Data Centers – are they infrastructure?

Maple-Brown Abbott Global Listed Infrastructure
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The Maple-Brown Abbott Global Listed Infrastructure (GLI) team has long held that data center companies do not exhibit the requisite "core" characteristics of infrastructure, namely due to lower barriers to entry, higher competition and typically shorter contract lengths relative to other "core" sectors.

We re-visited our long-standing position by analysing the key features of data center companies and comparing these to cell tower companies. Our analysis re-affirms our view that data center companies do not satisfy the "core" infrastructure definition employed by the GLI team in the investment process. We find that the industry has moderate barriers to entry and high competition as the assets themselves are fairly homogenous, not intrinsically monopolistic and do not operate within a regulatory construct. Data center companies generally have relatively short contract durations and moderate churn, with prices highly dependent on competitive dynamics and the prevailing supply and demand environment. This means they do not offer strong predictability of volumes and/or price and therefore cash flows or returns.

Accordingly, companies in this industry do not offer the strong inflation protection and low cash flow volatility characteristics that are targeted by core infrastructure and the GLI strategy, and rather, appear more consistent with real estate assets or "core-plus" infrastructure. Indeed, several data center stocks are REITs and are among the top constituents of various REIT indices, but do not feature in major infrastructure indices including the FTSE Infrastructure 50/50, Dow Jones Brookfield Infrastructure, S&P Global Infrastructure and FT Wilshire GLIO Listed Infrastructure.

In the digital infrastructure universe, we prefer to invest in cell tower companies (towercos), which we view as having more robust business models and stronger combinations of inflation protection and low cash flow volatility. We have seen a material divergence in the performance and valuations of listed data center and tower companies, and believe the market underappreciates the opportunities in listed tower companies.

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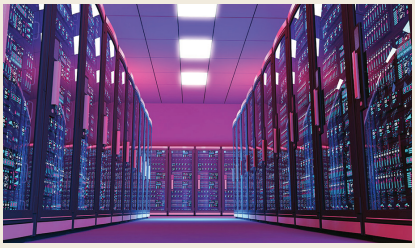
Comparison of key characteristics

	Data Centers	Towers
Essential service	**Yes** – essential for data storage, processing and computing to support a wide range of digital processes and functions	**Yes** – essential component of wireless mobile communications networks
Barriers to entry	**Moderate** – includes capital, land and power, but not intrinsically monopolistic nor operating within a regulatory construct	**Moderate/high** – natural monopoly over an area due to zoning and electromagnetic spectrum limits
Competition	**Moderate/high** – compete heavily on price, as well as location, product offerings and reliability	**Low** – due to the above
Substitution	**Moderate** – customers can in-source or self-build, or use the cloud instead of a third-party data center provider	**Low** – companies have strong protection via long term contracts with specified terms (e.g. holistic take-or-pay structures, all-or-nothing renewals)
Stranded asset risk	**Moderate** – assets have shorter lives and are exposed to fast-changing technology trends and requirements, including for power and cooling systems	**Low** – very long physical asset lives
Customer base	100's of customers; wide range in size and industry; higher credit risk from exposure to SMEs	Few key customers (mobile network operators/carriers); higher concentration risk
Contract terms	**More volatility** – shorter contract lengths (1–3 years for colocation, 5–10+ for wholesale), varied levels of inflation protection	**Low volatility** – long contract lengths (5–20+ years) with annual escalators (CPI or fixed)
Pricing	**Market based** – determined by prevailing supply and demand dynamics of the market	Set at initiation based on required return
Churn	**Moderate** – varies from 3–10% pa	**Low** – generally 1–2% pa
Valuations	**Moderate** – trade at a premium to other digital infrastructure and real estate assets	**Attractive** – trading at a discount to historical levels and to comparable transactions

Strategic Positioning

Barriers to Entry

The key requirements to build a data center include land, electricity, and capital. Outside of these factors, there are generally few barriers for DC operators or enterprises to construct and own a DC facility, and therefore the risk of new entrants is moderately high. While having a large or existing presence and local relationships can be advantageous when securing permitting and power connection, there are typically no regulatory, technical, and legal limitations that prohibit a new DC being built right next to an existing one. This is distinct to towers, which generally have a natural monopoly over a given area and therefore greater scarcity value due to local zoning and electromagnetic laws, which can restrict the presence of towers in certain locations or within a certain distance from one another.



What are data centers?

A data center (DC) is a physical facility that contains systems and equipment to store and/or connect data. Traditionally, organisations used in-house or on-premise data storage hardware and software to store their data. However, over time they have increasingly outsourced this to companies that operate DCs on an industrial scale, offering space in these shared facilities to multiple tenants. Much like with cell tower companies ('towerco's') and real estate assets generally, this allows customers to essentially outsource and share the capital costs of the infrastructure and recognise usage as opex in the form of contract fees paid to the DC operator.

Amazon, Apple, Alphabet, Meta and Microsoft are among the major tech companies known as 'hyperscalers' that rely heavily on DCs as part of their core business. There has been a sharp rise in demand for new DCs in recent years to match the exponential growth in the volume of data being created and stored to support social networking, video streaming, e-commerce and AI.

The cost of building a DC generally ranges from $7–16 million per megawatt of commissioned IT load, with the key elements being

1 the land, building shell and fit-out (35–45% of total costs)
2 electrical systems (35–45%) and
3 cooling/HVAC systems (15–25%).

In addition to the DC infrastructure itself, the IT equipment (primarily servers as well as networking and storage equipment) within DCs is the largest cost at around $30 million per MW, although this is incurred by the customer rather than the DC operator.

Building a DC can take anywhere from six months to several years to complete. In recent years, data center demand has increased significantly and outpaced growth in supply, impacted by challenges with power/grid availability, supply chains, inflation and labour experienced globally, leading to a decline in vacancy rates. Indeed, the DC industry has experienced several booms and busts since its inception, given the moderate barriers to entry and this long lead time for supply, which has significant impacts on pricing.

Competition

The industry is highly fragmented and competitive. Equinix (EQIX US), the largest independent global DC operator, identifies competition as a key risk factor in its 2023 10K, and states "The global multi-tenant data center market is highly fragmented. It is estimated that we are one of more than 2,200 companies that provide these offerings around the world."[1] The number of companies is notable, and in-fact has increased materially from that quoted in EQIX's 2021 10K of 1,200, implying an addition of around 1,000 competing DC companies in just two years.

The key differentiators for a DC are location, product offerings, reliability, and price. For customers, minimising the distance between the business and data center is important to minimise latency in the transfer of data (generally the facility needs to be in the same city or region as the customer, and near fiber optic infrastructure to not impede performance). Certain customers may also desire presence across multiple locations and/or connectivity to stakeholders such as other enterprises and cloud providers (e.g. to set up interconnections), which can also give rise to a network effect where a provider's platform becomes more valuable as it grows.

Switching Costs

The switching costs for DC customers can vary depending on the type of customer, level of service and contract terms. For instance, wholesale customers typically have more equipment and may have set up their own power connections, so switching is a more complex and costly task. Retail customers pay the DC provider for power and other services, and thus switching only requires moving servers (usually also a smaller number of servers) from one facility into another. Additionally, there are typically multiple alternative facilities from competitors with no major difference in location, service level or performance, however this depends on the customer's needs.

This is distinct from towercos, where it is much more difficult and costly to switch. Taking communications equipment off a tower site and moving it to another can be expensive, typically requiring a specialised tower climber, and can impact the communications network coverage. In addition, towerco contracts may include an 'all-or-nothing' renewal clause, which restricts customers from terminating agreements on individual sites.

1 Equinix, 'Form 10-K Annual Report 2023', February 2024.

Substitution

Fundamentally, data storage is an essential service in today's data driven world. However, organisations who want to store data have several options:

1 owning and operating an in-house/on-premise DC

2 using a third-party, multi-tenant (colocation) DC company, or

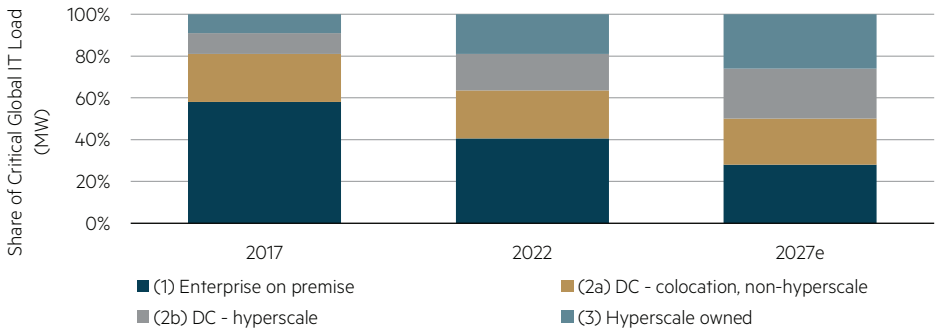
3 outsourcing all data infrastructure to a cloud service provider (CSP).

Over time and as data storage needs have grown exponentially, there has been a trend towards outsourcing to third-party DCs as it is generally easier, less capital intensive, and more time and cost efficient to implement and scale up/down as needed. The performance is also generally better as the DC is a dedicated, specialised operator with greater ability to provide redundancy mechanisms and other operational features to improve availability/uptime.

However, most of these functions and benefits can also be provided by a CSP – the main difference being that the organisation no longer owns and controls their own data storage hardware (either in their own on-premise data center or inside a third-party DC facility). In fact, a CSP requires DCs to store and connect all their customers data as well, and many CSPs are key customers of DCs for this reason. However, CSPs and other large enterprises with significant data storage needs (think TikTok, Meta, Disney) often own data center facilities themselves (self-building) rather than relying solely on third-party DC companies, given their financial resources, the limited barriers to entry, and the fact that their massive scale diminishes the benefits of outsourcing. In fact, hyperscalers such as AWS, Microsoft Azure and Global Cloud own more DC capacity themselves than even the largest independent DC providers Equinix and Digital Realty. Synergy Research Group estimates that around half of the total hyperscale data center capacity globally is in owned facilities and half is leased in third-party DCs.[2] In this way, DC providers benefit indirectly from companies using CSPs, via increasing demand from CSPs for data center capacity (rather than outsourcing to a DC directly).

Indeed, the trend for many organisations has been towards IT outsourcing to DCs and CSPs given growth in data and higher application complexity, and this is expected to continue. However, using a third-party DC operator is not necessarily essential as customers have alternative options.

Data Center capacity



Source: Synergy Research Group, July 2023.

2 Synergy Research Group, 'On-Premise Data Center Capacity Being Increasingly Dwarfed by Hyperscalers and Colocation Companies', July 2023.

Stranded Asset Risk

The risk of technological change and obsolescence is particularly important for digital infrastructure assets. Customers, rather than DC operators, are indeed the owners of the servers and computing equipment. However, as technology hardware, software and overall network architecture evolves, requirements for the DC facility evolve too. Industry-wide, companies are finding that DC facilities that are more than a few years old do not have sufficient modern power, back-up, cooling and control systems, resulting in excess capacity or necessitating expensive upgrades by DC operators.

A prominent example of this today is the introduction of new processing units (CPUs and GPUs) and higher rack densities to support AI. These new chips and servers have higher power consumption and thermal density properties, which has meant that traditional air-cooling techniques and power supplies may be inefficient or not technically adequate. For instance, traditional CPUs typically consume around 100W of power (TDP), whereas Nvidia's H100 GPU consumes up to 700W per chip. Today, many DCs are looking to liquid cooling solutions, which can be more efficient in terms of usage of power, space, and costs. However, electrical and cooling systems are complex and there is a multi-year lead time for new purpose-built facilities, while for existing facilities, retrofitting is a major undertaking that can be costly, impractical or technically infeasible. This can lead to stranded capacity, with wasted energy, space or cooling equipment, and a shorter useful life of those facilities. Importantly, the operators bear these risk exposures, including to additional capital requirements and a potential deterioration in returns, as there are no regulatory or contractual protections for operators.

This highlights how DCs are more exposed to rapid changes in the wider technology industry and can have shorter asset lives than other more traditional infrastructure assets. TowerCo's generally do not face such technological risks, as these companies focus on providing the passive infrastructure with a very long life cycle (that is, steel towers with physical lives of 50+ years), rather than actual telecommunications equipment (such as antennas).

Impacts of AI

Over the last two decades, DC demand has been driven by digitisation and the shift from on-premise data storage to outsourced DC operators (traditional retail and wholesale colocation) and to the cloud (indirectly driving hyperscale demand). In the last few quarters, AI (particularly generative AI) has become a huge and important driver for DC companies, with significant implications for demand, service offerings, power consumption and associated requirements, and investments. This is particularly true in the US, where AI spending, implementation, and utilisation is greatest.

Generative AI has two phases:

1 training, where AI models process material amounts of input data to learn how to perform a given task, and

2 inferencing, where the model is deployed and used.

Training is highly data, compute and power intensive, involving the use of thousands of GPUs operating at full capacity in DCs. This has required DC operators and customers to upgrade or install new computing, power and cooling equipment in facilities. It is also estimated that DCs for training workloads will be significantly larger in size/capacity, with Synergy Research Group forecasting that the average capacity of new hyperscale data centers will soon be more than double that of those currently operational.[3] AI workloads for training are therefore more applicable to hyperscale capacity than retail/enterprise colocation and are being deployed near existing cloud availability zones and more remote locations.

3 Synergy Research Group, 'Hyperscale Data Center Capacity to Almost Triple in Next Six Years, Driven by AI', October 2023.

Inferencing workloads, by contrast, are less demanding on computing and power resources, however, place greater importance on connection and location to reduce latency when relaying information to end users of the AI applications. It is also much more varied in terms of potential users, technologies and use cases. Here, there is a potential greater role for DC companies that provide interconnection, such as Equinix, CoreSite (AMT) and Digital Realty, and those located in Tier 1 markets and potentially edge facilities. Inferencing is still evolving, and it is expected that data center demand for AI workloads will shift from training to more inferencing over time.

Inflation Protection and Cash Flow Volatility

Customer Base

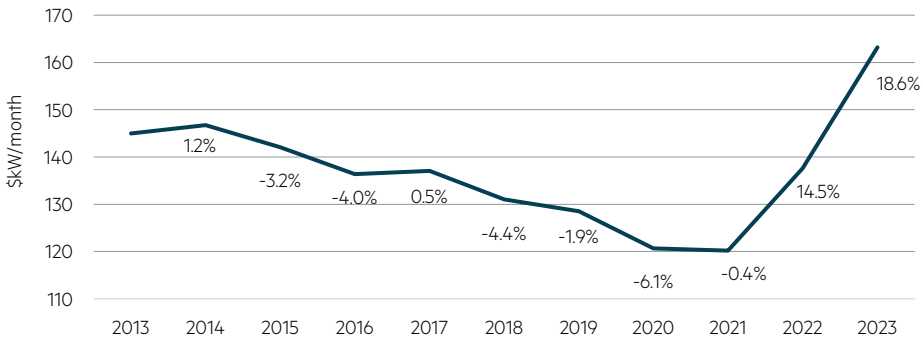
DCs may serve a combination of large, established enterprises and small and medium sized enterprises (SMEs); coming from a range of industries including cloud service providers (CSPs), media and IT companies, financial institutions, government organisations, and healthcare providers. Typically, no single customer represents more than 15% of revenues, with larger customers usually including very large enterprises and hyperscalers such as Microsoft, Amazon, Apple, Meta and Google. This compares with towerco's for which the vast majority (>90%) of revenues usually come from three to four customers in each country, being the mobile network operators (MNO's). While towerco customers are therefore more concentrated, they are largely investment grade rated organisations, particularly in developed markets, and so may have lower counterparty/credit risk than DCs with exposure to SMEs.

Contract Terms and Pricing

DC operators typically sign leases with customers for the core offerings, priced according to the consumption of space or capacity, as well as factors such as power usage or number of connections. Such contracts vary in length and terms, with retail leases generally being 1–3 years (though ranging widely) and wholesale/hyperscale leases typically longer at 5–10+ years and with built in escalators, which can be fixed or CPI-linked.

In theory, shorter term contracts without in built escalators should re-price at higher prices upon renewal (known as the renewal or releasing spread). However, the extent to which this occurs is related to the competitive position of each company, the type of customer, and most importantly, the prevailing supply and demand dynamics in the market. For instance, across the industry, vacancy rates have fallen since 2022 as growth in demand for DC capacity has outpaced supply, leading to strong absolute increases in average rents (on a per square foot (sf) or megawatt (MW) basis) and positive releasing spreads, as operators re-price contracts at prevailing market rates. However, the industry dynamics were unfavourable for operators in earlier years, leading to declining rents and low to negative releasing spreads. Overall, the variability in average rents and releasing spreads by major DC companies reflects the sensitivity of pricing and revenues to the broader industry environment, with limited linkage to inflation.

Average asking rental rate for primary markets



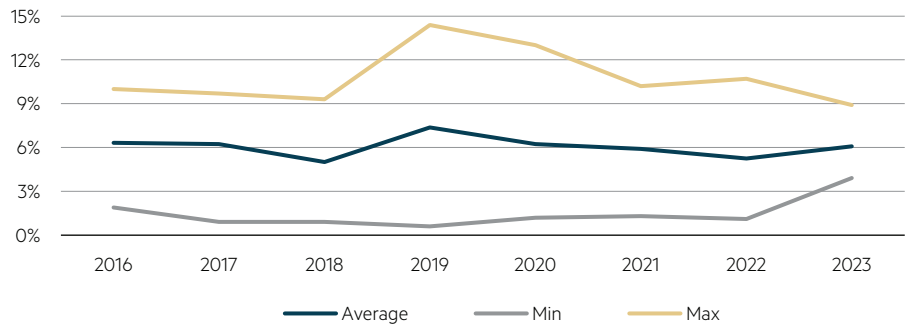
Source: CBRE, 2023. Refers to North America, asking rates for 250–500kW at N+1 / Tier III requirements.

Renewal Rates

With relatively short average contract lengths of around 3–5 years, a high proportion (~20–35%) of recurring revenues face renewal each year, exposing operators to material re-pricing and volume risk. The rate and terms of renewal varies significantly between companies and segments and can be impacted by factors such as technology trends and economic cycles. Churn for most DC operators ranges from 3–10% of recurring revenues per annum, typically being lower for wholesale than retail, reflecting the longer contract terms and higher switching costs. Overall, this implies that roughly a quarter of customers on average are deciding not to renew and switching providers when their contract matures.

In comparison, towerco churn is generally lower at 1–2% pa, and primarily relates to customers working with towercos to redesign their networks or remove sites for efficiencies, rather than to switch to an alternative tower in the same area. It is also less sensitive to macroeconomic cycles and less price elastic, as customers cannot easily remove equipment from a tower and switch off the network. However, given the more concentrated customer base, towercos may be more materially impacted by structural changes in the customer base such as customer consolidation.

Annual churn rate



Source: RBC, Company reports. Includes available data from 10 companies.

Expenses

Power, in terms of the load that can be supported, is generally used to define the capacity of a facility, and it often represents the largest expenditure for operators at around a third to half of total operating costs. Customer contracts will typically be priced based on the space occupied and power consumed, however this may be as part of the 'all in' price (more common with US retail providers) or on a metered basis (a pass through, more common in wholesale and international markets). In the former scenario, the DC operator is exposed to variability in power prices, and so operators commonly aim to enter into short to medium term contracts with local utility companies.

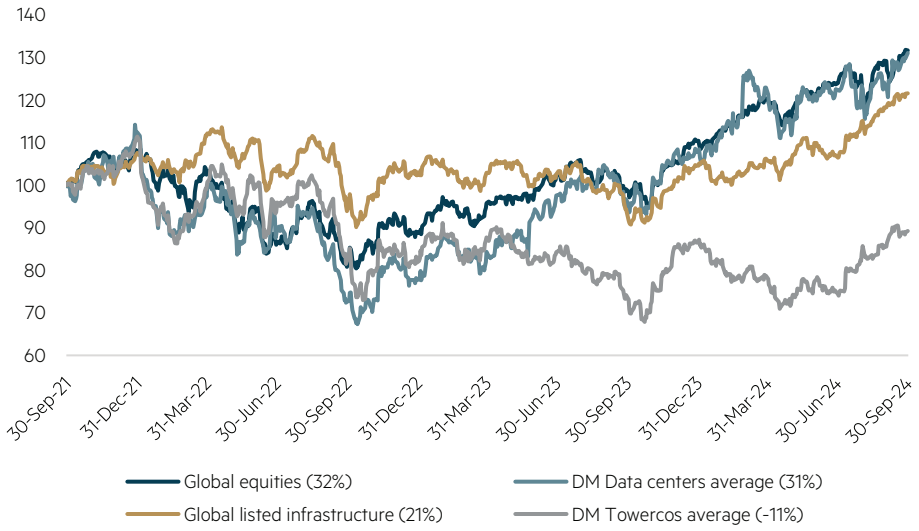
Ground leases are also usually a key cost item for operators, as land is typically a combination of owned and leased, though the mix may vary greatly between companies and geographies. For instance, Equinix's owned assets generate two-thirds of recurring revenues and leases have 18 years remaining average maturity, while GDS leases almost all land for 15–25 years (land cannot be owned outright in mainland China). This compares to towercos (for which ground leases are the largest operating expense), where operators aim to match the terms (tenure and escalators) of contracted revenues with ground lease expenses (for land that is not owned). For DCs, this does not appear to be as well matched and therefore may result in greater volatility.

Investment Opportunities

The investable universe is currently small in listed markets. There are currently only a handful of large, standalone, multi-tenant DC companies that are listed, with the largest being Equinix (EQIX) and Digital Realty (DLR) who are global operators, and more regionally focused players including NextDC (NXT) and GDS Holdings (GDS). Many listed DCs have been subject to mergers and acquisition (M&A), particularly during 2021–23, and subsequently delisted.

In the digital infrastructure universe, we prefer to invest in cell tower companies, which we view as having more robust business models and stronger combinations of inflation protection and low cash flow volatility. We have seen a material divergence in the performance and valuations of listed DC and tower companies, with DC stocks performing well over the last two years, benefiting from the AI thematic.

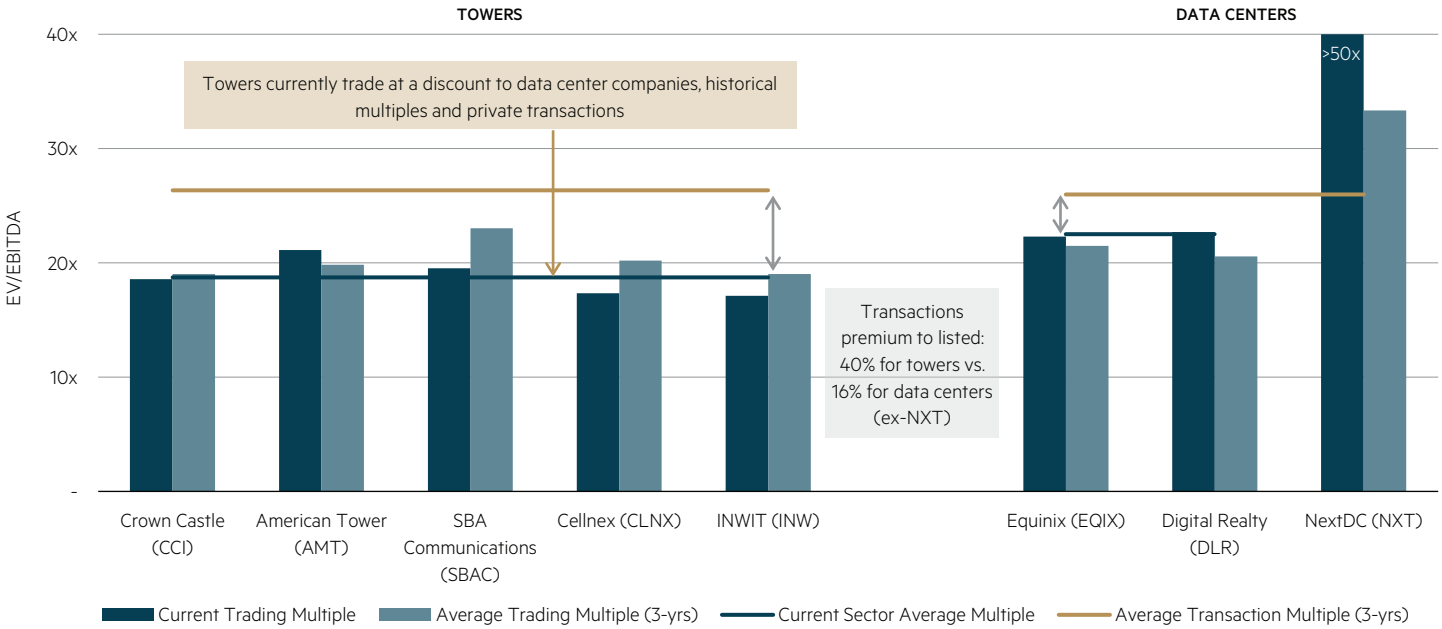
Total return (3 years to 30 September 2024), indexed to 100



Source: Bloomberg, at 30-Sep-24. Global equities refers to the MSCI World Index; Global listed infrastructure refers to the FTSE Global Core Infrastructure 50/50 Index Net Tax Hedged to USD; DM Data centers is the simple average of EQIX, DLR and NXT; DM Towercos is the simple average of AMT, CCI, SBA, CLNX and INW (all stock returns in local currency).

M&A has been a consistent theme across digital infrastructure, involving a wide variety of pure-play operators, telcos, asset managers and other players, for both single assets and platforms. For both towercos and DCs, transaction multiples have tended to be at a premium to most listed company valuations. Notably, we have observed that towercos traded at premium multiples to comparable transactions prior to 2022 and this has since reversed materially, giving rise to what we believe is an attractive opportunity to access high quality digital infrastructure assets at favourable valuations in the listed markets.

Valuations of Tower and Data Center Companies



Notes: MBA GLI estimates and Bloomberg data, at 30-Sep-24. EV/EBITDA is rolling 12 months forward, adjusted for non recurring and non cash items and for EU towercos is pre-IFRS 16 (i.e. EBITDAaL (after lease expense) and Enterprise Value excluding lease liabilities, comparable with US GAAP). Data centers sector average excludes NXT. Transactions include whole company and asset sales in comparable markets in our transactions database.

Key data center transactions

Target	Date	Buyer	Seller	Deal value, USDm	EV, USDm	EV/ EBITDA	Stake
AirTrunk (APAC)	Sep-24	Blackstone, CPPIB	Macquarie Infrastructure and Real Assets	10,072	16,000	23x	88%
ChinData (China)	Aug-23	Bain Capital	Listed on NASDAQ	1,800	3,160	9x	57%
Allied Datacenters (Toronto)	Jun-24	KDDI Corporation	Allied Properties REIT	1,020	1,020	28x	100%
Compass Datacenters (North America)	Jun-23	Brookfield, OTPP	RedBird Capital Partners, Azrieli Group	2,769	5,700	30x	100%
AIMS Group (Malaysia)	Nov-22	DigitalBridge	TIME dotCom Berhad	438	700	37x	70%
AMT Data Centers (US)	Oct-22	Stonepeak	American Tower	3,070	10,500	29x	36%
Switch Inc (US)	May-22	DigitalBridge, IFM	Listed on NASDAQ	8,663	10,500	33x	100%
Teraco Data Environments (South Africa)	Jan-22	Digital Realty	Berkshire Partners, Permira	1,725	3,500	35x	55%
CyrusOne (US & Europe)	Nov-21	KKR, GIP	Listed on NASDAQ	11,895	15,322	25x	100%
CoreSite (US)	Nov-21	American Tower	Listed on NYSE	8,300	10,100	29x	100%
QTS Realty Trust (US and Europe)	Jun-21	Blackstone	Listed on NYSE	6,700	10,000	25x	100%

Source: Company data, Infralogic, Broker reports.

Our conclusion

Our analysis re-affirms our long-standing view that DC companies do not satisfy the "core" infrastructure definition employed by the GLI team in the investment process. We find that there are lower barriers to entry and higher competition relative to other "core" sectors, and the relatively short nature of contracts and competitive pricing environment means companies can have low predictability of cash flows and returns, with exposure to material re-pricing and volume risk. We conclude that DC assets are a subpar avenue for targeting inflation-like protection and lower cash flow volatility in the investment process.

We believe there are other, more attractive "core" avenues to invest in the digitalisation theme to better deliver on the GLI strategy. These include cell tower companies to support wireless connectivity and electric utilities who are attractively positioned to meet growing power demand from the data centers themselves.

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