

## The AI Explosion: Impacts on Real Assets

Seeking opportunity and navigating a changing Real Assets Landscape

### IN A NUTSHELL

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- The growing computational needs of Artificial Intelligence (AI) are reshaping energy strategies.
  - AI is driving significant changes in energy infrastructure, power demand, and real estate.
  - Technology companies are investing heavily in securing future electricity supplies.
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### Artificial Intelligence enters a new era

The rapid advancement in artificial intelligence (AI) and machine learning technologies has the potential to transform various sectors, including infrastructure and energy. With the increasing adoption of AI, there is a rapidly growing demand for data center infrastructure, leading to significant changes in how energy is managed. This shift will require substantial investments in power generation, transmission, and distribution systems to support the expanding requirements of AI-driven applications. These developments will likely increase demand across the Real Asset complex.

Broader integration of AI and the associated incremental increase in power demand, as AI computation requires higher energy consumption, will have differing impacts on various aspects of the energy industry. Although renewables such as wind, hydro, and solar are typically preferred as cleaner energy solutions, they alone will not be able to accommodate the trajectory of AI data center buildouts. Therefore, natural gas should likely play a major role in providing the necessary, always-on, power source. The higher computational demands of AI increase data centers' need for dependable and scalable energy sources. This increased energy requirement is influencing the strategies of natural gas producers, renewable energy firms, utilities, and midstream infrastructure providers as they adapt to meet the changing demands brought about by AI-powered technologies.

Beyond energy consumption, AI is also driving innovations in energy efficiency, smart grid technologies, and sustainable energy solutions. This piece explores the effect that AI could have on the energy transition, implications for natural gas demand, renewable energy integration, and midstream infrastructure development. By understanding these dynamics, investors can better navigate the challenges and opportunities presented by this revolutionary transformation.

#### AI and Data Centers

The advancement of AI and machine learning technologies heavily depends on data centers, which play a major role in storing, processing, and analyzing vast amounts of data. Various factors such as location, access to low-cost, dependable power supply, water for cooling systems, customer location, and fast fiber-optic networks influence the final decision on where data centers will ultimately be located. Northern Virginia stands out as an illustrative example for the potential bottlenecks of an extensive network of data centers. Local officials in Prince William County recently approved measures to

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back the Digital Gateway Project, which aims to bring 37 additional data centers to the area, which is known for its high-quality fiber network.

Despite the ambitious target, Northern Virginia has limited spare electricity generation available, with just 0.2% of surplus capacity. This constraint highlights the need for new energy resources to support the growing infrastructure. Two major natural gas pipelines, both passing through Prince William County, could see significant upside in supporting new power generation for these data centers.

## Real Asset Linkages to AI's Network

### Real Estate

AI is accelerating favorable data center supply/demand dynamics for publicly listed Real Estate Investment Trusts (REITs). Since the proliferation of generative AI, demand for data center capacity has meaningfully increased, with net absorption more than tripling from 2020-2023 in primary markets. Market vacancies decreased roughly 700 bps over the same time period to near record lows in the low single digits, with the result of accelerating pricing power; an average 18.6% year-over-year growth in 2023. And as use of generative AI continues to rapidly scale, the outlook for data center demand remains robust with estimates of double-digit compound annual growth rate (CAGR) over multiple years. While there has been increasing data center construction in response, power availability is expected to continue to be a significant constraint to new supply deliveries being able to meet this growing demand. Preleasing of data center assets under construction strengthened to above 80% in 2023, while projected development yields have also increased. The constraint on new supply benefits incumbent owners/operators and well-capitalized developers, including the data center REITs and, in some cases, industrial REITs, where land banks or existing assets have a higher-and-better use as data center assets, leading to attractive value creation and earnings growth.<sup>1</sup>

Electrification has also created accretive new opportunities for listed REITs. The growing demand for power, in either behind-the-grid or in-front-of-the-grid applications, has allowed REITs, and in particular industrial REITs, to be among the largest providers of rooftop solar energy generation in the United States. In other cases, REITs have been able to install battery storage and vehicle charging capabilities within their portfolios. By charging for generated power, in addition to leasing rooftop space to third-party operators, REITs make their assets more attractive to potential tenants and gain access to a new and expanding income stream with attractive return profiles. For example, the largest industrial REIT has plans to grow its solar, storage, and vehicle charging offerings from 555 MW in 2023 to 7,000 MW by 2030, representing net operating income (NOI) growth from \$37mm annually to \$800mm with a 12-14% unlevered internal rate of return (IRR).<sup>2</sup>

### Infrastructure

#### Midstream Companies and Infrastructure Development

Midstream firms, tasked with moving, storing, and selling large volumes of natural gas, stand to benefit from the rising need for the commodity to fuel data center electricity. These companies are well-positioned to capitalize on this trend due to their extensive pipeline networks and excellent strategic locations. For example, one of the leading mid-stream provider's Texas intrastate pipeline systems is linked to a large number of gas-powered plants, favorably positioning the company to potentially meet the increasing energy requirements. Additionally, the regulatory landscape in Texas, one of the most favorable in the U.S., will further support the expansion of energy infrastructure. Beyond their current facilities, midstream firms are investing in new ventures to enhance their capacity and cater to future electricity demands.<sup>3</sup>

#### Utilities

Let's talk about power demand. We have all seen the explosive growth of Graphics Processing Units (GPUs) to power AI. The largest manufacturer of GPU's recently posted quarterly Data Center End User revenue of \$22.5B. This compares to \$4.3B 1 year ago. According to industry experts, AI data center racks require 7x more power than a traditional data center rack. If

<sup>1</sup> Source: CBRE, North America Data Center Trends H2 2023, March 6, 2024

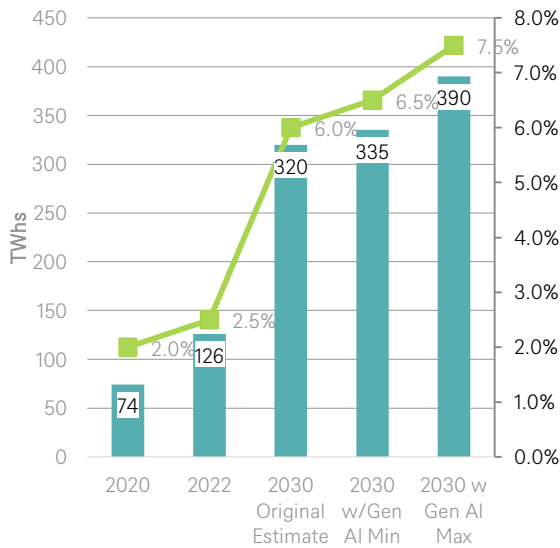
<sup>2</sup> Source: Company sources and DWS analysis, March 31, 2024

<sup>3</sup> Source: Company sources and DWS analysis, March 31, 2024

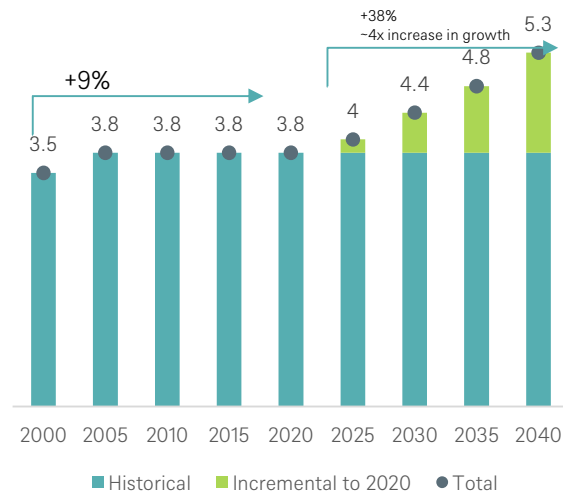
these trends continue Data Center electricity consumption could grow from 2.5% of total U.S. electricity demand as of 2022 to 6-7.5% by the end of 2030, a 14% CAGR. This new growth vector is coming at a time where electric demand growth is already increasing materially for other reasons, namely increased Electric Vehicle penetration, electrification of industrial processes, and the reshoring of U.S. manufacturing. When combined, U.S. power demand is estimated to grow by 38% by 2040 compared to 2020, nearly four times the 9% growth in power demand experienced between 2000 and 2020. We believe this underappreciated growth will have a positive impact on the U.S. Utility sector at large.<sup>4</sup>

**Data Center electricity usage growth**

**Potential AI Impact**



**U.S. Power Demand, thousand TWh**



Source: BCG, Constellation Energy investor presentation, March 31, 2024  
 Source: McKinsey Energy Solutions Global Energy Perspective 2023; November 8, 2023

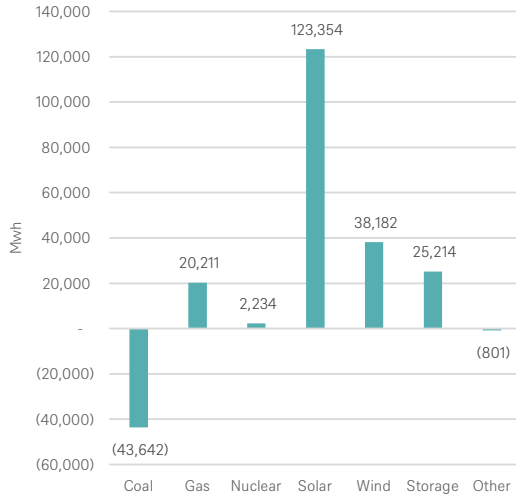
On the supply side, the United States is in the midst of an energy transition away from fossil fuel power generation to clean generation. Over the next 3 years, nearly 44GW of coal generation could be taken offline, while 20GW of gas and 187GW of renewable generation is brought online.<sup>5</sup> Though the United States is adding a large notional amount of generation, renewable generation is an intermittent resource and therefore requires a larger amount of installed capacity as well as storage solutions to deliver the same amount of output. There is a tradeoff between higher reliability and CO2 emissions, unless affordable nuclear energy could be developed, which faces technological and political hurdles. When combined, the significant increase in power demand and the changing mix of the electric grid could create an environment where more gas plants are need to be added for base load generation to ensure reliability. To address this potential issue we have seen utilities issue requests for proposals for gas plants in their service territories. Texas, for example, conducted a solicitation process looking to add 10GW of gas power plants for reliability purposes. We believe there could be more opportunities for utilities to invest in generation as these emerging growth trends take hold.

<sup>4</sup> Source: Company sources and DWS analysis, March 31, 2024

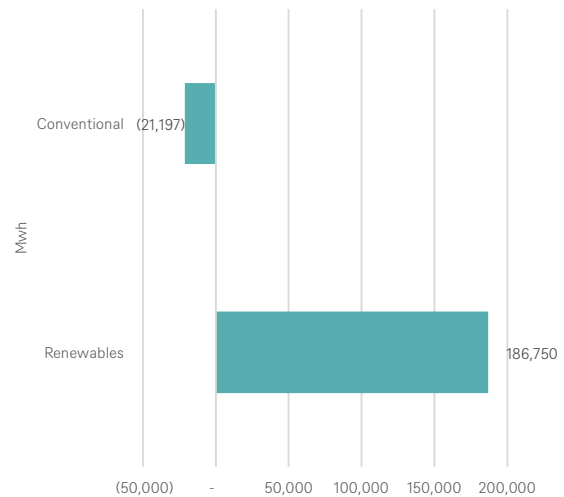
<sup>5</sup> Source: EIA, U.S. Energy Information Administration – Annual Energy Outlook 2023, March 16, 2023

Data Center electricity usage growth

Net Generation capacity by fuel type, 2023 – 2027E



Net Generation capacity by fuel type, 2023 – 2027E



Source: McKinsey Energy Solutions Global Energy Perspective 2024, November 8, 2023

In summary, we believe utilities can benefit from these new sources of load growth. We see this manifesting in several ways. First, the increased load growth should improve cash flows for utilities, which could enhance their return on capital, a concept in the industry known as regulatory lag. Last, and perhaps most importantly, if demand growth continues, the utility industry will need to make significant investments in their regulated generation fleets and transmission networks, which require, among other things, copper, aluminum, and steel. We believe the market is underappreciating that utilities are enablers of AI and U.S. electrification, and we could be in the early stages of a new secular growth trend that the industry hasn't seen in decades.

Natural Resources

Energy & Impact on Natural Gas Demand

As mentioned, Natural Gas is poised to play a pivotal role in meeting the higher energy intensity of new data centers. The build-out of AI infrastructure is estimated to increase natural gas demand by 10 to 18 billion cubic feet per day (bcf/d) by 2030. This increase is driven by the need for continuous, reliable power to ensure data centers operate efficiently.<sup>6</sup>

A prime instance involves one of the largest interstate natural gas pipeline systems in the U.S., which is witnessing increased demand in the Midwest. The pipeline operator has inked a deal with a local distribution company (LDC) to provide natural gas to one of the largest technology company's recently established data center in Mount Pleasant, Wisconsin. The Wisconsin Reliability Project aims to supply around 144 million cubic feet per day (mmcf/d) of gas, playing a vital role in meeting the area's energy requirements and boosting midstream operators' yearly profits.

Texas is considered an ideal location for setting up data centers due to its friendly regulations, ample supply of affordable natural gas, and proximity to large urban areas. The state's energy policies facilitate easy project approvals, and the availability of natural gas ensures a steady and cost-efficient energy source. Moreover, being near cities such as Dallas, Houston, and Austin provide access to markets, strong telecommunications networks, and a skilled labor force. As the top natural gas producer, accounting for 24.6% of U.S. production in 2022 and holding nearly 25% of reserves, Texas could see increased demand for natural gas, benefiting commodity producers.<sup>7</sup>

<sup>6</sup> Source: McKinsey & Company, Global Energy Perspective 2023, November 8, 2023

<sup>7</sup> Source: DWS, Company Sources, March 31, 2024

### Renewable Energy and Data Centers

Although natural gas will serve as the main energy source for data centers in the near future, the adoption of renewable energy presents both significant opportunities and unique challenges. Renewable energy firms have the potential to offer sustainable energy, with future supply already being quickly absorbed by leading technology firms. Rapid advances in solar photovoltaics, wind turbines, and energy storage systems are making renewable energy more viable for data center operations. The cost of electricity from solar photovoltaics has fallen by 87% between 2010 and 2022, bringing it closer to being a competitive option for powering data centers. Additionally, innovations in energy storage are improving the reliability and consistency of renewable energy sources, addressing one of the key challenges in their integration.

A leading technology company, for example, has committed to operating its data centers on 24/7 carbon-free energy by 2030, leveraging a combination of renewable energy sources and advanced energy storage technologies. Such commitments clearly demonstrate a broader trend towards sustainable energy practices in the data center industry, driven by both regulatory pressures and individual corporate sustainability goals.

### Energy Efficiency Technologies

Energy efficiency is another critical consideration in the operation of data centers. As the number of data centers continues to grow, the need for energy-saving technologies will inevitably increase. Solutions such as advanced cooling systems, energy-efficient servers, and intelligent energy management tools are key to minimizing the energy consumption of data centers and improving efficiency. The U.S. Department of Energy (DOE) is actively promoting energy efficiency in data centers through initiatives such as the Better Buildings Data Center Challenge. This program encourages data center operators to enhance energy efficiency by at least 20% over the next decade. Companies that embrace these innovations will likely reduce their operational expenses and contribute to broader sustainability objectives.<sup>8</sup>

## Commodities

### Higher Demand for Copper and Aluminum

According to Trafigura, adaption of AI across various industries is projected to notably increase the demand for copper, potentially adding up to 1 million tons by 2030. This growth could be driven by the critical role copper plays in AI-related technologies such as data centers and advanced computing systems which rely heavily on this metal for wiring and components, not to mention the additional energy infrastructure buildout and replacement of aging transmission networks. The surge in demand comes at a time when copper supplies are already constrained, potentially leading to price hikes and tighter market conditions. For copper producers this situation presents a lucrative opportunity. The expected increase in demand should enable producers to take advantage of higher prices and sales volumes to drive profitability and invest in additional production capacities. The overall tight balance in the copper market highlights the importance of timely capital allocation towards added capacity and production technologies to meet the urgent need for more supply spurred by AI advancements.

While specific estimates for AI-driven aluminum demand are less frequently discussed than those for copper, we believe that overall trend will be overwhelmingly positive. AI applications in data centers and other technology infrastructures should increase the need for aluminum because of its role in cooling and structural component, as well as contributing to the development of energy infrastructure. According to recent industry reports, the global aluminum market is set to reach \$393.7 billion by 2032 from \$243.89 billion in 2024, driven by various applications including those influenced by AI technologies.<sup>9</sup>

<sup>8</sup> Source: U.S. Department of Energy, March 31, 2024

<sup>9</sup> Source: Trafigura, June 6, 2024

## Conclusion

The rise of AI is set to significantly impact the need for Real Assets such as natural resources and commodities, real estate, renewable energy, and the development of midstream infrastructure. Utilities, natural gas and midstream companies are strategically positioned to benefit from this trend through increased production and transportation needs to meet rising energy requirements. Renewables should also play a major role, leveraging the desire of technology giants to rely on sustainably sourced power sources. The on-going development of energy infrastructure and the adoption of energy-efficient technologies will be critical in supporting the AI boom and its associated energy requirements. The energy sector must adapt to these changes quickly to ensure a balanced and sustainable energy transition. We believe that active management is the best approach for distinguishing between companies poised to benefit from the continued increases in power demand driven by AI and machine learning, as not every company will be affected similarly by these technological advancements.

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