InfraRed
Capital Partners

Value-Add Infrastructure

UNLOCKING THE GROWTH POTENTIAL OF SECULAR TRENDS

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INTRODUCTION

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Value-Add (VA) infrastructure is an established asset class but it has gained in popularity in recent years, as secular trends, such as decarbonisation and digitalisation have substantially broadened the infrastructure opportunity set, particularly in the mid-market. While historically infrastructure was an asset class focused mainly on offering diversification and long-term income generation, its role in investors' portfolios is broadening to a source of return enhancement. In a market characterised by higher interest rates, VA strategies offer an opportunity to capitalise on the growing demand for new infrastructure, to generate resilient, higher returns.

This paper represents a general introduction to VA infrastructure as an asset class, and outlines the building blocks of VA infrastructure strategies.

It describes the key infrastructure characteristics managers seek in assets they select, and the growth levers they adopt to expand and de-risk infrastructure businesses and create value at exit. Furthermore, it examines the risk-return profile of the asset class and its distinctive role as a diversifier and return-enhancer within investors' portfolios.

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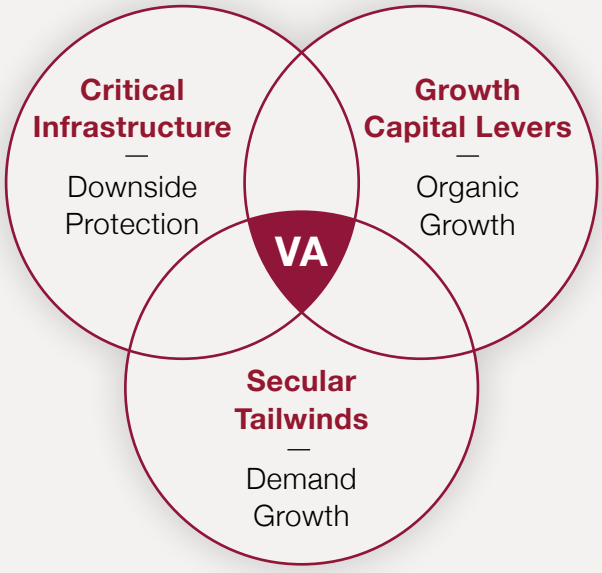
THE BUILDING BLOCKS OF VALUE-ADD INFRASTRUCTURE

What Is Value-Add Infrastructure: Value-Add infrastructure combines aspects of traditional infrastructure investment focused on capital preservation and downside protection, with the value-creation approach of growth capital strategies. VA strategies invest to develop or expand assets with strong infrastructure characteristics, that benefit from growing demand underpinned by secular trends. Assets are expanded, de-risked and divested to core or core plus investors, with net return targets at c. 15% and money multiples of c. 2x.[1]

VA infrastructure managers have a unique skillset. **VA managers require traditional deal structuring capabilities, and a deep, active asset management expertise.** This includes the ability to create value by selecting and supporting infrastructure businesses that require ongoing development capex to grow, and often the ability to shape new management teams.

Compared to some private equity managers, who are focused on using financial levarage and inorganic growth to create value, and may often focus on services, VA infrastructure managers can focus on the organic expansion of hard assets. VA infrastructure managers benefit from a deeper expertise in managing infrastructure assets and usually take a more prudent approach to leverage as a tool to create value.

VA INFRASTRUCTURE STRATEGIES



[1] Source: InfraRed Capital Partners, November 2024. Return targets are an indication based on VA funds currently in the market, as per Preqin database, as at November 2024. Return targets may not materialize.

A Key Asset Class:
VA strategies have an established track-record. Some infrastructure managers have focused on creating and expanding assets in the social infrastructure space and in renewables over the last two decades. Moreover, core plus infrastructure funds have historically invested a portion of their capital in VA assets to boost fund performance.

Today, secular themes, such as energy transition and digitalization are expanding the VA market opportunity to create and expand infrastructure to a broader investment universe. Energy transition and digitalisation investment needs are surging, and there is an unprecedented need for VA capital, capable of supporting the development and growth of critical, modern infrastructure.

The bulk of the VA opportunity is concentrated in the mid-market, with typical equity tickets under USD 300 million and with the number of assets requiring capital exceeding by far available dry powder.[2] While this provides potential for alpha and more limited competition for assets, it also requires the ability to identify managers with solid investment selection and risk management criteria, focused on identifying opportunities with the adequate combination of critical infrastructure characteristics and growth potential to achieve targeted returns.

Infrastructure Characteristics:
VA strategies generally seek infrastructure businesses in **mature countries** that rely on **proven technologies**, have **hard asset characteristics** and experienced management teams. VA managers may focus on assets that require growth capital, or assets that are in earlier stages of development. Nevertheless, these businesses are already past the venture phase, have a tested business model, an established market, and require capital to grow alongside the projected demand expansion.

During their ownership, among many other activities, VA infrastructure managers focus on de-risking the business further, enhancing its infrastructure characteristics, strengthening barriers to entry, improving downside protection, and supporting revenue visibility with long-term contracts as the business grows.

[2] Source: Infrared Capital Partners analysis based on InfraLogic database, July 2024.

Growth Capital Levers:
VA infrastructure managers leverage a repeatable set of tools to scale a business, as they provide capital, and seek a balance between growth and investment downside protection for investors. **As businesses are in their growth phase with limited operational assets and cash-flows, entry prices are generally low and not a key driver of performance.** Instead, industrial alignment is a key consideration for the business partner, that seeks a partnership capable of supporting the business growth ambition and deliver on value creation as the asset base grows.

Therefore, VA investors focus on alignment of interest with management, and contribute to operational improvements, such as by expanding the customer and contract base. **Growth is mostly rolled-out organically, but platform strategies focusing on opportunistic bolt-on acquisitions are sometimes possible.** Unlike private equity strategies, leverage is not a key value driver, and a prudent, infrastructure-like approach to capital structure optimisation is adopted, with Net Asset Value growing steadily as capex and growth are rolled-out.

Exits:
VA infrastructure investors crystalise the value accretion at exit, generally after 5-7 years of ownership. Income is not a focus for VA strategies, as in case of positive operational cash-flows, capital is generally reinvested in the business to support growth.

VA infrastructure assets have several avenues for exit. This is due to the smaller scale and higher growth potential of assets, which can attract a broad range of buyers, including strategic acquirers or financial investors. However, assets are generally exited to a larger core or core plus infrastructure investor, with a cheaper cost of capital, who is a better fit for the more mature stage of the asset, generally focusing on a combination of yield and capital appreciation.

Distributed generation platform: Example of a Value-Add investment[3]

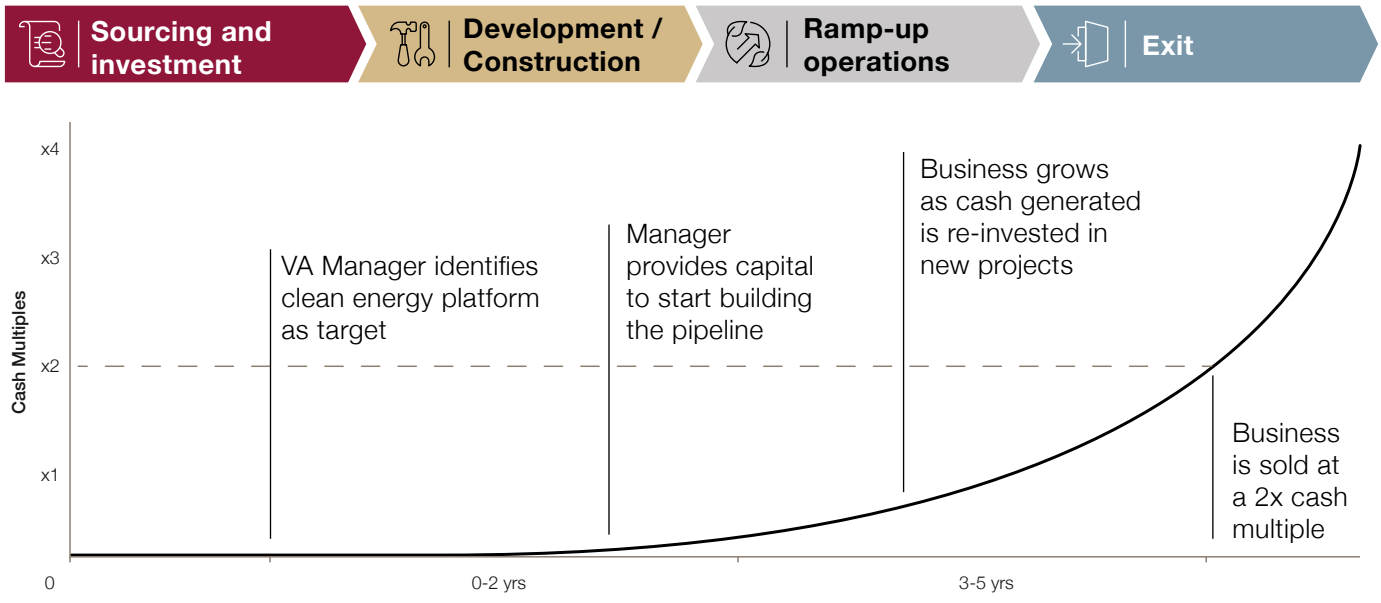
A VA infrastructure manager identifies a clean energy platform in a **mature economy** as a potential target. The company has a small base of operational battery storage and flexible generation assets and **requires capital to grow** the business. Several projects in the pipeline are ready to be built and management has a proven ability to identify and secure high quality project sites. **Renewables and batteries are proven technologies.** Flexible generation is supported by secular tailwinds offering an avenue for growth and will be increasingly critical to balance the grid in the transition to low carbon generation.

The manager acquires a majority stake in the company in a **bilateral deal** with a small scale developer and establishes the governance to execute on the strategy, providing the capital required to start building the pipeline.

It structures the deal as **preferred equity**, to secure **downside protection** for investors, but positions the asset for strong value generation in case of successful delivery on the business plan. Management incentives are aligned with the business plan and ultimate exit. The VA manager provides additional support to secure strategically located development sites, strengthening the pipeline with strategic industry partnerships, and **accelerating growth**.

The company grows at an annual double-digit rate, reinvesting cash generated into new projects, as it expands its Net Asset Value consistently every year. In year 5, the manager exits, **achieving a net money multiple of 2x**. The business is sold in an auction to a core plus infrastructure investor paying a price premium to acquire a leading infrastructure platform in the flexible clean generation space.

Key steps in a typical investment process

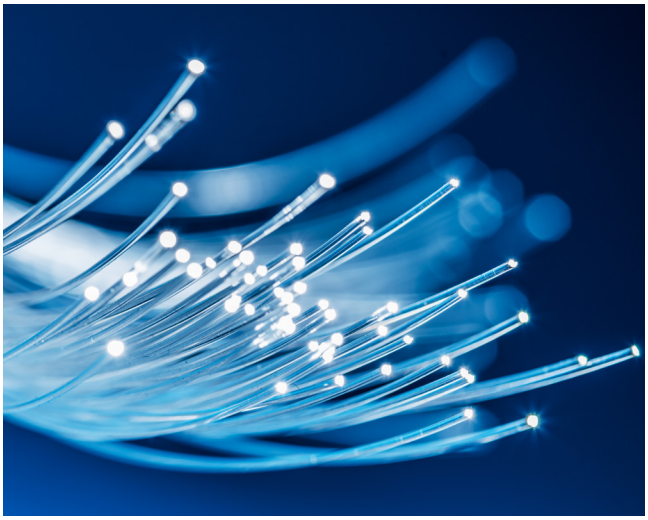


[3] InfraRed Capital Partners, Hypothetical example of a value-add investment for illustrative purposes only. Past performance is not a guarantee of future returns

SECTION

THE CHARACTERISTICS OF VALUE-ADD INFRASTRUCTURE

A Value-Add manager ultimately aims to exit an infrastructure business to a core or core plus investor looking for a defensive infrastructure asset capable of generating a combination of yield and capital appreciation. Therefore, a VA manager will need to select assets that have defensive infrastructure characteristics or have the potential to develop those, and work to de-risk the asset as it grows and matures.



A well-structured risk-framework, underpinned by the manager's experience and a long history of deal and asset management experience, is essential during the asset selection and asset management process*, to align the risk proposition of an asset with its return expectations and to de-risk the asset during the ownership period until it is ready to be exited. Each infrastructure asset incorporates a unique combination of physical and financial infrastructure characteristics, driven by factors such as its sector, geographic location, revenue risk, and contract structure. No infrastructure asset, not even a regulated utility, simultaneously possesses every infrastructure characteristic to entirely shield performance.

Infrastructure characteristics can be split into three key categories: the business characteristics, that focus on the physical attributes of an asset, and **the financial characteristics that focus on its performance resilience.** Moreover, VA strategies focus on assets with no market formation risk, and with a predictable demand expansion throughout macroeconomic cycles, so **market characteristics** are another important selection criteria.

* For more information on value-add risk frameworks see - Defined Criteria for an Expanding Infrastructure Market, October 2024

01 | BUSINESS CHARACTERISTICS

Hard Asset

Infrastructure constitutes tangible assets, with a long useful life, providing a store of value through diverse economic cycles due to their enduring necessity. **VA investments may include an established operational asset base but also assets under development.** Some strategies may focus on asset-light investments and services, further blurring the line between infrastructure and private equity.

Critical Service

Infrastructure includes essential services like energy, water, and transportation, with consistent demand patterns across normal economic conditions. **VA investments aim to expand critical services and tap into increasing demand and capture market growth.**

Proven Technology

Infrastructure relies on established technologies. **VA strategies focus on proven technologies** thereby reducing the risks associated with unproven innovations.

Barriers To Entry

Significant capital investment requirements or early mover advantage create entry barriers for competitors. For **VA infrastructure, expansion capital can solidify an asset's competitive position through scale or client relationships.**

Business Model

VA infrastructure managers focus on **proven and tested** business models that require capital to scale, in markets with a well-defined competitive structure.

02 | FINANCIAL CHARACTERISTICS

Revenue Model

The revenue generation of core infrastructure assets is predictable due to long-term contracts or regulation. VA infrastructure focuses on **revenue visibility, but revenues might incorporate growth assumptions** based upon successful asset expansion or some market price exposure.

Operating Margins

Infrastructure businesses have strong operating margins. VA infrastructure margins may initially be lower as **expenses are incurred in pursuit of long-term value creation** through asset expansion, but as assets grow, operational performance is de-risked and margins strengthen.

Inflation-link	VA Infrastructure assets have revenues that typically grow at a rate above inflation, as assets expand, but **may have a component explicitly linked to inflation,** which ultimately makes them attractive for core investors.
Cash Flow Visibility	Long-term cash flow visibility is key for infrastructure. For VA infrastructure, cash flows might be less visible in the short term, but equally the aim is **for long-term resilience and visibility** upon execution of contracting strategies.
Leverage	Infrastructure projects can employ significant leverage due to their stable cash flows to enhance returns. **For VA infrastructure,** leverage requires more careful calibration against the associated organic expansion risks, **with debt that tends to be nil, or comparatively lower, as it is carefully calibrated over time as the investment grows.**
Valuations	Core and core plus infrastructure valuations are based on discounted long-term, expected cash flows. **VA valuations are less determined by future cash-flows;** the focus is on developing assets at cost, and creating platform capabilities to provide a strong valuation upside at exit.
Governance	Governance in infrastructure is crucial for effective asset management. For VA strategies, **control or co-control positions are essential** to align stakeholders with active asset management and expansion plans.

03 | MARKET CHARACTERISTICS

Demand Growth	Infrastructure generally targets stable market conditions to underpin demand. VA strategies also focus on **markets with visible growth** and established demand to support asset expansion.
Economic Cycle Resilience	Infrastructure investments tend to be resilient to economic cycles. VA investments may exhibit greater sensitivity to economic cycles during the expansion phase, but will still focus on critical infrastructure assets.
Liquidity / Exit	VA managers focus on infrastructure sectors with a broad market of potential buyers, but asset liquidity is often subject to successful asset expansion and demonstrated value creation before exit.

SECTION

VALUE-ADD GROWTH LEVERS

Sourcing and investment | Development / Construction | Ramp-up operations | Exit

Growth Levers:
Value-Add strategies focus on a **repeatable set of value creation and risk-mitigation levers**. The focus is on creating scalable operations that are efficient and sustainable, while actively managing risks to deliver on the business plan and return targets. Managers systematically advance infrastructure assets through a series of well-defined stages and with a disciplined approach to capital injections.

The process adopted by VA managers is repeatable across different sectors and geographies

and enables them to focus on the identification of relative value across different investment opportunities and geographies.

Sourcing and investment

During the sourcing phase investors lay the groundwork for future value creation. Managers begin by sourcing opportunities leveraging industry networks, strategic partnerships or proprietary project pipelines.

This stage also involves deep market research to identify opportunities that are likely to benefit from long-term trends, supportive regulatory frameworks, and technological maturity. The goal at this stage is to develop a **pipeline of investments** that align with predefined investment criteria and have inherent potential for growth and value enhancement.

Managers perform a rigorous and selective due diligence for each target opportunity, with a comparatively low ratio of acquisitions to deals evaluated,[4] highlighting the strict asset selection criteria of VA strategies. VA managers evaluate the asset's business model, its infrastructure characteristics and risk-return proposition, and put particular emphasis on the execution risk of the business plan, and quality of the management team. The acquisition phase involves legal, commercial and technical due diligence. The deal is often structured to enable downside protection, such as through preferred equity, and management is assessed and incentivised to deliver on the planned growth. Risk-mitigation measures and the asset strategic fit within the portfolio are other key factors being assessed.

Deals are normally closed through off-market transactions, rather than competitive auctions, and the focus is on the ability to establish an industrial partnership with management for value creation, rather than price. In comparison to core and core plus strategies, for **VA strategies, entry valuations play less of a role in achieving target returns, as capital is mostly deployed at cost alongside asset expansion.**

[4] InfraRed Capital Partners.

Development / Construction

Ramp Up Operations

Governance

Effective governance structures are vital for steering companies toward success, post-acquisition. Strong governance practices lay the foundation for efficient decision-making that drives asset expansion. Therefore, VA strategies focus on control or co-control positions, as managers require levers to drive business expansion.

Effective governance entails establishing robust boards with experienced directors and relevant sector expertise; setting clear objectives aligned with stakeholder interests and implementing transparent reporting procedures.

Organic Growth

With solid governance in place, investors work closely with management teams to hone growth strategies that focus on asset expansion, on developing additional revenue streams and on growing the business capabilities. **VA strategies mostly rely on organic growth** strategies and capacity upgrades of existing businesses. However, VA strategies can also involve investing in early-stage greenfield assets or rely on inorganic growth strategies focused on bolt-on acquisitions that offer complementary capabilities or geographic coverage to existing businesses.

Asset Management

Active asset management is critical in VA infrastructure, and a distinctive skill of VA managers. The focus is on active asset management for downside protection like other infrastructure strategies. However, expanding an asset requires deep technical expertise and the ability to deploy capex effectively, leveraging the appropriate combination of equity and financing. It also requires the rapid responses to evolving market conditions, and the ability to engage proactively with market participants and regulators to support asset growth.

Risk Mitigation

Throughout all stages of ownership risk identification and mitigation are key factors underpinning VA strategies. Managers focus on de-risking assets as they expand, seeking to enhance infrastructure characteristics, such as by reinforcing barriers to entry and contracting revenues.

Risk mitigation can involve a continuous reassessment of business plans alongside potential changing market conditions. It may also involve diversifying revenue sources, so reliance on single clients and markets is diminished; securing long-term contracts which provide predictable cash flows and financing at lower cost of capital where necessary or implementing hedging strategies against market price risks.

Exit

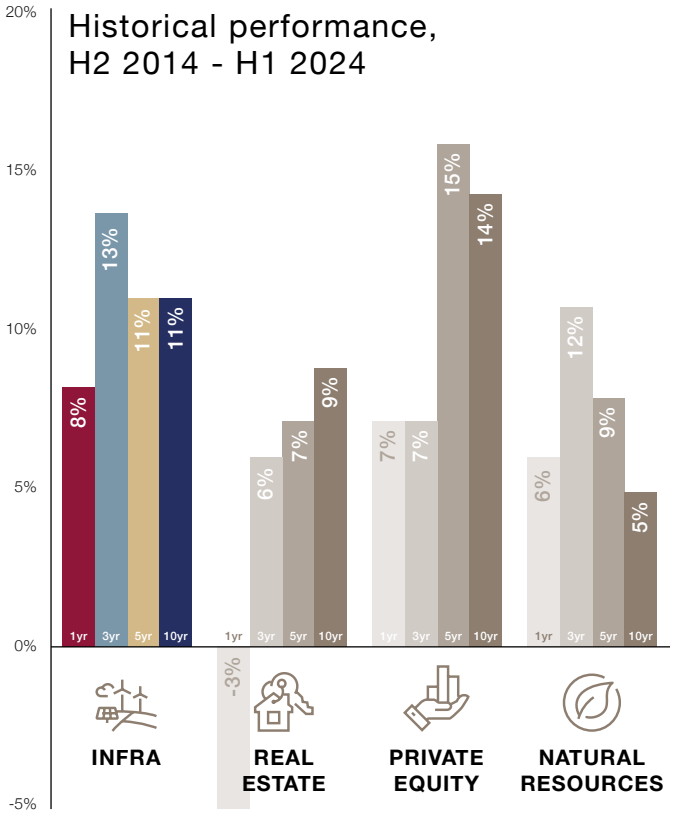
Exits are generally planned after 5-7 years of ownership. An effective exit strategy involves identifying the optimal timing when a business has reached its potential under current ownership but has still potential for future growth, making it attractive for an incoming buyer. **At this point, the scaled asset can command a premium market valuation** with larger investors focused on benefitting from the asset's attractive income generating profile or on further expanding the business.

SECTION

VALUE-ADD RISK-RETURN PROFILE & PORTFOLIO ALLOCATIONS

Infrastructure As a Return Enhancer: Historically, private infrastructure was mainly adopted as a fixed-income replacement in long-term investors' portfolios, with investors focusing on achieving portfolio diversification and a return-premium over long-term government bonds and inflation protection. While infrastructure continues to retain this role, a growing number of investors now allocate a portion of their portfolios to the asset class, aiming to capture a return enhancement over listed equities, with VA ideally positioned to achieve this.

Infrastructure has generated a return premium over PE strategies over the past three years



A structural change in market and macroeconomic conditions somewhat blurs the boundaries between alternative asset classes and requires a different perspective to portfolio construction and on the role of individual asset classes and strategies.

The advent of global megatrends has partially transformed infrastructure into a return enhancer in recent years, with a growing number of investors focusing on leveraging the asset class for generating a long-term return premium over listed equities. The recent increase in interest rates, driven by inflation pressure, the limited upside for long-term equity returns in investors' long-term policy portfolio return assumptions, and the progressively weaker performance of private equity, amid historically high valuations and a lack of exits, have generated an interest in leveraging VA infrastructure as a return enhancer.

Return Profile of Value-Add: Data indicates that net return assumptions (IRRs) for VA infrastructure are at c. 15%[5] as at YE 2024. While VA infrastructure assets offer potential for higher returns over core and core plus infrastructure assets, VA infrastructure is also characterised by a potentially wider return dispersion for individual assets, underpinning the importance of portfolio diversification, asset selection and risk management.

Source: InfraRed Capital Partners, Preqin fund net returns. Past performance is not a guarantee for future returns.

[5] InfraRed Capital Partners based on publicly available information

Risk Profile of Value-Add:
Investors allocate to infrastructure because of the resilience of the asset class to macroeconomic cycles. Nevertheless, the asset class is not exempt from exposure to systemic risk, with long-term performance partially linked to systemic risk factors, such as inflation and long-term interest rate fluctuations, albeit with a time-lag related to the private nature of the asset class.

Exposure to systemic risk progressively reduces moving from core to VA infrastructure, while idiosyncratic risks increase. Therefore, **performance volatility of VA infrastructure is potentially less exposed to fluctuations in long-term interest rates.** However, VA infrastructure's performance is driven more heavily by idiosyncratic risks and equity factors such as management effectiveness, competitive positioning within an industry sector, and the successful execution of business plans.

Data indicates that net return assumptions (IRRs) for VA infrastructure are at c. 15%[5] as at YE 2024.

[5] InfraRed Capital Partners based on publicly available information

KEY RISK AND RETURN DRIVERS BY STRATEGY

Strategy	Targe Return (net)	Return Drivers	Systemic Risk	Idiosyncratic Risk	Typical Hold Period
Core Real Estate	6%-8%	Rental Income, cap rate compression	High	Low	Long-term
Core Infrastructure	8%-10%	Long-term total return, yield, inflation-link	Moderate	Low	Long-term
Value-Add Infrastructure	~15%	Organic growth, operational enhancements	Low	Moderate	Medium-term
Private Equity Buyout	+20%	Multiple expansions, operational improvements, leverage	Moderate	High	Short/ Medium-term

Source: InfraRed Capital Partners target returns are indicative only and are only based on publicly available market information as at November 2024 Definitions: Systemic Risk: also known as undiversifiable risk, refers to risks inherent to the overall market, not just a particular asset, including interest rate, term spread and inflation risk. Idiosyncratic Risk: also known as unsystematic risk, is the inherent risk involved in investing in a specific asset. For illustrative purposes only. Past performance is not a guarantee for future returns.

Value-Add Funds & Portfolio Construction:

Given the wider return distribution potential of individual VA infrastructure assets, **portfolio construction is essential for VA funds.** A higher exposure to diversifiable, idiosyncratic risks, as opposed to undiversifiable systemic risks, such as interest rates, provides a meaningful advantage to VA infrastructure managers, **as fund returns can be meaningfully stabilised through adequate portfolio diversification across assets with different business fundamentals, development stage and geographic exposure.**

Value-Add Infrastructure funds typically have sizes in the range of $1bn. to $3bn, as the mid-market is where most of the opportunity is concentrated.[6] Funds are diversified across c. 10 assets to provide sufficient diversification. Investment periods generally last 4 years, and funds' length is in the 10-to-12-year range, to enable sufficient time for the expansion and exit of individual assets. Returns are generally crystallised during the second half of a fund's life as assets are exited, with portfolios requiring an adequate balancing of entries, exits and equity injections for growing assets to achieve target returns.

The J-curve of VA infrastructure funds is deep but rapidly accelerates as businesses grow and are exited, with money multiples in excess of 2x achievable at the end of the fund's life.[7]

[6] Source: Preqin, 2024, InfraRed Capital Partners 2024 - https://www.ircp.com/news/the-mid-market-opportunity-decarbonisation-digitalisation/

[7] InfraRed Capital Partners. For illustrative purposes only. Future economic and competitive conditions, market conditions, and similar activity is difficult to predict and may vary materially from current expectations. Readers are cautioned to not place undue reliance on forward-looking statements.

Value-Add Infrastructure in An Alternatives Portfolio:

By diversifying across traditional PE, core infrastructure, and VA infrastructure, investors can achieve a balance between return stability and growth, and improve risk adjusted returns. Given the risk-return proposition of VA infrastructure relative to other alternative investments and its diversification effects, underpinned by a comparatively lower exposure to systemic risk, VA infrastructure provides clear portfolio benefits and plays a distinctive role in an alternatives' portfolio.

Value-Add and Infrastructure:

Long-term historical performance highlights the benefit that an allocation to VA infrastructure can offer within a broader private infrastructure portfolio. VA infrastructure offers the potential for return enhancement, while it can also contribute to partially reducing the overall volatility profile of the portfolio.

In fact, despite the potentially higher volatility of VA infrastructure, the low variance-covariance of VA infrastructure returns compared to other infrastructure strategies including core and core plus infrastructure, offers portfolio diversification benefits. As a result, a growing number of infrastructure investors are considering an allocation to VA infrastructure strategies irrespective of their benchmarks.

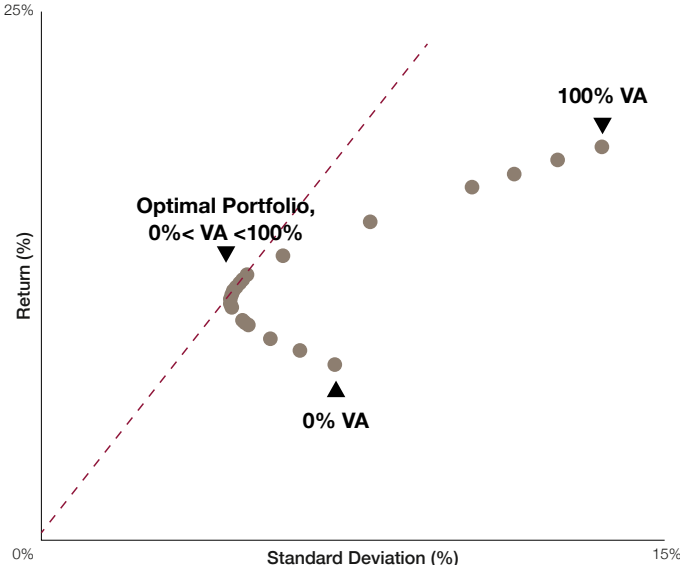
VA infrastructure strategies focus on exits to generate returns, in comparison to large-cap, core infrastructure funds that are more focused on long-term income generation through a portion of their total return target. As a growing number of infrastructure investors are emphasising the relevance of DPI and of increased capital velocity to reinvest capital at attractive market returns in the future, allocations to mid-market VA infrastructure are anticipated to grow.

Value-Add and Private Equity:

VA infrastructure strategies are underpinned by resilient megatrends and can offer attractive returns also to private equity investors, particularly given the recent return compression observed across private equity strategies amid higher interest rates and wider bid-ask spreads. Therefore, we see increased interest in allocating a portion of long-term investors' private equity allocations to VA infrastructure.[8] **From a portfolio perspective, due to the strong diversification benefits, VA infrastructure can improve the risk-adjusted performance of a private equity portfolio,** and can act as a return stabiliser, contributing to reducing the volatility profile of portfolio returns in the long-term.

Portfolio Optimisation, Infrastructure

Efficient Frontier Analysis



Illustrative example based on historical performance analysis, optimal portfolio includes a combination of core, core plus and value add infrastructure strategies. Typical optimal allocations to VA can range from 10% to 30% of optimal portfolios, based on infrastructure portfolio composition, benchmarks and expected returns. Past performance is not a guarantee for future returns. Future economic and competitive conditions, market conditions, and similar activity is difficult to predict and may vary materially from current expectations. Readers are cautioned to not place undue reliance on forward-looking statements.

[8] Hodes Weill & Associates, Infrastructure Allocations Monitor, 2024

SECTION

SECULAR TRENDS DRIVING VALUE-ADD INFRASTRUCTURE INVESTMENT OPPORTUNITIES

As the global economy continues to modernise, secular trends, including energy transition, digitalisation, deglobalisation and demographic shifts, are contributing to the creation of new investment themes for infrastructure, such as green energy and green mobility.

These themes represent both a source of new opportunities and risks for the asset class and are translating into growing demand for new critical infrastructure businesses. A meaningful capex commitment is required to close the investment gap. In addition, these themes have the potential to meaningfully impact existing, more mature infrastructure assets, such as network utilities, that may require meaningful capex to modernise and adapt to new business conditions.

VA strategies offer investors the opportunity to capitalise on these trends with a pure-play approach. Investors can target specific investment themes, where investment opportunities can be selected and combined to create portfolios focused on delivering long-term value.

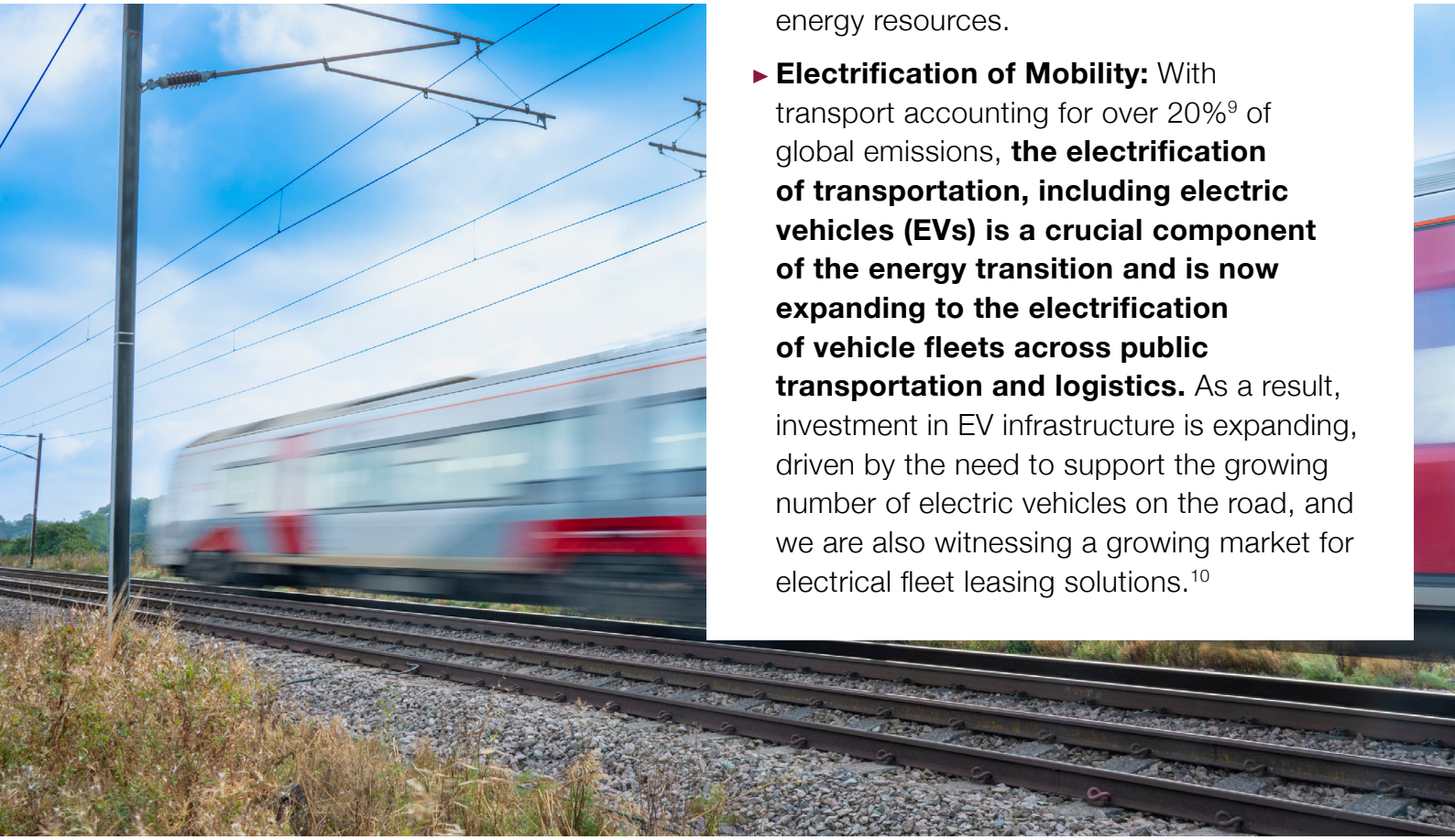
However, as the opportunity set continues to broaden and faces increased complexity, a well-structured risk-framework becomes increasingly important for asset selection, de-risking, active management, and for portfolio construction.

Megatrends, annual investment needs to 2030

Source: Macrobond, IEA, McKinsey, Irena, World Bank, July 2024. For illustrative purposes only. There is no guarantee that the forecast highlighted may materialise.

Energy Transition:
The global push for decarbonisation is driving an unprecedented shift in how energy is produced, distributed, and consumed. This transition is critical for mitigating climate change and is supported by regulatory frameworks, technological advancements, and shifting consumer preferences. **The energy transition is by far the largest investable megatrend for infrastructure,** and several investment themes have recently emerged in this space for VA infrastructure investors. Some are already investable today, while others are in the process of maturing over the coming years and will require a multi-decade investment flow.

- **Electricity Decarbonisation:** Electricity is expected to contribute to up to 50% of the global energy mix by 2050, from c. 20% today.[8] Renewables are central to the electrification of energy systems with new installed capacity growing exponentially, beyond wind, and particularly for solar PV. **In recent years, the investable space has broadened to battery storage, distributable generation, and the market has shifted from industrial scale projects to smaller platforms, serving commercial and residential customers.**
- **Grid Modernisation:** As green electricity and electricity demand increase, **the grid must be modernised** to handle changes in power flows and intermittent power generation. This involves investments in sectors such as smart grid technologies, grid-scale energy storage, and distributed energy resources.
- **Electrification of Mobility:** With transport accounting for over 20%[9] of global emissions, **the electrification of transportation, including electric vehicles (EVs) is a crucial component of the energy transition and is now expanding to the electrification of vehicle fleets across public transportation and logistics.** As a result, investment in EV infrastructure is expanding, driven by the need to support the growing number of electric vehicles on the road, and we are also witnessing a growing market for electrical fleet leasing solutions.[10]



[8,10] Source: IEA, McKinsey, Irena, World Bank, July 2024. There is no guarantee that the forecast highlighted may materialise.
[9] Source: Statista, 2024

- **Molecules Decarbonisation:** Electrification is contributing to the displacement of fossil fuel use across several industries, from heating to transportation. For example, the electrification of heating systems is anticipated to increasingly rely on heat pumps. Molecules make up about 80%[11] of global energy today, and while electricity is anticipated to reduce the reliance of global energy systems on molecules to about 50% by 2050, gas is expected to continue playing a critical role as an energy transition fuel, particularly across heavy industry in emerging markets. However, **fully decarbonising molecules may require the emergence of new infrastructure sectors, relying on the maturation of innovative technological solutions**, including blue and green hydrogen applications, such as with ammonia, and small nuclear reactors (SMEs).
- **Circular Economy:** In transportation, not all fossil fuel demand can be displaced by electrification, and alternatives are being developed, such as biofuels. Beyond heavy-vehicle road transport, these solutions can be employed in shipping and aviation, but the process of maturation is still ongoing, just like with hydrogen solutions. **The energy transition requires a more efficient use of resources, ranging from innovative solutions for drinking water and wastewater, to recycling of rare materials critical to electrification and batteries.** This is driving increased demand for different types of recycling businesses. Despite the key role of recycling, energy from waste is another sector projected to experience resilient future demand, due to landfill taxes and bans for new landfill capacity across a number of jurisdictions.
- **Energy Efficiency:** Energy efficiency solutions for industrial, commercial and residential customers provide an opportunity to reduce energy consumption and limit emissions, as well as to benefit from improved technology and falling costs, with a growing number of smart solutions provided to end-customers to improve their energy usage patterns. **Energy as a Service (EaaS) models focus on providing industrial and residential customers with green energy and other energy management services on a subscription basis.** EaaS has comparatively low capex intensity, but can free customers from having to make any upfront capital expenditure, while also potentially offering investors with a long-term stream of predictable cash-flows with core infrastructure characteristics.
- **Capturing and Storing Carbon:** Capturing and storing carbon dioxide (CO2) from industrial and energy-related sources is key to closing the energy cycle and will require meaningful capital. Today, solutions such as Direct Air Capture are still in a maturing phase, and use solid sorbents to soak up carbon dioxide, that can be stored underground or can be reused to produce sustainable fuels, low carbon concrete or other industrial products.[11]

[11] Source: IEA, McKinsey, Irena, World Bank, July 2024. There is no guarantee that the forecast highlighted may materialise.

Digitalisation:
Digitalisation is a powerful trend, fundamentally altering how economies operate, and ranks just after Energy Transition in terms of its size and annual investment needs. **Emerging digital technologies**, such as AI (Artificial Intelligence), the Cloud, Big Data, and AR (Augmented Reality), are **fuelling demand for infrastructure assets that support data transmission, storage, and processing.**

The recent, rapid increase in data consumption driven by AI, is also **redefining the relationship of digital infrastructure and energy**, with more energy demand from datacentres predicted to contribute to boosting capacity and innovation in energy systems.

- **Data Capacity & Latency:** Increased data consumption and storage needs, are fuelling demand for new data centre capacity. Investments in data centres are expanding as demand for digital services surges for hyperscale and co-location customers. In addition to traditional, large data centres, **new technologies, such as autonomous vehicles requiring low-latency communication, are fuelling demand for new, edge data centres** that are more localised facilities enabling faster connectivity due to proximity to end-users.

Emerging digital technologies are fuelling demand for infrastructure assets that support data transmission.

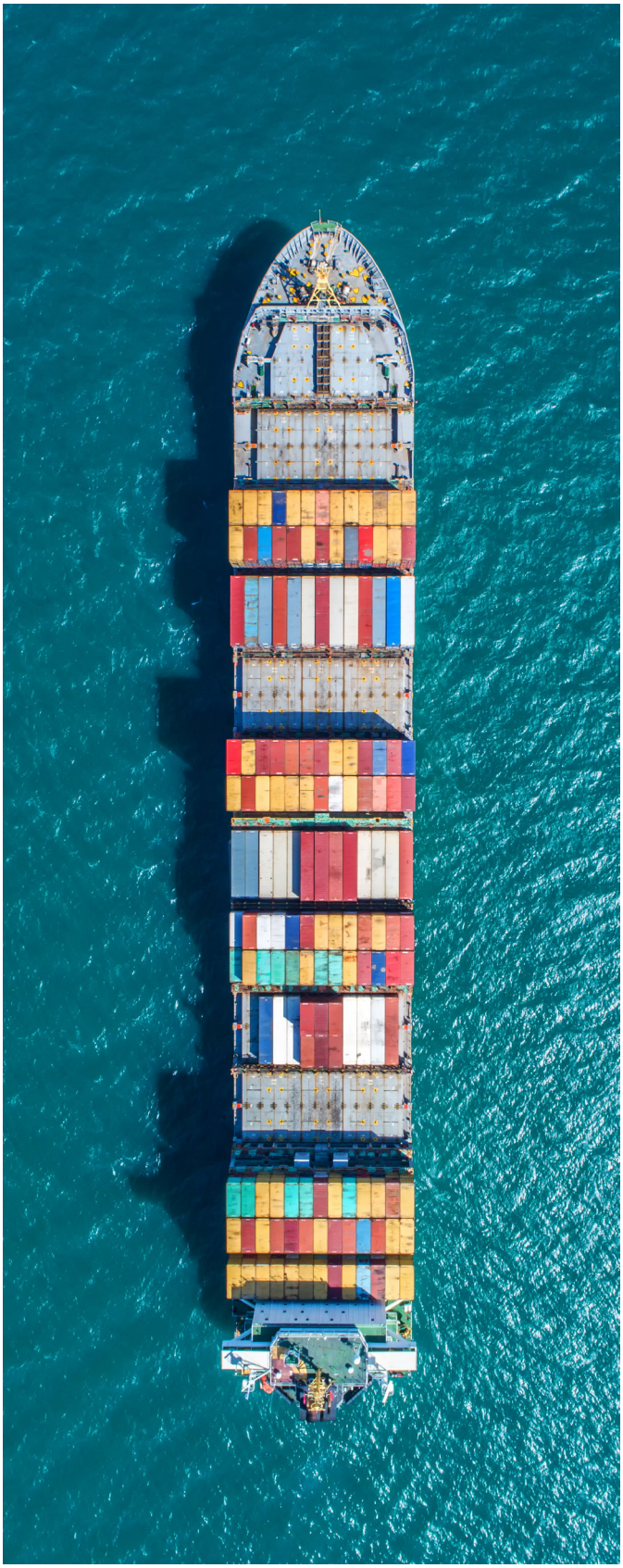
- **Data Speed:** High-speed internet connectivity is essential for both businesses and consumers. Fiber optic networks are being deployed to meet the increasing demand for bandwidth, driven by the proliferation of digital devices and the need for faster, more reliable internet connections, with new projects often benefitting from government subsidies. Projects range from dark fibre to Fibre-to-the-Home (FTTH), with business risk fundamentals depending on the specific target market.
- With **fibre business models and market structure varying by county**, we anticipate fibre networks in certain markets, such as the UK or Germany to also undergo a wave of business consolidation in the future, providing further opportunities to investors.
- **Mobile Network Densification:** The rollout of 5G networks is enabling faster mobile internet speeds and new applications, from smart cities to autonomous vehicles. Investments in small-cell telecom tower network densification is key to unlock the potential of the next generation of mobile technology. Additional technologies, such as satellite internet infrastructure, or Fixed-wireless-applications (FWA) may also continue to broaden the spectrum of potential opportunities targeted by private capital in the future.
- **Cybersecurity:** The practice of protecting critical systems and assets against physical and cyber threats is growing in importance. Although not a target for infrastructure investors today, several business models are emerging, with the potential to display high barriers to entry, a sticky customer base and other infrastructure-like characteristics, potentially becoming attractive for private capital in the future.

Other Key Secular Trends:

- **Demographic Shift:** Rising population, urbanisation and a growing middle class are driving the need for new infrastructure capacity in emerging economies, and particularly Asia, ranging from traditional, core sectors, such as roads, airports and ports to other infrastructure sectors underpinned by the decarbonisation and digitalisation themes. Projects are mostly greenfield, and often positioned in the large-cap space, particularly for transport.

  The fact that institutional frameworks in emerging economies are often still maturing, increases their perceived risk profile for institutional investors, with capital frequently being sourced from multilaterals, Sovereign Wealth Funds or strategic investors for these projects, rather than institutional investors. **Across Western Europe and North America, a rapidly ageing population drives changes in consumption patterns, with an increase in demand for innovation in social infrastructure and healthcare projects.**

- **Deglobalisation:** Geopolitical shifts and rising trade barriers are redefining global supply chains, driving a re-shoring of business operations and manufacturing processes back to Western countries. **Several infrastructure sectors can benefit from this dynamic, including logistics, regional ports, and rail freight.** Re-shoring has the potential to increase demand for new industrial clusters across Western Europe and North America, with the industrial utilities sector[12] positioned to capitalise on this trend potentially providing opportunities to VA infrastructure investors.



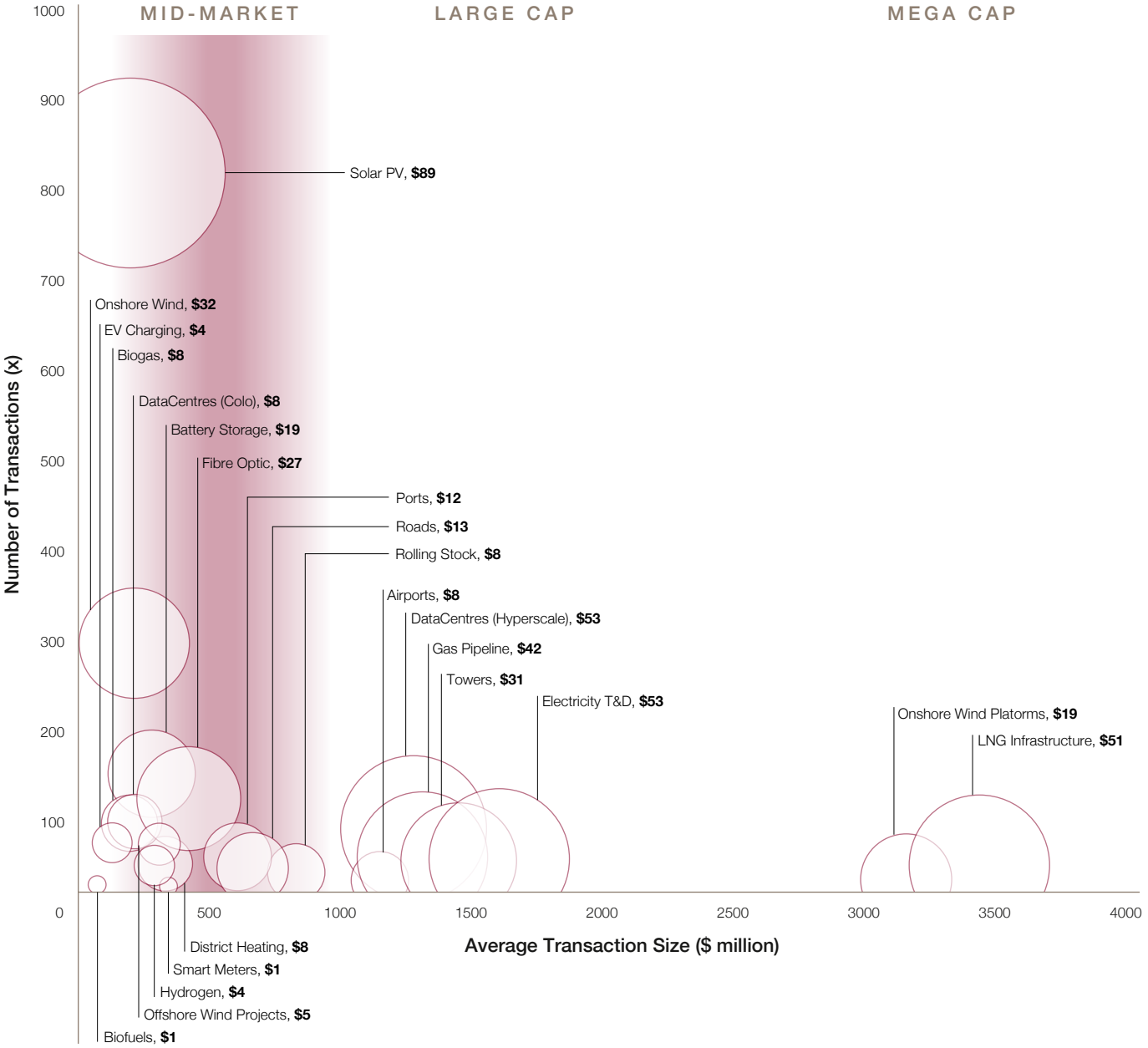
[12] Includes the provision of essential services for industrial production facilities such as green power, water, industrial gases and steam under long-term contractual agreements

The Key role of The Mid-Market:

As a result of a broadening opportunity set created by secular trends, the infrastructure market is changing, and we are witnessing a decrease in the median equity deal size in the private infrastructure space. For example, in Europe, it has decreased from $520 million in 2018 to $340 million in 2023, highlighting how the lower end of the mid-market is gaining in importance.[13] This shift is increasing investors' appetite for mid-market opportunities to align with market beta and capture opportunities underpinned by secular tailwinds.

Infrastructure Transactions, Europe and North America, 2023-2024 YTD

Bubble Size and Label = Total Transaction Volume in $bn.



Source: InfraRed Capital Partners, Infralogic, August 2024. Past performance is not a guarantee for future returns.

[13] InfraRed analysis on Infralogic transaction database of closed infrastructure deals

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