

The infrastructure evolution: investing in energy megatrends

Publicly listed infrastructure is uniquely positioned to provide investors with exposure to some of the most powerful fundamental themes currently driving global markets. In our view, the booming investment cycle around generative artificial intelligence (AI) will drive a proliferation of data center development. When coupled with growth in the onshoring and nearshoring of manufacturing capacity, the U.S. will experience a period of accelerating demand for electricity not seen in a generation.

Meeting this collective demand will necessitate expanded electricity-producing resources across generation types, particularly in renewable energy technologies, nuclear and natural gas. And while this will create opportunities across the investable infrastructure universe, there will inevitably be relative winners and losers among specific industries and individual companies over time. We believe investing in listed infrastructure is best-suited to active portfolio management, which may help optimize investor exposure to the asset class in ways that passive or indexed approaches are unable to match.

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WHAT'S POWERING THE OPPORTUNITY IN LISTED INFRASTRUCTURE TODAY?

Recent economic trends and market dynamics have highlighted the potential advantages of investing in publicly listed infrastructure companies as part of a well-diversified portfolio. These companies own or operate assets that are integral to making economic activity and everyday living possible by facilitating the movement of people, energy, goods, commodities and information. Demand for these essential functions and services that infrastructure companies provide is inelastic — that is, it tends to remain steady regardless of changes in economic conditions, unlike sectors that are more closely tied to the ups and downs of the economic cycle.

Additionally, listed infrastructure has historically been an effective hedge against inflation. The following analysis highlights key trends and drivers that are presenting a secular growth story for infrastructure that hasn't existed in decades, potentially making investments in listed infrastructure even more compelling.

Enabling the mega theme of power demand

The economic resilience and inflation protection attributes that listed infrastructure offers make a strong case for a strategic allocation to the asset class. Beyond that, across its broad range of industry sectors, shown in

Figure 1 below, listed infrastructure appears poised to continue growing as a clear beneficiary of the energy demand mega theme, and three critical drivers in particular:

1. The emergence and evolution of generative AI and the associated need for new data centers, as well as other factors, including the continued electrification of the global economy, and increased onshoring and nearshoring of U.S. manufacturing operations
2. An escalation in capital expenditures (capex) for new renewable, gas and nuclear energy generation, as well as power grid upgrades
3. Significant investments in electric transmission and gas pipelines to enable augmented generation capacity

Figure 1. Listed infrastructure sectors

TRANSPORTATION	UTILITIES/ENERGY	COMMUNICATIONS INFRASTRUCTURE
Airports	✓ Pipelines	Cell phone towers
Ports	✓ Renewable energy	✓ Data centers
Toll roads	Waste	Satellite systems
Construction/concessions	✓ Electric transmission	
Rail/public transportation	✓ Gas utilities	
	Water infrastructure	
	✓ Electric utilities	

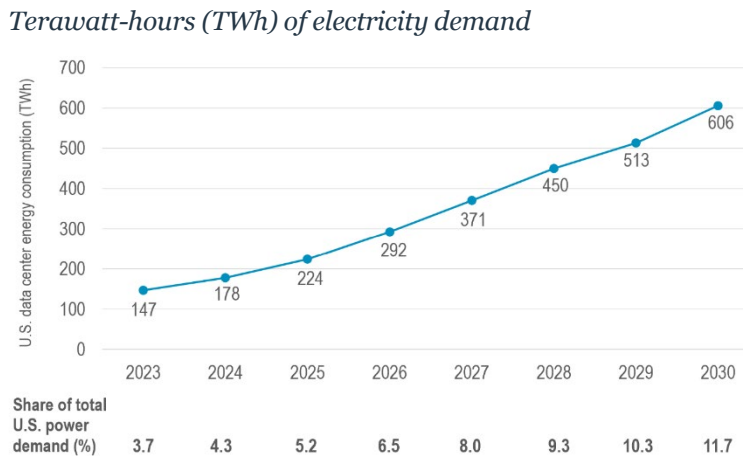
✓ = Sectors related to themes in this analysis

THE GLOBAL ECONOMY IS POWER-HUNGRY

Several dynamics in the evolution of the global economy point to a future in which rapidly increasing energy production will be paramount. Current investment in AI stands just shy of \$235 billion, globally, while forecasts show that number reaching \$631 billion by 2028, according to IDC. Keeping up with this rapid growth will require significant development of new data center infrastructure across the U.S. — with profound implications for additional power generation.

According to consulting firm McKinsey & Co., electricity demand for U.S. data centers is expected to surge by over 400 terawatt hours (TWh) between 2024 and 2030 (Figure 2), a roughly 240% increase, making the U.S. the fastest-growing market in terms of data center-driven demand for power. A leap of this magnitude would follow decades of nonexistent gains in U.S. demand growth for electricity, translating to a need for substantially more power-generating assets.

Figure 2. Data center demand for electricity is expected to surge



Source: McKinsey & Company; Global Energy Perspective 2023, 16 October 2023

Ultimately, this unprecedented rising demand means many regional energy markets will become much tighter, likely leading to higher electricity prices — until the supply of new power catches up with demand. Recent construction of new data centers has, not surprisingly, been concentrated in primary markets (e.g., northern Virginia, Silicon Valley and Dallas, Texas) where demand for electricity is especially strong (Figure 3).

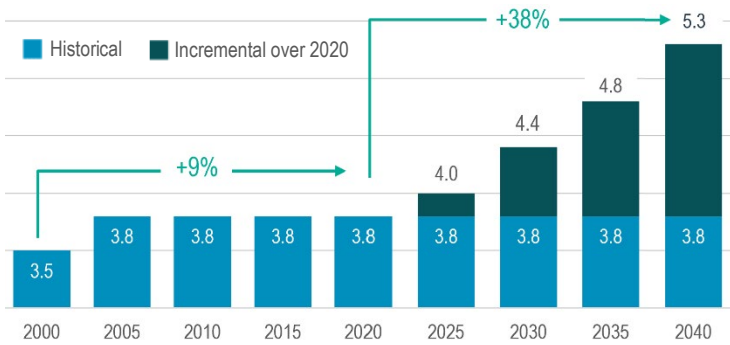
Figure 3. Three tiers of U.S. data center markets

PRIMARY	SECONDARY	EMERGING
Large existing demand of more than ~800 MW	Relatively smaller demand but typically high growth	Recent hyperscale activity due to cheap and sustainable or clean power, with negligible co-location presence
<ul style="list-style-type: none"> • Chicago • Dallas • Northern California • Pacific Northwest • Virginia 	<ul style="list-style-type: none"> • Atlanta • Austin • Boston • Florida • Houston • Las Vegas • Los Angeles • Minneapolis • New Jersey • New York • Ohio • Pennsylvania • Reno • Salt Lake City • San Antonio 	<ul style="list-style-type: none"> • Alabama • Albuquerque • Indiana • Iowa • Kansas • Mississippi • North Carolina • Oklahoma • Omaha • South Carolina • Tennessee • Wisconsin • Wyoming

Source: McKinsey & Company

“Several dynamics in the evolution of the global economy point to a future in which rapidly increasing energy production will be paramount.”

Figure 4. Exponential growth in energy demand
U.S. power demand (thousands TWh) is on the rise



Sources: McKinsey Energy Solutions Global Energy Perspective 2024; EIA/AEO 2023

But building new data centers in these areas has become more challenging due to limitations on power transmission (ranging from technical to regulatory to required state/local siting approvals) and a slower speed-to-market for new projects. We anticipate that footprints for new U.S. data centers will expand into secondary and tertiary markets in the South and Midwest — areas where companies can benefit from a more favorable development backdrop, with greater land availability and of the ability to repurpose existing infrastructure (known as “brownfield development”).

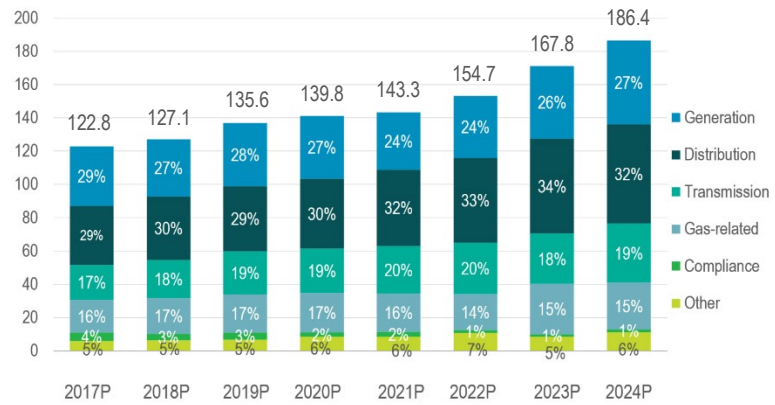
Heightened demand for electricity is also expected from another major source: the growing trend of “onshoring” and “nearshoring,” in which U.S.-based companies with multinational operations relocate some or all of their manufacturing facilities closer to home. Continued and accelerated investment in infrastructure will be essential to enable this future growth.

BROAD ELECTRIFICATION SPARKS INFRASTRUCTURE SPENDING ...

Some historical context on power demand in recent decades is helpful in understanding where it may be headed. Over the past 25 years, the U.S. has seen only tepid growth in power demand, largely due to substantial investments in energy efficiency. Figure 4 shows the scope of the change we anticipate in U.S. power demand relative to history in light of today’s mega themes.

Substantial capital expenditure (capex) growth will be needed to support the electric grid and bring new power-generating capacity online. According to the Edison Electric Institute, total company functional spending by U.S. investor-owned electric utilities grew by more

Figure 5. Electric utility infrastructure spending
Projected functional capex (\$ billions) is also climbing



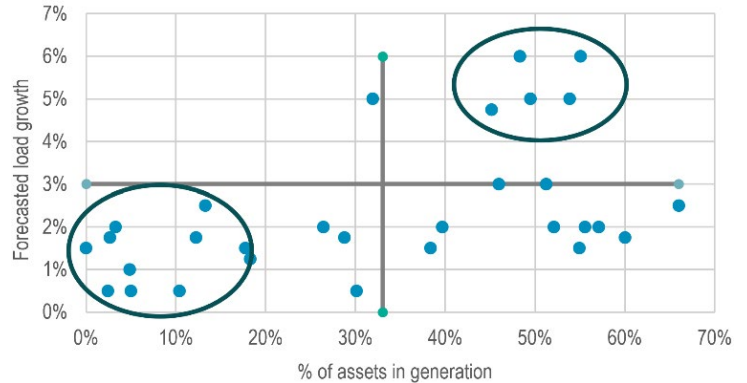
Source: Edison Electric Institute

than \$60 billion between 2017 and 2024 (Figure 5), with spending on electricity generation accounting for almost \$15 billion of that total. We expect continued increases in demand and infrastructure capex trends like these will ultimately drive further investment opportunities.

... LEADING TO INVESTMENT OPPORTUNITY

In addition, we think higher capex spending will in turn spur increased growth in earnings and cash flows for the broad utility sector over the longer term. Companies with greater exposure to power generation stand to benefit the most as demand for energy rises and electricity markets tighten. Figure 6 below plots 30 different U.S. utility companies by their exposure to electric generation (X-axis) and overall growth of demand for electricity (Y-axis). Those with lower generation exposure and higher transmission and distribution (T&D) exposure are positioned to the left, while generation-only companies, such as independent power producers, are plotted on the right.

Figure 6. Assessing utility investment opportunities
Load growth vs. generation



Sources: Wolfe Research, Nuveen

Ultimately, the fastest growing utility companies are those that are able to increase capital expenditures the most relative to their current size. For example, by investing in new generation or refurbishing their existing electrical grid, companies can expand their investment base thereby enhancing their long-term cash flows and earnings growth.

In our view, companies in the upper-right (northeast) quadrant are well-positioned to benefit from increased demand trends, given their greater opportunity to invest in new power generation to meet rising load growth (i.e., demand for electricity). Furthermore, power generation companies in more competitive (i.e., nonregulated) markets stand to benefit as energy prices move higher.

In contrast, utilities with lower load growth and an emphasis on transmission and distribution (T&D), shown in the lower-left (southwest) quadrant, could be at a relative disadvantage in terms of incremental investment opportunities given their limited participation in building new generation.

Additionally, they may be subject to increased regulatory scrutiny, as state utility oversight tends to focus on maintaining affordability for utility customers. In a rising power price environment, rapidly increasing utility bills could lead to more contentious regulatory proceedings, potentially inhibiting investment opportunities and pressuring authorized returns for T&D companies.

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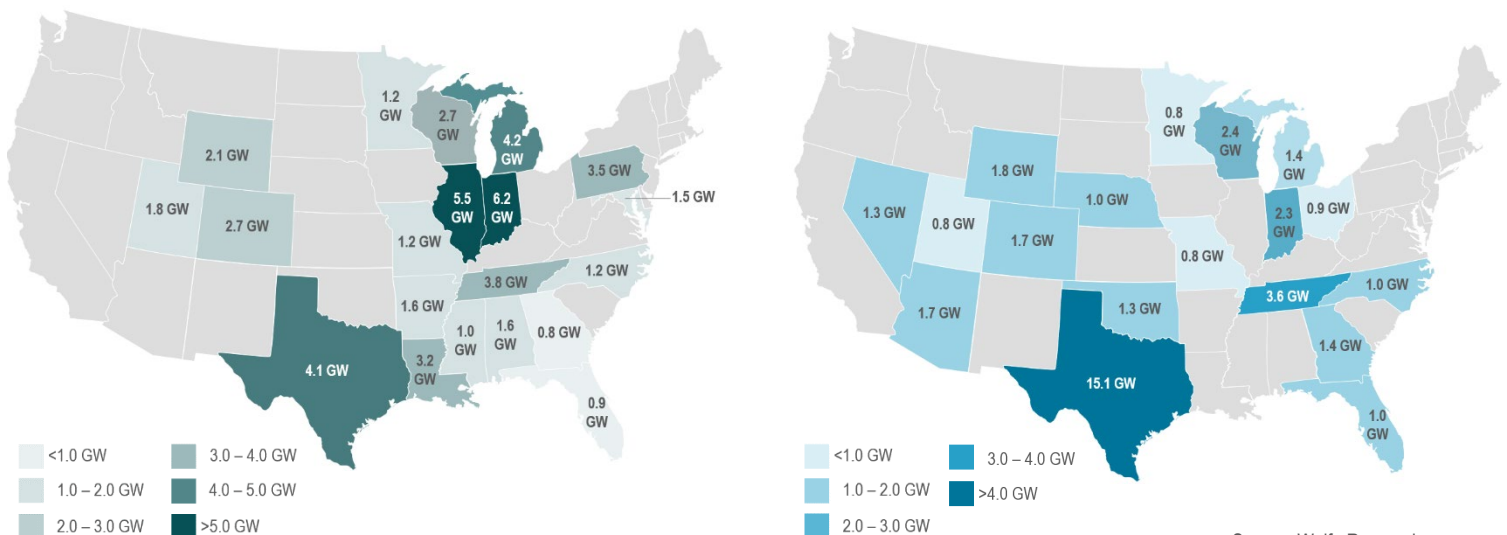
A ROLE FOR RENEWABLES, NUCLEAR AND GAS INFRASTRUCTURE

What sources of energy will be used to generate electricity to meet future growth in demand? Many large consumers of electricity (such as big technology firms) have demonstrated a preference for zero-emission or lower-carbon energy production, evidenced by nuclear power agreements recently signed by Amazon, Meta, and Microsoft.

Renewable energy technologies like wind and solar are a popular option in many markets due to their low cost of power generation, but they can be hindered by intermittency issues (e.g., lack of production in a low-light or windless environment). On the other hand, electricity generated by natural gas can help provide power around the clock, regardless of weather conditions.

Moreover, demand for gas-powered generation has risen as coal plants have been retired (Figure 7) and as overall market share for renewables (accompanied by their occasional intermittency) has grown. According to Wolfe

Figure 7. Growth in renewable energy generation will also require the U.S. to step on the gas
 As the retirement of coal plants reduces power generation ... capacity is being added via new natural gas plants



Source: Wolfe Research

Research, 3% annual growth in demand for power would drive 10 billion cubic feet (bcf) per day of incremental gas demand by 2028 — a notable gain. By comparison, the United States consumed nearly 90 bcf per day in 2023. This increased demand could lead to significant opportunities for gas pipeline companies in states like Texas, where future demand forecasts exceed the capacity that the current gas infrastructure can support — thereby driving up the value of the companies' existing assets and opening the door to deploying new capital for serving incremental demand.

Texas has become the epicenter for much of the load growth that is being discussed at the national level. As a result, there will be substantial need to expand generation across this particular jurisdiction. In particular, load growth will most likely be met by a combination of gas-powered and renewable electricity generation. We therefore believe the best-positioned midstream companies will be those with footprints that are advantageously located relative to where the new gas-fired generation will be located.

CONCLUSION

The proliferation of data centers and acceleration of the electrification of the global economy are creating a wide-ranging generational investment opportunity. We believe listed infrastructure is particularly well-positioned to invest in many stages of this mega theme, beginning with data centers essential to the ever-growing and transformational AI phenomenon, the new power-generating capacity needed to meet this demand for data and the essential enabling infrastructure such as electric and gas transmission that will be required to support this future growth.

As the primary investment attributes of infrastructure — including economic resilience and inflation protection — continue to hold true, the secular growth themes highlighted in this analysis point to an even more compelling future for the asset class, poised as it is to capitalize on a historic inflection point in the demand for power.

For more information, please visit us at nuveen.com.

Endnotes

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