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ARTIFICIAL INTELLIGENCE

4 AI bottlenecks could bolster old economy companies

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Feedback

The artificial intelligence (AI) hype cycle may be coming to an end. Technology giants and investors alike are enthusiastic about AI's potential to drive productivity gains and transform the economy.

But certain resource constraints could prevent AI growth rates from meeting lofty expectations. Indeed, investors in recent months have begun to question how long it will take for the multibillion dollar investments in AI to translate to profit growth. But the bottlenecks might not be where you expect.

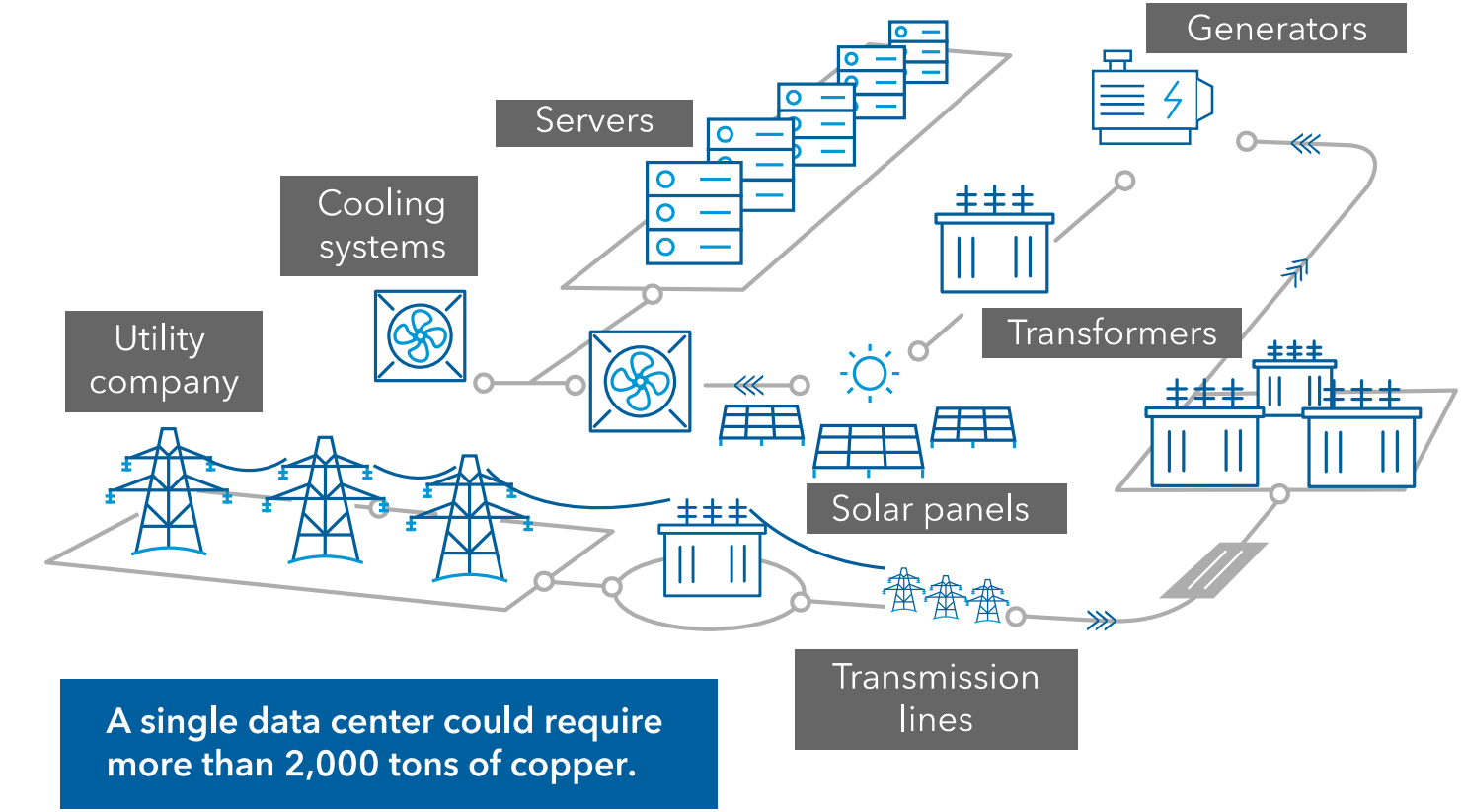
"One of the ironies of producing an advanced technology like AI is that it requires vast physical resources, and you might not think of such advanced technology as being physically constrained," says U.S. economist Jared Franz.

Not all resource constraints will make the news like shortages of advanced semiconductors made by NVIDIA and other chipmakers. Here are four resource constraints that could slow the growth of AI — and present opportunities for old economy companies.

1. AI sparks a 21st century copper rush

Generative AI tools like ChatGPT run on large language models hosted on thousands of servers in massive data centers. These data centers require cooling systems to help the servers run more efficiently, as well as a power infrastructure consisting of transformers, generators and transmission lines. Most of these elements require copper. The construction of a $500 million Microsoft data center near Chicago required 2,177 tons of copper, for example.

Anatomy of a data center: Servers, power and cooling systems



Source: Capital Group.

"If the projections by the hyperscalers are right, data centers constructed over the next eight years will require one million tons of copper in the U.S. alone," Franz says. "And you're going to have to think globally about this build-out."

Demand for copper in electric vehicles, clean energy technology and the modernization of the U.S. electric grid is already expected to create growing deficits. The planned construction of AI data centers will push those deficits to

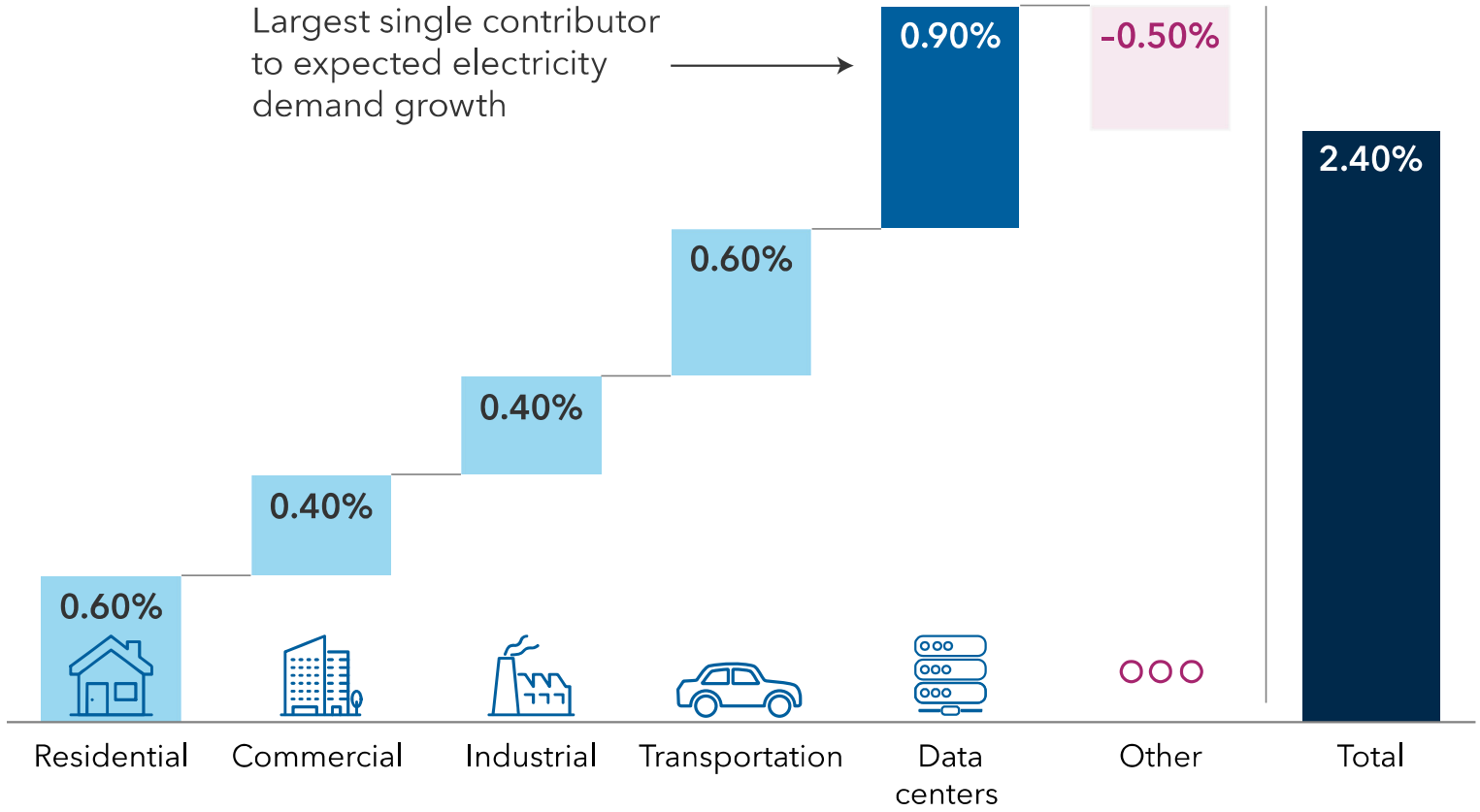
more than six million tons by 2030, according to JPMorgan. “The question is, can miners extract enough copper out of the earth quickly enough to meet expectations for the AI build-out?” Franz asks.

Anticipating shortfalls, global mining companies are focusing on acquiring and expanding copper operations. Grupo México, a conglomerate that operates some of the lowest cost copper mines, restarted work in south Peru this past July to boost production. Similarly, the fourth largest copper producer, Glencore, is turning to operations in Argentina to double its output in the coming years.

2. Power demand is going nuclear

AI, like just about any advanced technology, needs power. A lot of power. Data centers could consume as much as 9% of total U.S. electricity output by 2030, more than double current usage, according to the Electric Power Research Institute. “The demands on the grid from both data centers and electric vehicles are going to drive an increase in consumption we haven’t seen in about 20 years,” says Cheryl Frank, an equity portfolio manager for American Mutual Fund® and CGCV – Capital Group Conservative Equity ETF.

Data centers jolt demand for electricity



Sources: Goldman Sachs, U.S. Energy Information Administration (EIA). Estimates from Goldman Sachs as of April 28, 2024. CAGR is the compound annual growth rate. "Other" includes the impact of energy efficiency improvements and the change from categories not listed.

The question is, can U.S. utilities meet the soaring demand in the near term? Probably, but there are complications, according to Franz. First, supply and demand dynamics vary by state. "You could have mismatches in specific states, but if the current trajectory is right, there should be enough power. But if the trajectory doubles, bringing on new capacity very quickly would be very challenging."

What's more, many of the tech giants have committed to net zero carbon emissions by 2030. "It will be challenging to meet these commitments and power demand in the short term," Franz adds. "You'll need a lot more wind, a lot more solar, natural gas – and you may need to slow the pace of decommissioning coal plants. All energy sources may need to be on the table."

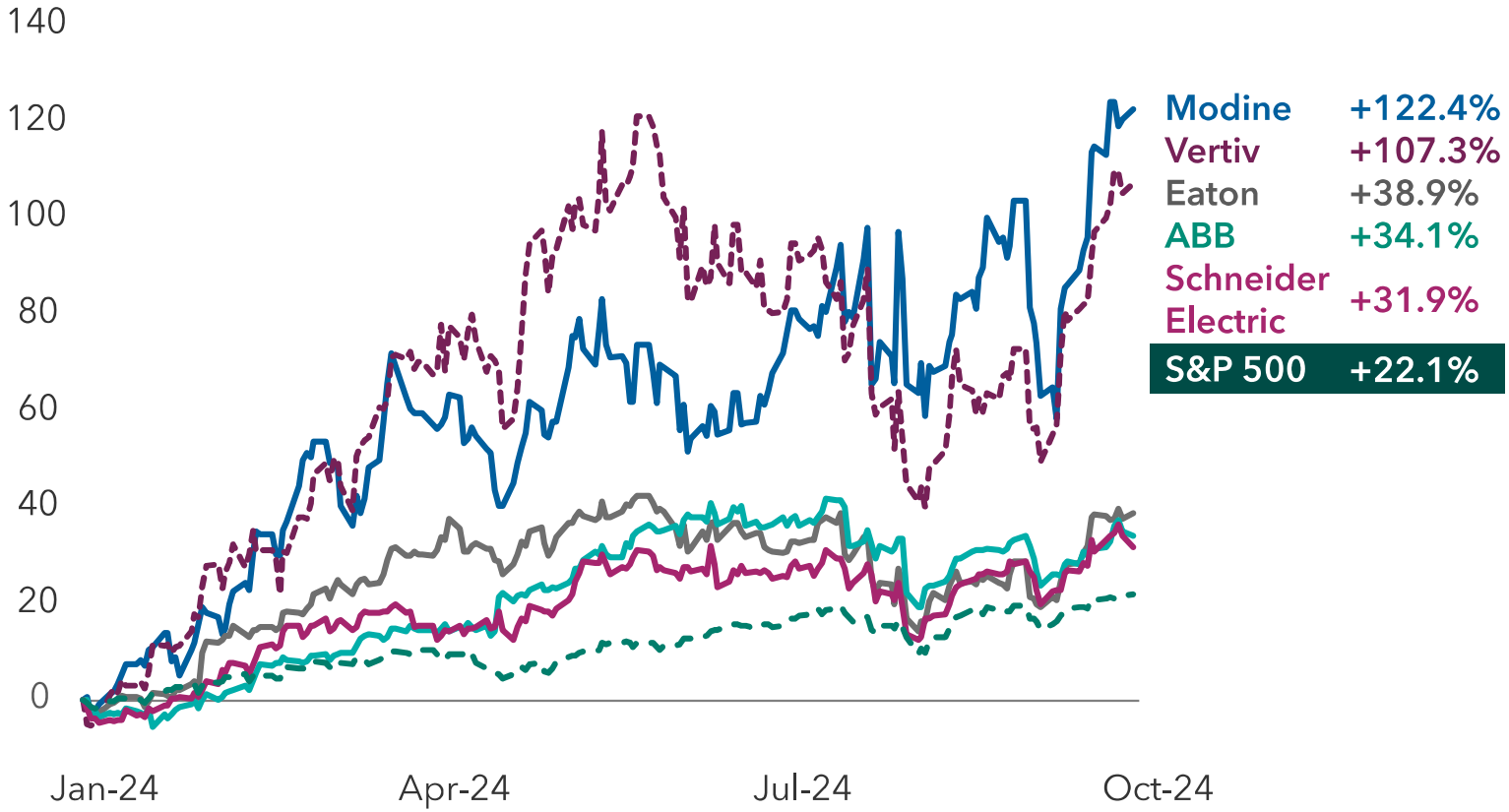
In some high-demand areas, available connections are scarce. "Companies are being told they can't get a connection into the system and will need to go on a waiting list," Frank says. To help meet its growing needs, Microsoft in September reached an agreement with nuclear power provider Constellation Energy to restart the Three Mile Island nuclear plant in Pennsylvania.

3. Capital equipment needs are surging

Substantial capital equipment needs to build out data centers and increase power generation globally are driving demand for a range of industrial companies, in some cases leading to shortages. For example, energy equipment maker GE Vernova expects its $6.4 billion backlog of gas turbines needed for backup generators and other electrical equipment to triple by the end of 2024.

Because AI chips generate a great deal of heat, data centers require advanced liquid cooling systems to prevent equipment failure and improve energy efficiency. Industrial manufacturers such as Modine and Vertiv have seen triple-digit increases in their stock prices this year as demand for their offerings has surged.

Need for cooling technology has bolstered industrial companies



Sources: Capital Group, FactSet. Figures reflect cumulative total returns between January 1, 2024, and September 30, 2024.

4. AI needs more humans

News headlines will focus on the potential for AI to eliminate jobs. But the rollout of AI faces a potential human resources shortage. “We're starting to hear companies say there is an actual shortage of AI engineers who can build foundational models, as well as a shortage of people able to implement AI systems at the enterprise level,” Franz says.

According to a recent Salesforce survey, 60% of public sector IT professionals identified a shortage of AI skills as their top challenge to implementing AI.

Without experienced people leading the rollout, adoption will likely be slower and take more time to generate the efficiencies the technology can provide. “I think professional services companies like Accenture and Oracle will play an important role in helping enterprises determine their AI strategies,” Frank adds. “There will be a lot of people in this chain.”

The bottom line

To be sure, AI technology has great potential to drive productivity and transform the economy over the long term but build-out and adoption of the technology will likely take time because of the potential bottlenecks identified here in addition to other factors. Technological advances could mitigate some of these constraints. For example, future advances in semiconductor design could reduce the amount of power needed in data centers, or at least minimize current requirements.

“I expect two AI cycles,” Frank concludes. “The one we are in the middle of, which is an advertising-driven consumer AI cycle and later, an enterprise AI cycle that will be more manageable but a much longer and slower build. That pattern is normal when it comes to innovation.”

Read important disclosures

Jared Franz *is an economist with 18 years of investment industry experience (as of 12/31/2023). He holds a PhD in economics from the University of Illinois at Chicago and a bachelor's degree in mathematics from Northwestern University.*

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