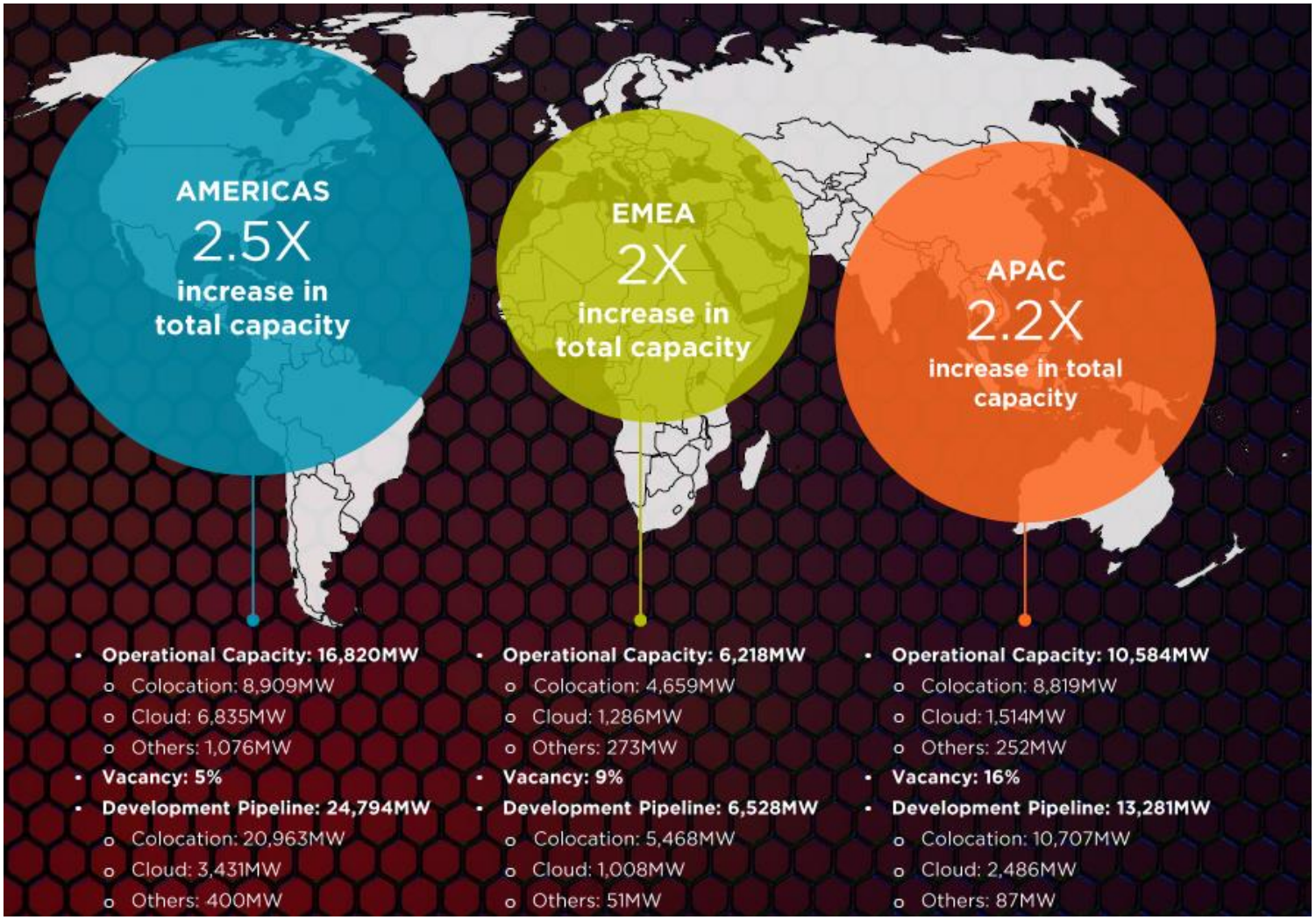


Source: DC Byte (published April 2024)

[1] Defined by DC Byte as "IT Load that has been announced or speculated, but has yet to secure all of the required elements" such as government, land and power for development.
[2] Defined by DC Byte as the "sum of Under Construction and Committed Supply", where Committed Supply referred to the "estimated IT Load" that DC Byte was "highly confident" would materialise.

Cushman & Wakefield ("C&W"), a real estate firm that also researched on data centres, likewise projected the capacity in Americas, EMEA and Asia Pacific (APAC) to grow as shown in **Exhibit 14**.

Exhibit 14: Projected Growth in Capacity in Americas, EMEA and Asia Pacific (APAC)



Source: C&W (published March 2024)

(I) AMERICAS

According to C&W, Americas operational capacity rose by 1.7 GW to 18.5 GW in 1H 2024. C&W commented that interest in AI deployment and cloud data centres surged in 1H 2024, and that demand continues to "outpace supply, resulting in consistently declining vacancy rates across the board". C&W also noted that the six largest markets (Virginia, Atlanta, Phoenix, Chicago, Dallas and Silicon Valley; by existing + under construction + committed pipeline capacity) saw "continued expansion despite varying levels of limitations to power availability".

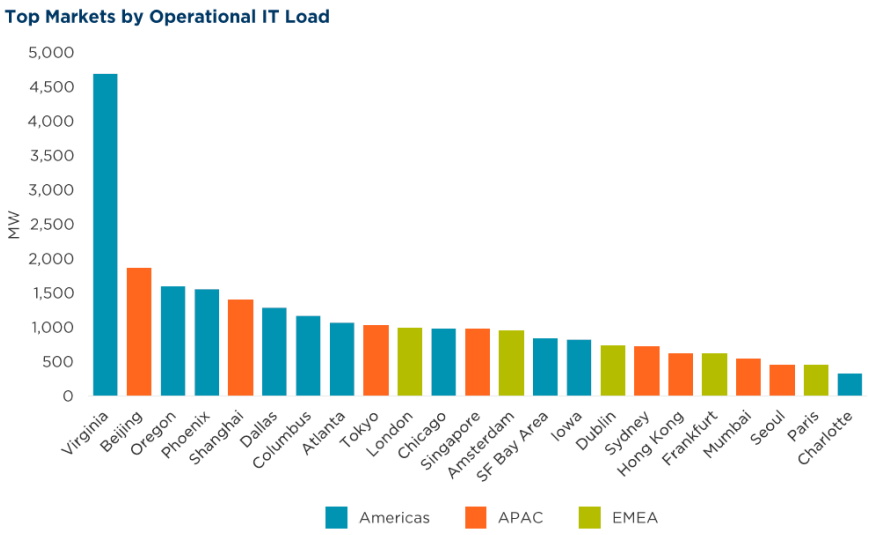
C&W noted that power availability "is the greatest consideration for data center developers, with operators seeking two-to-three-year delivery times but many encountering more than five-year timelines for future power in multiple markets". C&W also noted that "certain operators have collaborated with power companies to deliver substations, transmission lines or source micro-grid power" where utility providers have been unable to provide power earlier, and that many agreements are "being signed directly with third party energy generation developers, with wind, solar, battery storage, natural gas and even geothermal developments moving quickly across markets". C&W noted too that "Interest in large-scale power availabilities, plentiful land and less strict latency requirements for AI, have driven hyperscalers and operators to expand in a host of historically peripheral markets" such as Indianapolis, Kansas City, Reno, Charlotte, Salt Lake City, Minneapolis, Philadelphia and Montgomery.

With AI data centres "increasingly becoming integral to both hyperscale and colocation development pipelines", C&W noted that AI training facilities tend to be located in "large, latency-tolerant locations in rural markets" whereas AI inference facilities tend to be "strategically positioned near major cloud regions".

We analyse and review the Virginia market as an example of a data centre market in Americas.

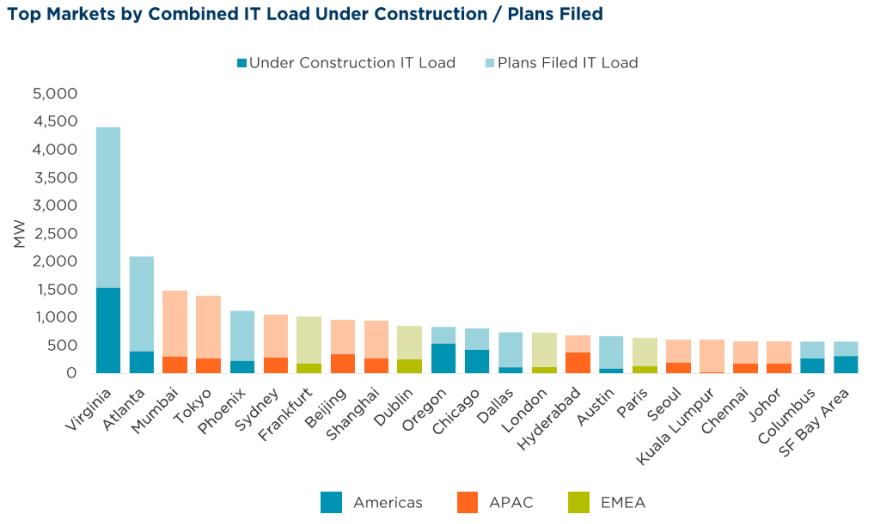
According to C&W, Virginia is the largest data centre market in the world. Virginia has the largest operational IT load and combined IT load under construction or plan filed as shown in **Exhibit 15** and **Exhibit 16** respectively. Virginia Economic Development Partnership noted that network connectivity in Northern Virginia "traces its roots to the U.S. government's experiments in wide-area fiber optic networking in the 1960s". DCD noted that the first Internet exchange MAE-East (Metropolitan Area Exchange, East) was founded in Virginia in 1992 and that "around half of all Internet traffic" passed through it in the early 1990s.

Exhibit 15: Top Markets by Operational IT Load



Source: C&W, DatacentreHawk, DC Byte, Structure Research (published March 2024)

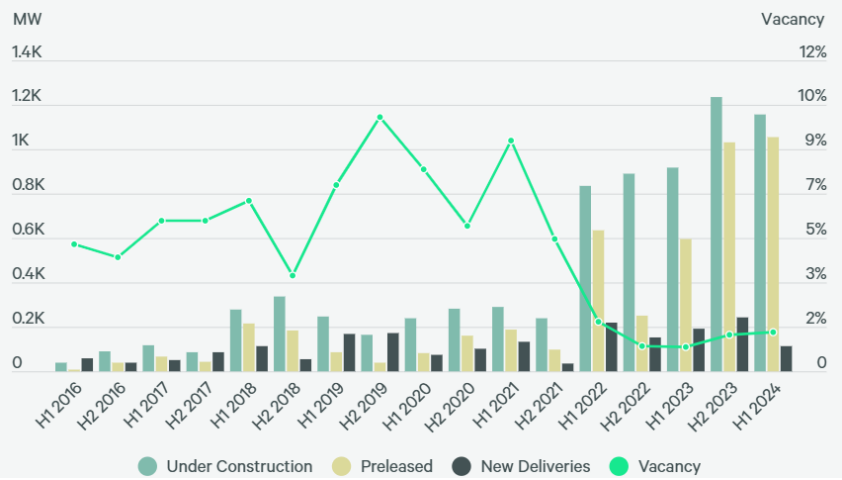
Exhibit 16: Top Markets by Combined IT Load Under Construction or Plans Filed



Source: C&W, DatacentreHawk, DC Byte, Structure Research (published March 2024)

According to CBRE, rental rates in Northern Virginia "continued to rise" in 1H 2024 as vacancy rates remained low. Vacancy rates remained below 2% from 2H 2022 after declining from over 9% in 1H 2021 as shown in **Exhibit 17**. Even though data centres under construction remained high in 1H 2024, most upcoming capacity continued to be preleased. Given the strong implied demand, rental rates had been rising across capacity requirements tracked by CBRE as shown in **Exhibit 18**.

Exhibit 17: Historical Supply (Northern Virginia)



Source: CBRE (published August 2024)

Exhibit 18: Historical Rental Rates (Northern Virginia)

Time period	Rental rates ($ per kW per month) for capacity requirement			
1H 2024	**10+ MW**	**3–10 MW**	**500 kW–3 MW**	**250–500 kW**
Max.	140	150	170	205
Min.	115	125	135	165
2H 2023				
Max.	115	140	150	190
Min.	100	120	130	150
1H 2023	**-**	**5–10 MW**	**1–4 MW**	**250–500 kW**
Max.	-	110	120	150
Min.	-	90	100	110
2H 2022				
Max.	-	95	105	140
Min.	-	85	90	100
1H 2022				
Max.	-	95	105	130
Min.	-	80	85	95

Source: CBRE (latest source published August 2024)

C&W noted that vacancy in Virginia remained at an "all-time low" of less than 1% as demand "far exceeded" development. C&W also noted that any land of "sufficient size, with power and fibre availability", is "heavily contested for either colocation or hyperscale self-build purposes" such that securing power for any capacity over 2 MW is difficult. To secure available power and larger land sites, C&W remarked that developments "have been announced increasingly farther afield". C&W also mentioned that besides the availability of power, "growing regulatory and political pushback to data center development in certain submarkets" may limit data centre supply growth.

C&W listed developments in Virginia as shown in **Exhibit 19**.

Exhibit 19: Recent Property Sales, Significant Construction & Planned Updates (Virginia; 1H 2024)

RECENT PROPERTY SALES

SITE / PROPERTY	SIZE	SALE DATE	SALE PRICE (US$)	BUYER	SELLER
Manor Woods (Frederick, MD)	150 acres	May 2024	$158.5M	Rowan Digital Infrastructure	Quantum Loophole JV TPG Real Estate
Dumfries Rd, Manassas	91 acres	Apr 2024	$218M	Amazon	Mike Garcia Construction
Golf Club Rd, Leesburg	37 acres	Apr 2024	$36.3M	STACK Infrastructure	Kettler
Horseshoe Dr, Sterling	136,000 sf	Mar 2024	$34.1M	TA Realty	Stewart Investments
Cosner Dr, Fredericksburg	17 acres	Mar 2024	$10M	PowerHouse Data Centers	Trivett's Furniture
Wellington Rd, Gainesville	124 acres	Feb 2024	$465.5M	Microsoft	JK Land Holdings
Freedom Trail, Ashburn	108 acres	Feb 2024	$185M	JK Land Holdings	Toll Brothers
International Dr, Sterling	118,500 sf	Jan 2024	$60.5M	Brookfield Properties	American Realty Advisors

SIGNIFICANT CONSTRUCTION & PLANNED UPDATES

OPERATOR	DATA CENTER	SIZE (SF)	POWER (MW)	STAGE - EST. DELIVERY
AWS	Multiple Sites	18,230,000 (est.)	Undisclosed	U/C & In Planning
Microsoft	Multiple Sites	1,250,000 (est.)	Undisclosed	U/C & In Planning
Compass & QTS	PW Digital Gateway	22,000,000	Undisclosed	In Planning
Starwood Capital	Herndon	2,200,000 (est.)	Undisclosed	In Planning
CloudHQ	Multiple Sites	4,500,000 (est.)	482 (est.)	U/C & In Planning
Corescale	Gainesville	2,300,000 (est.)	306 (est.)	U/C & In Planning
Digital Realty	Multiple Sites	12,436,000 (est.)	1,144 (est.)	U/C & In Planning
Peterson Companies	Culpeper	2,000,000	600 (est.)	In Planning
NTT	Multiple Sites	970,136 (est.)	224 (est.)	In Planning
CyrusOne	Multiple Sites	595,0000 (est.)	95 (est.)	In Planning
PowerHouse Data Centers	Ashburn & Sterling	2,000,000 (est.)	461 (est.)	In Planning
Rowan Data Centers (Quantum Loophole)	Frederick, MD	777,5000 (est.)	Undisclosed	In Planning
STACK Infrastructure	Multiple Sites	1,7000,000 (est.)	396 (est.)	U/C & In Planning
Sabey Data Centers	Multiple Sites	300,000 (est.)	42 (est.)	U/C & In Planning
The BlackChamber Group	Multiple Sites	3,100,000 (est.)	555 (est.)	In Planning

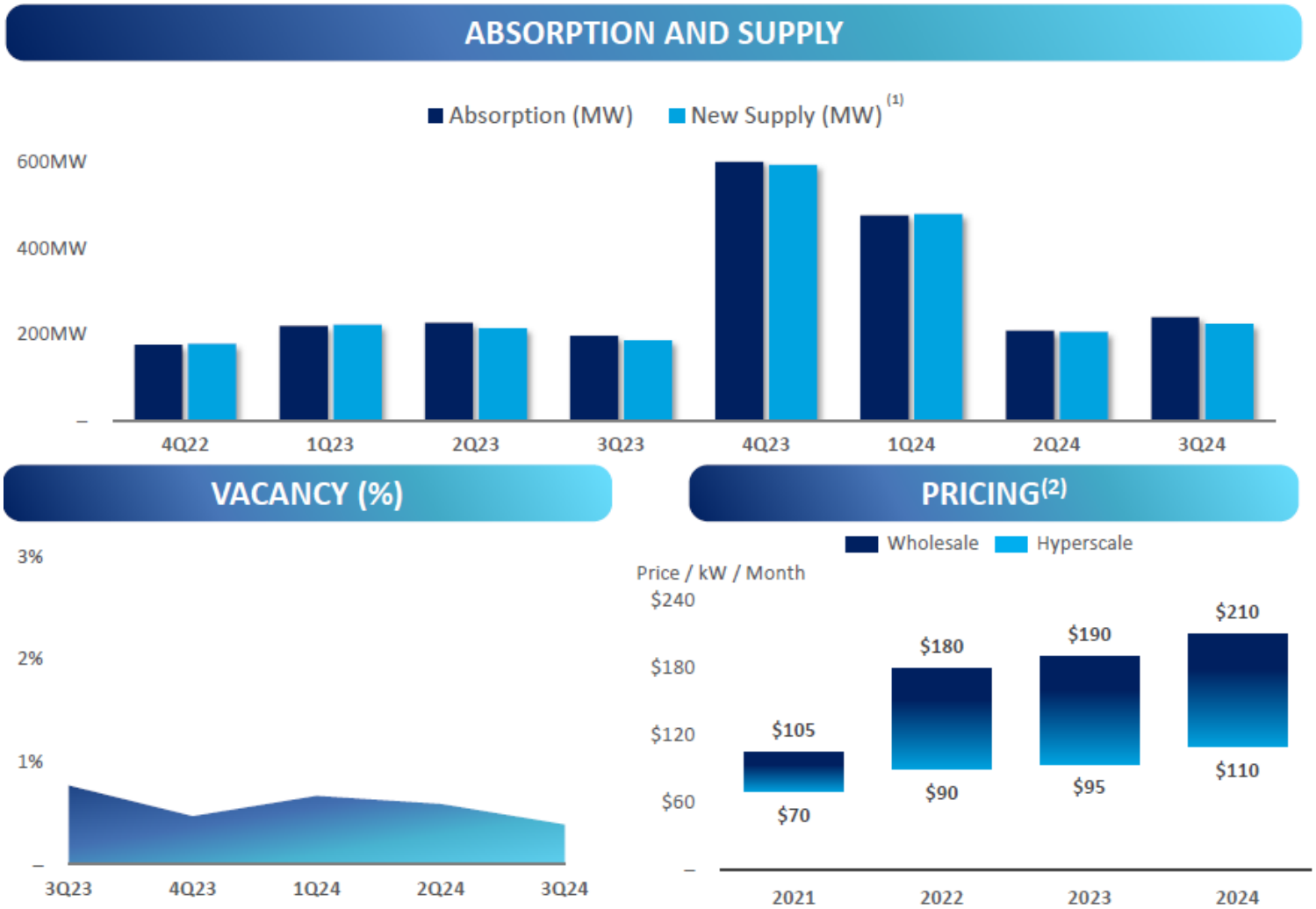
**Excludes Captive & ICT construction updates. †Total IT Load ˜ RFS: Ready for Service*

Source: C&W (published September 2024)

According to DatacentreHawk, power availability "drives site selection in Northern Virginia". DatacentreHawk noted that market activity has been "expanding south along the I-95 corridor as developers seek power access and expansion space". DatacentreHawk also noted that Dominion and Amazon are exploring nuclear power through a small modular reactor development in Virginia. On rental rates, DatacentreHawk noted that rents have been rising with "limited tenant flexibility, as some providers offer lower rates to secure remaining power capacity, while prioritizing larger, single-tenant deals".

Based on DatacentreHawk's data, wholesale (250 kW–4 MW) rents rose by 10.5% from $190/kW/month (currency unstated) in 2023 to $210/kW/month in 2024 while hyperscale (over 4 MW) rents rose by 15.8% from $95/kW/month in 2023 to $110/kW/month in 2024 as shown in **Exhibit 20**.

Exhibit 20: Market Information (Northern Virginia; 3Q 2024)



(1) Based on quarter-on-quarter ("q-o-q") change in commissioned power. (2) Wholesale pricing represents deals with capacity requirement of 250 kW–4 MW while hyperscale pricing represents deals with capacity requirement of over 4MW.
Source: DCREIT, DatacentreHawk (dated October 2024)

(II) EMEA

According to C&W, EMEA operational capacity rose by 6.6% from 2Q 2023 to 9.3 GW in 2Q 2024. C&W noted that there was 2.6 GW of capacity under construction and 8 GW in the planning stages, which brought the total capacity to around 20 GW. C&W also noted that over 46% of operational data centre capacity and more than 49% of combined under-construction and planned capacities were from the six largest markets: FLAP-D and Milan. C&W commented that all primary markets (including Stockholm, Zurich, Berlin, Madrid, Abu Dhabi, Warsaw and Johannesburg based on **Exhibit 21**) are "encountering challenges, including limited land availability, power constraints, and increasingly strict sustainability regulations, which have substantial cost and time implications for operators and investors".

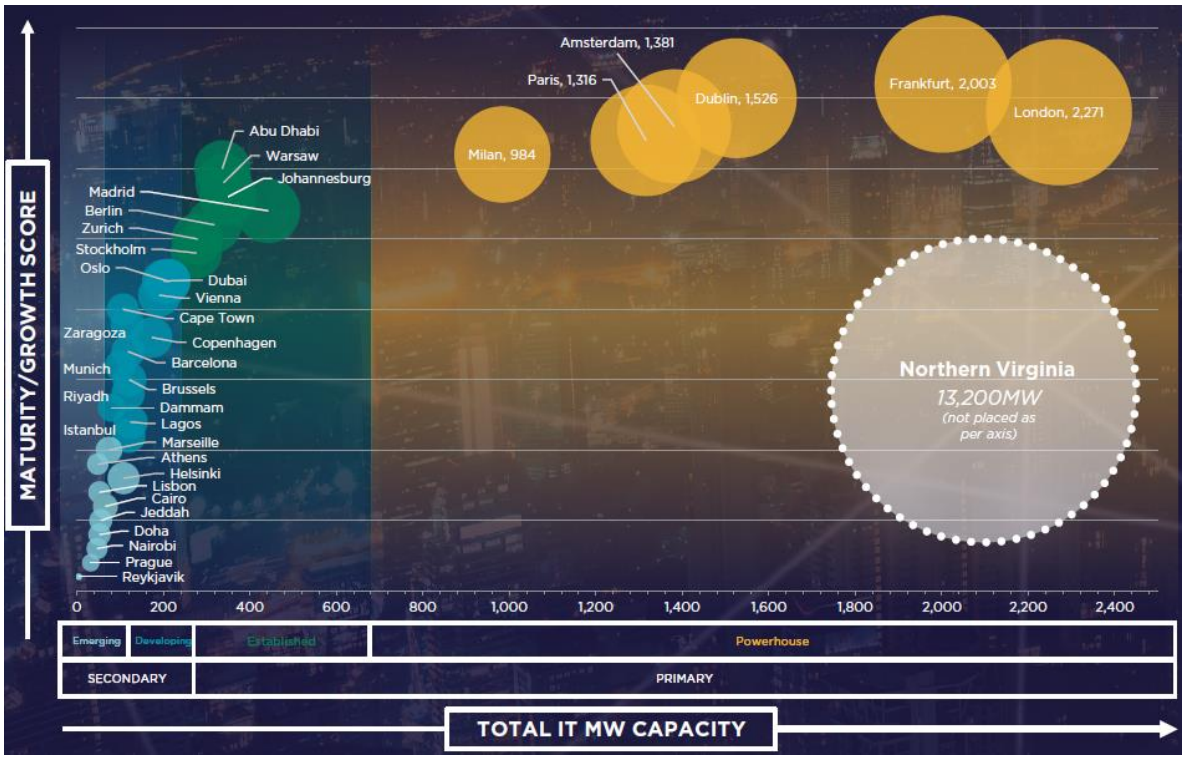
C&W remarked that there is an "Extremely high demand for large packets of power (sites over 150MW) for cloud computing, and AI applications" and that major cloud providers (AWS, Microsoft Azure, Google Cloud and Oracle Cloud) have been driving rising construction of hyperscale data centres.

Another key theme for EMEA is data sovereignty and regulatory compliance. C&W noted that EMEA countries have been imposing "strict data localization and privacy regulations, such as the GDPR in Europe and various data laws in the Middle East and Africa". These regulations may influence where data centres will be located.

C&W plotted the EMEA data centre markets based on their maturity and total IT capacity as shown in **Exhibit 21**. C&W evaluated each market's maturity using their "Maturity Index" score, which is based on: (1) overall stock & vacancy; (2) presence of colocation players & hyperscalers (apart from telecom entities); and (3) build capacities (scale of individual data centres) within each market, considering the impending influence of AI deployment across various markets. C&W also included Northern Virginia, the largest data centre market in the world, for comparison.

We analyse and review the Frankfurt market as an example of a data centre market in EMEA.

Exhibit 21: Comparison of EMEA Data Centre Markets with Northern Virginia



Source: C&W (published October 2024)

According to C&W, Frankfurt's data centre market is "experiencing significant growth, despite operational capacity remaining steady". C&W noted that the market was comprised mainly of colocation providers, with "major players including NTT, Equinix and Digital Realty, the latter holding the largest pipeline of 242MW".

C&W commented that the attractiveness of Frankfurt's data centre market "stems from its low-latency connectivity and role as an interconnection hub" which makes it a "prime location for companies needing efficient data exchange". However, land and power availability issues have "driven the expansion of the region into the wider Rhein-Main area toward Offenbach in the East, Mainz in the West and Darmstadt to the South".

C&W listed developments in Frankfurt as shown in **Exhibit 22**.

Exhibit 22: Recent Site Sales and Construction & Planned Updates (Frankfurt; 1H 2024)

RECENT SITE SALES

PROPERTY / SITE	SIZE	SALE DATE	SALE PRICE (US$)	BUYER	SELLER
Anderson Barracks 6460	178 acres	May 2024	(Undisclosed)	NTT	Bundesanstalt fur Immobilienaufgaben (Federal Agency for Real Estate Tasks)
Weismullerstrasse 3	18.5 acres	May 2024	(Undisclosed)	Tishman Speyer JV Mainova AG	Samson AG
Frankfurt	2,269 sqm	April 2024	(Undisclosed)	nLighten	Exa Infrastructure
Frankfurt	(undisclosed)	Jan 2024	(Undisclosed)	NorthC	(Undisclosed)

CONSTRUCTION & PLANNED UPDATES*

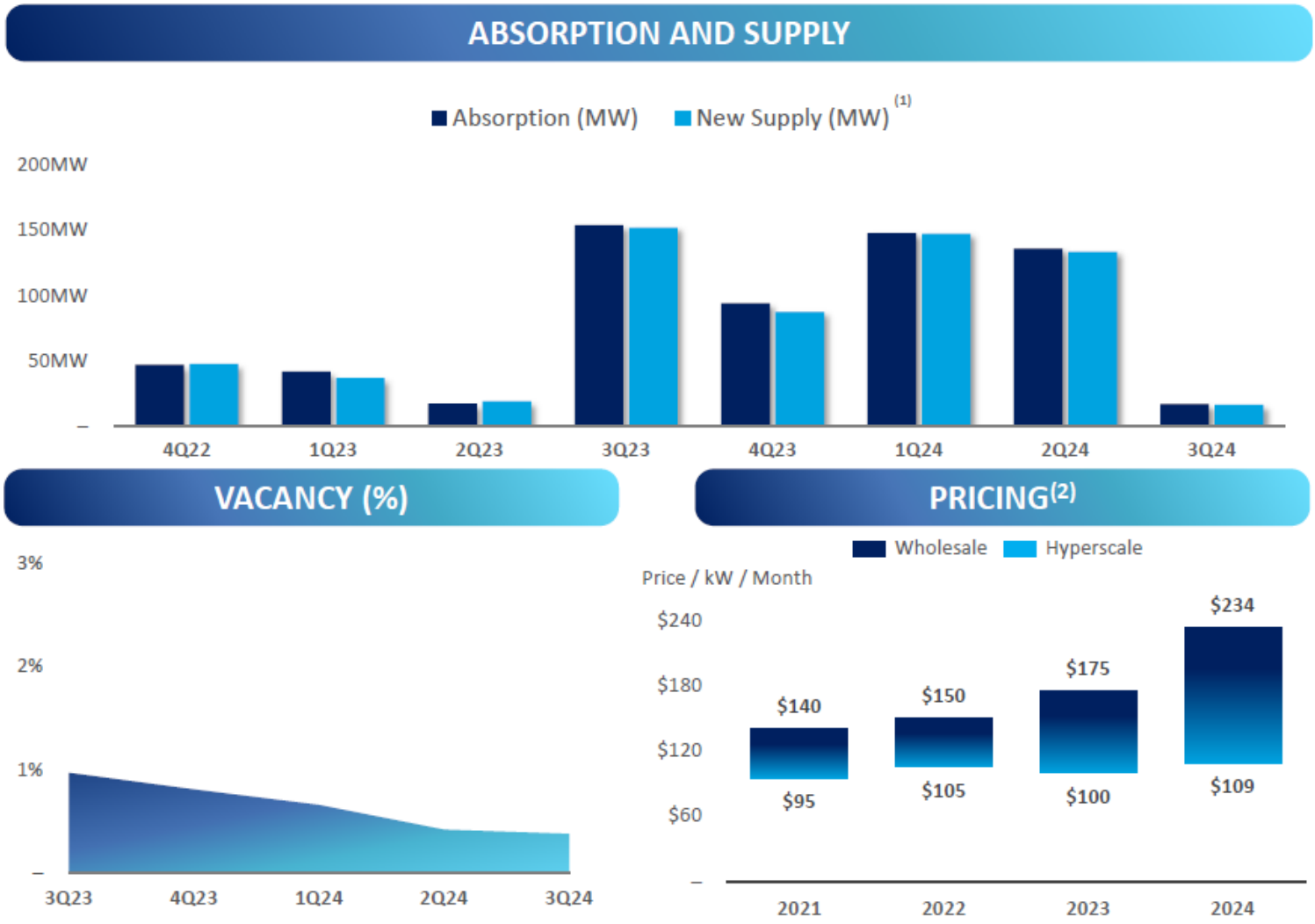
OPERATOR	DATA CENTRE	LOCATION	POWER (MW)	STAGE - EST. RSF
Digital Realty	Digital Park Frechenheim - 1	Frankfurt Am Main	165	Planned
	Digital Park Frechenheim - 3	Frankfurt Am Main	6	Under Construction
	Digitalpark Hattersheim - 1	Hattersheim	45	Planned
	Digitalpark Hattersheim - 2	Hattersheim	15	Under Construction
	FRA15	Frankfurt Am Main	10	Planned
CloudHQ	GER1 & GER2	Frankfurt Am Main	78	Under Construction
	GER1 & GER2	Frankfurt Am Main	22	Planned
	GER3	Hattersheim	16	Under Construction
	GER3	Hattersheim	80	Planned
SDC Capital Partners	FRA-01	Hattersheim	10	Under Construction
	FRA-01	Hattersheim	90	Planned
EdgeConneX	EDCFRA01	Frankfurt	10	Under Construction
	EDCFRA01	Frankfurt	48	Planned
CyrusOne	Frankfurt V	Frankfurt	9	Under Construction
	Frankfurt V	Frankfurt	45	Planned
	Frankfurt VII	Gallus	16	Under Construction
	Frankfurt VII	Gallus	72	Planned
Goodman	FRA I Data Centre - 1	Frankfurt	12	Under Construction
	FRA I Data Centre - 2	Frankfurt	52	Planned
	FRA II Data Centre	Frankfurt	54	Planned
Stack Infrastructure	FRAL1	Frankfurt	80	Planned
Vantage Data Centers	FRA1	Frankfurt Am Main	16	Under Construction
	FRA1	Frankfurt Am Main	24	Planned
	FRA2	Frankfurt	24	Planned
Green Mountain	FRA1-Main	Frankfurt	18	Under Construction
	FRA1-Main	Frankfurt	36	Planned
Colt DCS	Frankfurt West II	Sossenheim	8.1	Under Construction
	Frankfurt West II	Sossenheim	24	Planned
Equinix	FR13	Frankfurt Am Main	3	Planned
	FR16x	Frankfurt Am Main	14	Under Construction
Yondr	Frankfurt – Bischofsheim	Frankfurt	10	Under Construction
	Frankfurt - Bischofsheim	Frankfurt	30	Planned

Source: C&W (published October 2024)

According to DatacentreHawk, vacancy rates are expected to remain low in the near-term as there are "very few facilities being built speculatively". DatacenterHawk noted that pre-leasing will be the main source of activity as new projects are being added to an "already extensive" pipeline and that there is "more contractual flexibility around reservations for future builds being agreed".

Based on DatacentreHawk's data, wholesale (250 kW–4 MW) rents rose by 33.7% from $175/kW/month in 2023 to $234/kW/month in 2024 while hyperscale (over 4 MW) rents rose by 9.0% from $100/kW/month in 2023 to $109/kW/month in 2024 as shown in **Exhibit 23**.

Exhibit 23: Market Information (Frankfurt; 3Q 2024)



(1) Based on q-o-q change in commissioned power. (2) Wholesale pricing represents deals with capacity requirement of 250 kW–4 MW while hyperscale pricing represents deals with capacity requirement of over 4MW.
Source: DCREIT, DatacentreHawk (dated October 2024)

(III) ASIA PACIFIC

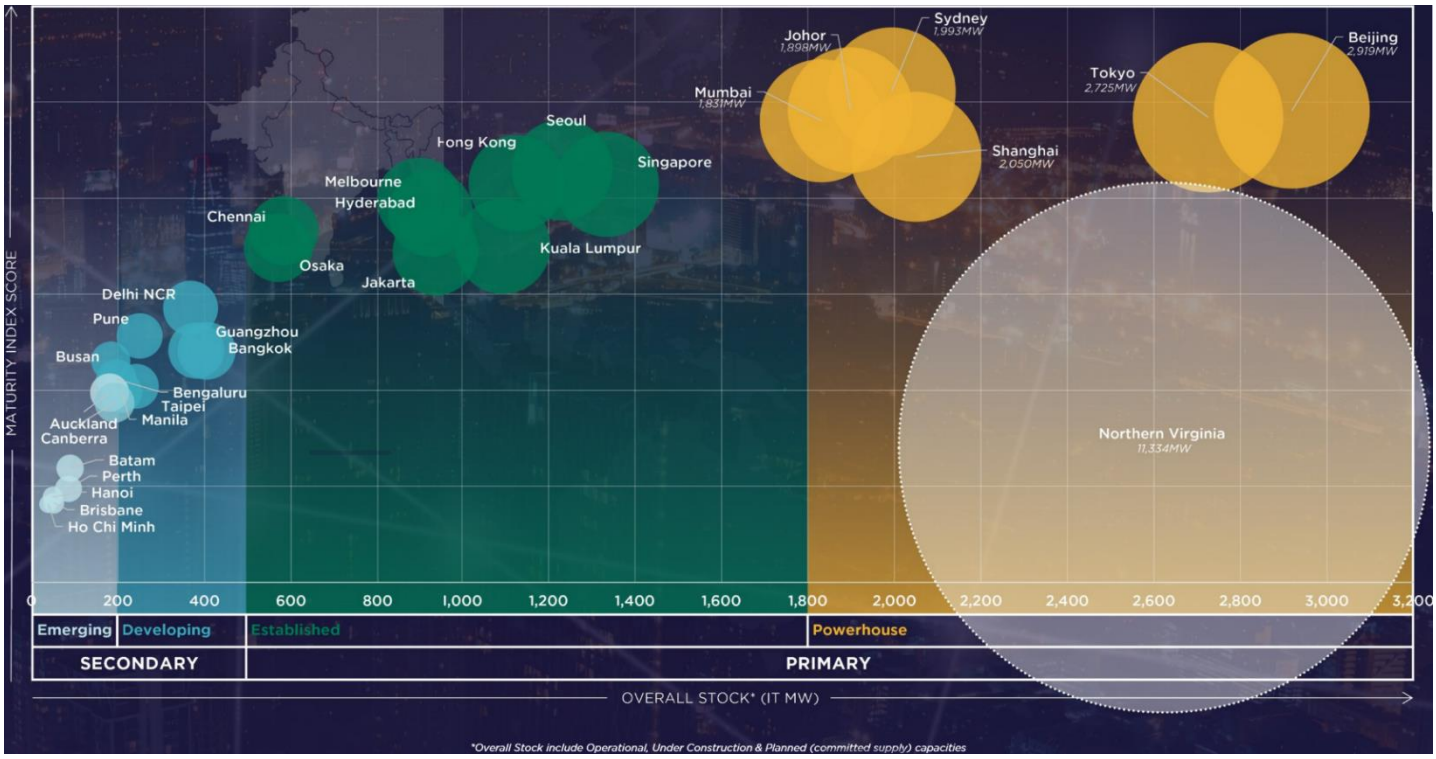
According to C&W, Asia Pacific operational capacity rose to 11.6 GW in 1H 2024. C&W noted that six (out of 14) markets contributed almost 85% of the regional operational capacity: Chinese Mainland (4.2 GW), Japan (1.4 GW), India (1.4 GW), Australia (1.2 GW), Singapore (0.98 GW) and South Korea (0.65 GW). C&W also noted that Malaysia's operational capacity (0.35 GW) had the highest growth of 80% from 2H 2023 to 1H 2024 mainly due to Johor, and that Malaysia is "expected to witness continued growth in the next few years" as it also had a similar growth in its development pipeline.

C&W commented that even though Asia Pacific has been "slower in experiencing the impact of artificial intelligence (AI) adoption along with generative AI, as compared to the U.S. (which has observed a bigger influence)", there is still "impending demand for increased data centre capacities" which "will positively impact requirement of larger data centre campuses within the region". C&W also commented that cost efficiencies, sustainability measures and the impact of carbon footprint reduction are major challenges for Asia Pacific. However, stakeholders have been "observed to be addressing them with improved technology adoption, while foraying ahead within larger build capacities".

C&W plotted the Asia Pacific data centre markets based on their "Maturity Index" score and overall IT stock (which includes not just operational but also under construction and planned capacities) as shown in **Exhibit 24**. C&W also included the Northern Virginia market for comparison.

We analyse and review the Johor market as an example of a data centre market in Asia Pacific.

Exhibit 24: Comparison of Asia Pacific Data Centre Markets with Northern Virginia

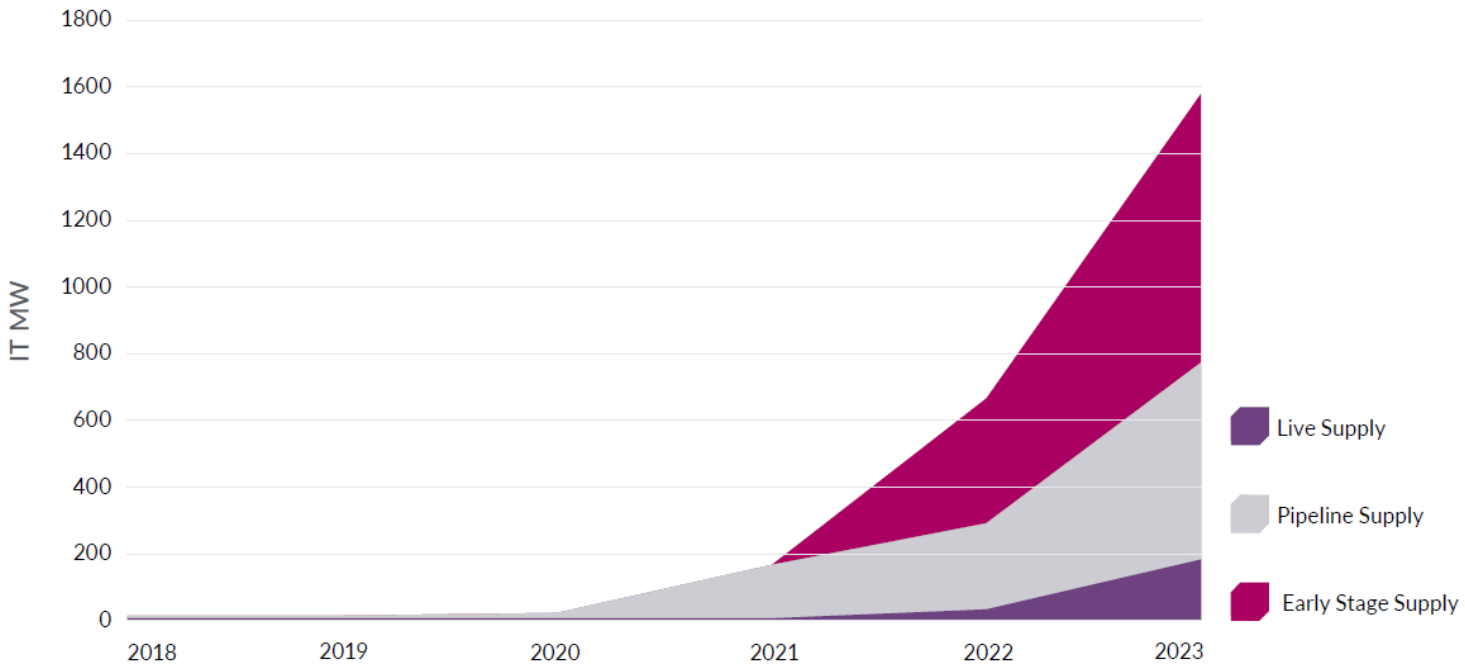


Source: C&W (published August 2024)

According to DC Byte, Johor has been the "fastest growing market within Southeast Asia". DC Byte remarked that Johor had been the "largest beneficiary" of Singapore's moratorium on data centres which was in effect from 2019 to 2022, with its Total Supply (Live Supply + Pipeline Supply + Early Stage Supply) rising from less than 10 MW in 2019 to over 600 MW in 2022 during the effective period of the moratorium as shown in **Exhibit 25**. DC Byte also commented that Johor "experienced exponential growth as it absorbed the spillover demand from regional tech companies and OTTs" (or Over-The-Top, which refers to the provision of streaming media content over the Internet according to Amazon).

DC Byte noted that the clusters are "located in Sedenak Tech Park, Nusajaya Tech Park, and YTL Green Data Centre Park" and that surrounding areas or regions offering land with power are "beginning to see heightened interest as activities continue to intensify". DC Byte also noted that Malaysian authorities have been "very supportive of the data centre developments" and actively positioned Malaysia as an upcoming regional hub. For instance, the Malaysian Investment Development Authority ("MIDA") and Malaysia Digital Economy Corporation ("MDEC") "collaboratively established a Digital Investment Office to act as a one-stop centre between the government and investors to coordinate and facilitate digital investments" so as to "support market entry of international operators".

Exhibit 25: Historical Supply (Johor)



Source: DC Byte (published April 2024)

C&W also remarked that Johor "continues to benefit from its proximity to Singapore" due to its "attractive land and power prices as well as lower construction costs" as compared with Singapore. C&W noted that the Malaysian government "fully supported the development of strategic large- scale parks located in secure environments with appropriate infrastructure, robust connectivity and abundant power resources". C&W also noted that government support remains strong as the Malaysian government is still "putting efforts to attract DC investment by offering tax incentives, grants and regulatory support to ease the entry" of these investments, "including the Green Lane Pathway promoted by TNB where access to power could be made available in 12 months duration".

Meanwhile, large players like Microsoft have been growing their data centre footprint in Johor within "identified data centre parks, i.e. Nusa Cemerlang Industrial Park ("NCIP") and EBP6 in Kulai" which are "strategically positioned close to Singapore and freehold in tenure". C&W also noted that other players have been "progressively entering these areas to acquire land for potential data centre developments".

C&W listed developments in Johor as shown in **Exhibit 26**.

Exhibit 26: Significant Construction & Planned Updates (Johor; 1H 2024)

SIGNIFICANT CONSTRUCTION & PLANNED UPDATES*

COMPANY	DATA CENTRE	LOCATION	POWER (TOTAL CAPACITY†)	STAGE - EST. RFS^
Equinix	JH1	Nusajaya Tech Park	0.6MW (2.40MW)	U/C - 2024
GDS	Kempas TechPark (previously Starhill)	Kempas Lama	108MW (108MW)	U/C – 2024
	Site 3	Nusajaya Tech Park	45MW (45MW)	U/C – 2024
	Site 3	Nusajaya Tech Park	18MW (45MW)	Planned 2024
	Site 2	Nusajaya Tech Park	45MW (45MW)	U/C - 2024
K2 Data Centres	JHR1	Sedenak Tech Park	60MW (300MW)	UC – 2024
	JHR1	Sedenak Tech Park	200MW (300MW)	Planned
Open DC	JB1	Menara MSC Cyberport	1.1MW	U/C - 2024
PDG	JH1	Sedenak Tech Park	52MW (150MW)	U/C – July 2024
Singtel	Skandar Puteri	Iskandar Puteri	64MW (200MW)	Planned 2024
STTelemedia Global Data Centres	Nusa Cemerlang Industrial Park	Johor	16MW (120MW)	Planned 2025
VADS	Iskandar Puteri Core Data Centre	Nusajaya Tech Park	8.21MW (13.19MW)	Planned 2024
Yondr	Sedenak Tech Park	Bukit Batu	24MW (300MW)	U/C – 2024
	Sedenak Tech Park	Bukit Batu	80MW (300MW)	Planned 2024
YTL Data Centers	SEA Data Center	Kulai	12MW (340MW)	U/C – 2024
	SEA Data Center	Kulai	60MW (340MW)	Planned 2024

Source: C&W (published August 2024)

CONCLUSION

Data centres are facilities which house IT infrastructure that process, store & transmit data. Demand for data centres has been rising in recent years, driven by the growth in worldwide data creation and cloud computing. The rise of AI is expected to increase not just data centre demand, but also requirements as AI workloads are generally more power-intensive and may thus require advanced cooling technologies.

Different AI workloads (training and inference) also have different requirements, which may influence where the workloads will be located. Training AI workloads require a larger capacity block, and thus may be located in areas with higher availability of land and power (e.g., rural areas). In contrast, inference AI workloads require a smaller capacity block but have higher latency sensitivity, and thus may be located nearer to end-users or to major cloud regions.

To meet rising demand, data centre operational capacity has been rising across Americas, EMEA and Asia Pacific in 1H 2024. As demand continues to exceed supply, rental rates have also been rising across geographic regions. Common regional challenges include land and power availability, for which operators and developers have responded by expanding into peripheral markets (e.g., Indianapolis in Americas, Mainz in EMEA).

In view of the high expected growth of worldwide AI spending and the projected rise in AI-driven energy demand, we expect data centre demand growth to remain strong in the next few years. As land and power availability remain constrained across markets, we also expect that data centre demand will grow faster than supply such that rental rates will continue to rise.

Likely beneficiaries of rising data centre demand and rental rates would include listed data centre companies such as EQIX, DLR and NTT (or NTT DATA).

DISCLOSURES/DISCLAIMERS

This report is prepared for general circulation. It does not have regard to the specific investment objectives, financial situation and the particular needs of any recipient hereof. Advice should be sought from a financial adviser regarding the suitability of the investment product, taking into account the specific investment objectives, financial situation or particular needs of any person in receipt of the recommendation, before the person makes a commitment to purchase the investment product.

This report is confidential. This report may not be published, circulated, reproduced or distributed in whole or in part by any recipient of this report to any other person without the prior written consent of FPA Financial Corporation Pte Ltd ("FPA"). This report is not directed to or intended for distribution to or use by any person or any entity who is a citizen or resident of or located in any locality, state, country or any other jurisdiction as FPA may determine in its absolute discretion, where the distribution, publication, availability or use of this report would be contrary to applicable law or would subject FPA and its connected persons (as defined in the Financial Advisers Act, Chapter 110 of Singapore) to any registration, licensing or other requirements within such jurisdiction.

The information or views in the report ("Information") have been obtained or derived from sources believed by FPA to be reliable. However, FPA makes no representation as to the accuracy or completeness of such sources or the Information and FPA accepts no liability whatsoever for any loss or damage arising from the use of or reliance on the Information. FPA and its connected persons may have issued other reports expressing views different from the Information and all views expressed in all reports of FPA and its connected persons are subject to change without notice. FPA reserves the right to act upon or use the Information at any time, including before its publication herein.