

CHIEF INVESTMENT OFFICE

Investment Insights

The Energy Addition: Power Play

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Two transformations are reshaping the global economy: Generative artificial intelligence (Gen AI) and the closely linked transformation of the energy system, which we call the Energy Addition. Rather than replacing one energy source with another, the world is racing to add capacity as electricity demand accelerates.

Artificial Intelligence (AI) growth and electrification across transport, manufacturing and buildings are driving a step-change in power demand. Meeting this demand will require investment from the public and private markets across generation, grids, storage, electrification and enabling infrastructure. Capital is already flowing into the theme: Private energy transition funds have raised record amounts, while flows for thematic clean energy, nuclear and power grid exchange-traded funds (ETF) globally reached over \$20 billion from the past five quarters, with Q2 2026 accounting for the largest quarterly inflows, and Q3 2025 showing the largest quarterly jump.¹ Investor interest appears to be growing, though the Energy Addition remains in its early stages.

DEMAND, SUPPLY CONSTRAINTS AND THE POTENTIAL OPPORTUNITY SET

Global energy demand is growing faster than any single source can meet alone, requiring additions across the entire energy system rather than a simple replacement of one fuel with another. Electrification, Gen AI, energy security and favorable economics are accelerating demand, while grids, equipment, minerals, permitting and labor increasingly determine how quickly new supply can be delivered. This interaction between rising demand and physical constraints defines both the next phase of the Energy Addition and its investable opportunity set.

Electrification of the economy and Gen AI. Electricity is the focal point of the Energy Addition, with broad electrification across transportation, buildings, industry, appliances and cooling reinforced by AI-driven load growth. Global electricity demand grew 4.4% in 2024 and 3.0% in 2025, and the Internal Energy Agency (IEA) forecasts 3.6% average annual global growth through 2030—roughly 50% faster than the prior decade.² In the U.S., demand is projected to grow 4.2% annually through 2030, a marked acceleration from the 0.7% annualized growth observed between 2021 and 2024.³ (Exhibit 1).

¹ Bloomberg, Q2 2025 through Q2 2026 analysis of Thematic ETFs.

² IEA, Electricity 2026, February 6, 2026.

³ IEA, Global Energy Review 2026, May 2026.

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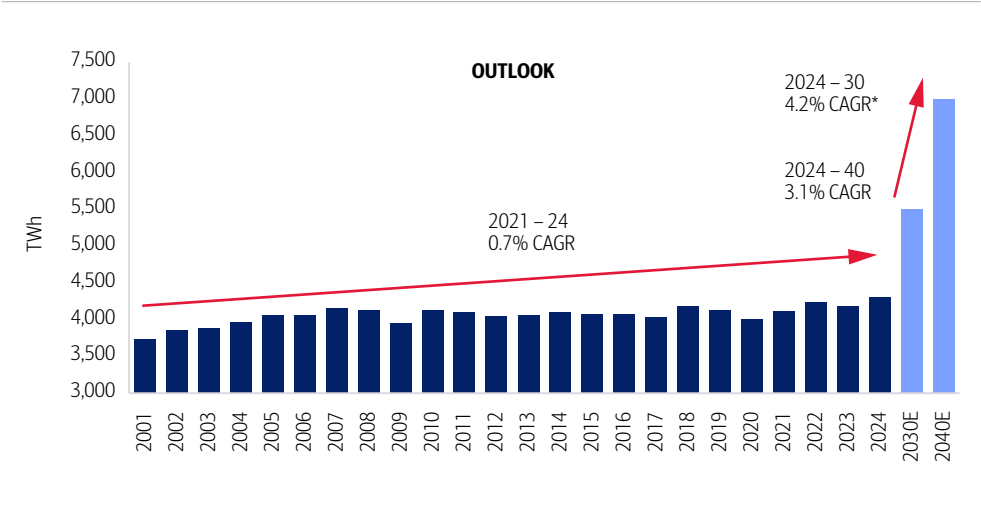
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WHY IT MATTERS FOR INVESTORS

Energy Addition is a broad supply-and-demand investment theme. Accelerating electricity demand requires more generation, grids, storage and enabling infrastructure, while constraints in transmission, equipment, critical minerals, permitting, and labor determine the pace and cost of that buildout. Together, these forces are directing capital toward utilities, infrastructure, industrials, natural resources, engineering services, and thematic public and private strategies.

Exhibit 1: U.S. Electricity Demand.



*Compound annual growth rate. E=estimate. Source: ICF Energy Demand Growth report as of June 2026.

AI is an important accelerator. The IEA estimates data centers will account for about 10% of global electricity demand growth through 2030, but more than 20% in advanced economies, where demand is expected to more than double over the next five years and grow roughly four times faster than overall electricity demand. Because AI data centers are energy-intensive and require large, concentrated loads, power availability has become a key constraint on AI deployment. With hyperscalers planning more than \$700 billion in 2026 AI infrastructure capital expenditures with more in 2027, the electric grid has moved to the center of the global AI race, giving countries with reliable, scalable and affordable power a growing competitive advantage.

Key take away: Affordability concerns, as well as concerns over water and land use, noise and air pollution, have led to communities pushing back on data center development, sometimes successfully: At least \$156 billion across 48 projects was blocked or stalled due to local opposition in 2025 alone. The first quarter of 2026 produced the largest single quarterly concentration of delayed or blocked data center projects on record.

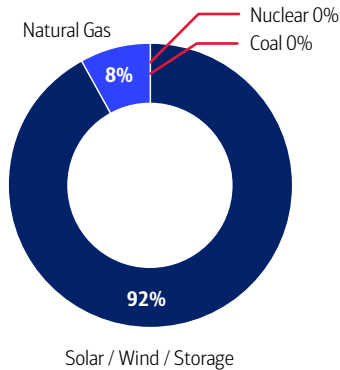
Policy makers, utilities, and developers will need to effectively engage with communities in order to keep up with the desired pace of construction.

Source: Data Center Watch: Q1 2026 Insights Report as of May 2026.

The supply response is broadening. Global energy demand rose across all major fuels and technologies in 2025,⁴ while renewables accounted for 38% of the increase in global energy supply and more than 90% of total power capacity additions.⁵ BloombergNEF estimates global energy transition investment reached a record \$2.3 trillion (T) in 2025, including \$1.2T directed toward renewables and grids. Notably, growth in renewable and nuclear generation exceeded the increase in global electricity demand in 2025, allowing fossil-fuel generation to decline despite rising electricity consumption.⁶ Reflecting this shift, solar surpassed coal in the U.S. electricity mix for the first time in May 2026⁷ (Exhibit 2).

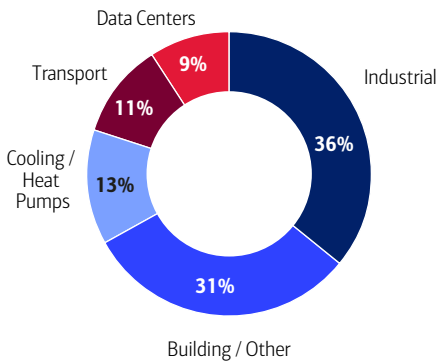
⁴ IEA, Global Energy Review 2026, May 2026.
⁵ IEA Global Energy Review 2026, May 2026.; BloombergNEF.
⁶ IEA Global Energy Review 2026, May 2026.
⁷ BNEF Solar Passes Coal in Historic Shift for US Electricity Mix (1) | BloombergNEF, July 10, 2026.

2025 U.S. Power Capability Additions

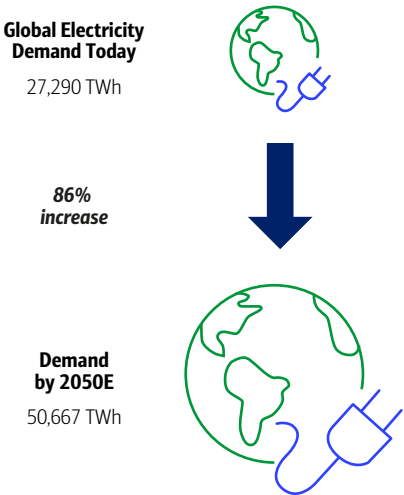


Source: Solar Energy Industries Association/Wood Mackenzie U.S. solar Market Insight as of March 2026.

Share of Global Electricity Demand Growth 2025-2030

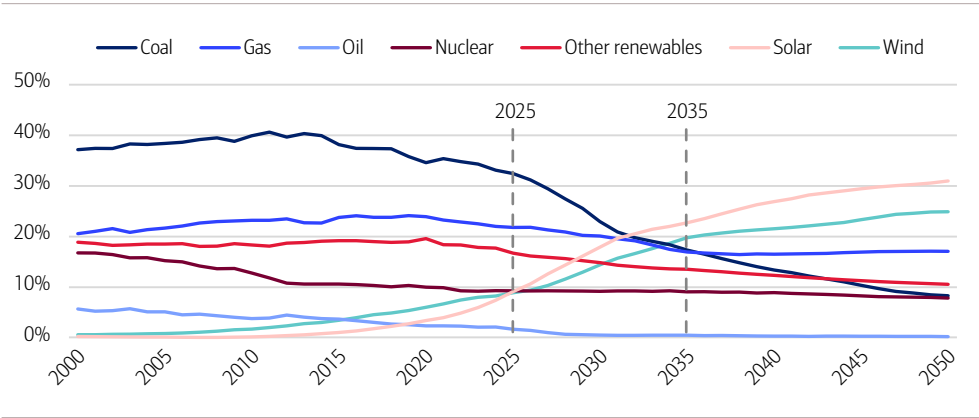


Source: IEA. Values for the 2025-2030 period are forecasts.



Source: Solar Energy Industries Association/Wood Mackenzie U.S. solar Market Insight as of March 2026.

Exhibit 2: Global Electricity Generation By Technology/Fuels, Shares.



Source: BNEF New Energy Outlook 2026.

Battery storage is a key enabling technology, helping shift renewable generation to periods of peak demand, improve grid flexibility, reduce congestion and defer transmission upgrades. As costs decline and deployments scale, the focus is increasingly on integrated renewable-plus-storage systems that can deliver both low-cost power and greater reliability.

Energy security and independence. Governments are increasingly prioritizing energy independence, supply diversification and domestic capacity. Russia's invasion of Ukraine in 2022 exposed Europe's reliance on imported natural gas, while the 2026 Iran conflict underscored the vulnerability of global energy supply chains. Countries now have more tools to reduce exposure to energy price shocks, including renewables, storage, nuclear power and grid modernization. The result is a growing recognition that energy security is inseparable from economic and national security, potentially accelerating a more diversified energy system as the IEA projects oil, natural gas and coal demand could peak this decade under current policies.

Economic context. Cost dynamics help explain why renewables continue to capture a large share of new power capacity. In most markets, renewables remain among the lowest-cost sources of new electricity generation,⁸ helping solar, wind, and battery storage account for roughly the vast majority of global power capacity additions in 2025.⁹ At the same time, rising gas turbine prices have pushed the cost of some new combined-cycle gas plants above new wind projects in many markets.¹⁰ While policy changes and higher equipment costs have increased renewable project costs in some regions, renewables generally remain competitive as the system adds capacity to meet rising power needs. (Exhibit 3).

DID YOU KNOW

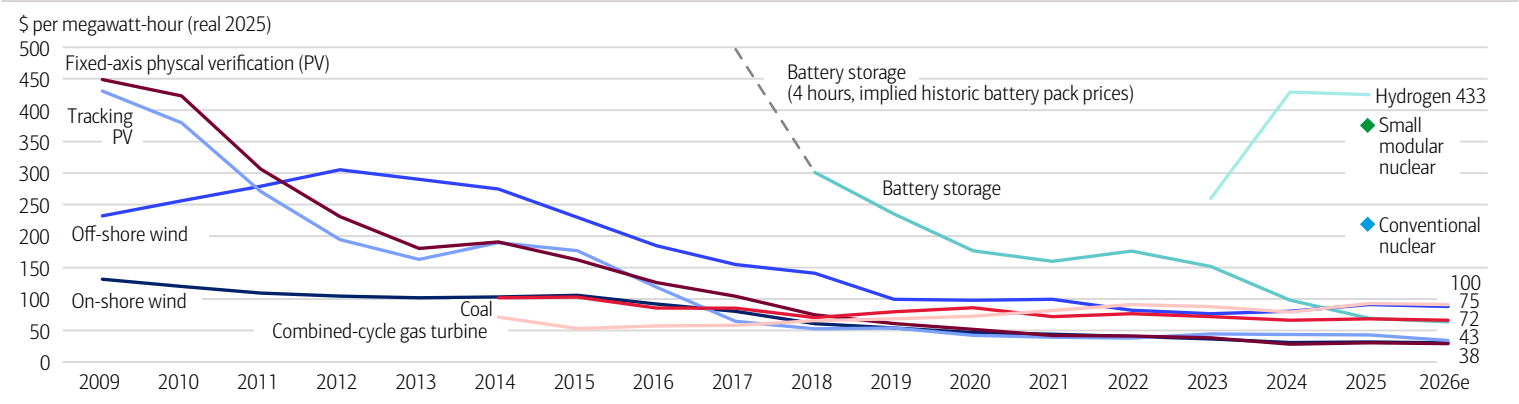
China installed more than 12x the amount of renewable capacity that the U.S. did in 2025. *Why are renewables so important to China?*

Energy security: China's reliance on imported oil and natural gas is increasing the appeal of renewables as a way to improve energy independence.

Industrial leadership: China previously used its industrial scale to become a leader in electric vehicles (EV), batteries, and critical minerals, a strategy it is now applying to renewables.

Source: IEA as of 2025.

Exhibit 3: Global Benchmarks for the Levelized Cost of Energy, 2009–2025.



Source: BloombergNEF. Levelized Cost of Electricity Update 2026. As of March 2026.

⁸ BloombergNEF, Levelized Cost of Electricity Update 2026, February 18, 2026. LCOE (Levelized Cost of Electricity) does not include subsidies, tax credits or grid connection costs, and includes a carbon price where applicable.

⁹ BloombergNEF.

¹⁰ BloombergNEF, Levelized Cost of Electricity Update 2026, February 18, 2026.

Where rising demand meets physical constraints. The demand drivers above require a broad supply response across generation, transmission, storage and enabling infrastructure. Yet deployment is increasingly constrained by grids, equipment, critical minerals, permitting, and labor. These bottlenecks are integral to the demand story: they determine the pace and cost of new supply and direct capital toward the parts of the system best positioned to relieve them.

Interconnection constraints. Grids are becoming a critical bottleneck as new generation, storage, and large loads compete for limited interconnection capacity. More than 2,500 gigawatt of renewable, storage, and large-load projects are stuck in interconnection queues worldwide¹¹, roughly twice the capacity of the U.S. power grid.

Grid modernization. Aging transmission lines, transformers, and substations must now support renewables, batteries, EVs, heat pumps, and AI-driven data centers. The IEA estimates annual grid investment must rise roughly 50% by 2030,¹² while the world needs to add or refurbish nearly 50 million miles of transmission and distribution infrastructure by 2040, effectively rebuilding today's grid.¹³ Grid-enhancing technologies, storage, demand response,¹⁴ and flexible loads¹⁵ can help unlock capacity and improve utilization.

Old Tech, New Purpose. The Energy Addition is not just about building new infrastructure. It is also about finding new ways to use the infrastructure, technologies, and expertise already in place.	Retired generators are being converted into synchronous condensers that help stabilize renewable-heavy grids.	Coal plant sites are becoming homes for data centers, batteries, and new power generation, leveraging existing grid connections.
Hydropower facilities are increasingly functioning as large-scale energy storage through pumped hydro.	Existing transmission lines are gaining capacity through advanced conductors, digital controls, and dynamic line ratings.	EV batteries are evolving into distributed energy-storage assets, while data centers are beginning to act as flexible grid loads.

Turbines, engines, inverters and transformers. Data center expansion, grid modernization, storage, and renewables are tightening supplies of key equipment. Demand for turbines and engines has surged, resulting in record order backlogs, multi-year lead times, and delivery schedules extending into the next decade. Transformer shortages and broader grid-equipment constraints are slowing transmission expansion in many regions, while growing deployment of solar, battery storage and distributed energy resources is driving sustained demand for power inverters.¹⁶ In the U.S. and Europe, manufacturing origin is becoming more important because of cybersecurity concerns.

Critical minerals. Demand for copper, aluminum, electrical steel, and battery minerals is rising as grids, storage, EVs and renewable generation expand, creating potential opportunities in natural resources, materials, recycling, refining and substitution technologies.

Skilled Labor, Permitting and Sitting. Even with sufficient capital and equipment, deployment can be delayed by shortages of electricians, line workers, welders, installers, technicians, engineers, construction labor and lengthy approval processes. With transmission projects often taking five to 15 years to plan, permit and construct, execution capacity has become a core determinant of how quickly this Energy Addition can proceed.

¹¹ IEA, Electricity 2026, February 6, 2026.
¹² Ibid.
¹³ IEA, Electricity Grids and Secure Energy Transitions, October 2023.
¹⁴ Demand response refers to reducing demand rather than increasing supply to match demand during stressed periods.
¹⁵ Flexible loads refer to shifting electricity use to times when power is abundant.
¹⁶ IEA, Electricity 2026, February 6, 2026.; Wood Mackenzie, Global Solar PV Inverter State of the Market Report 2025, September 24, 2025.

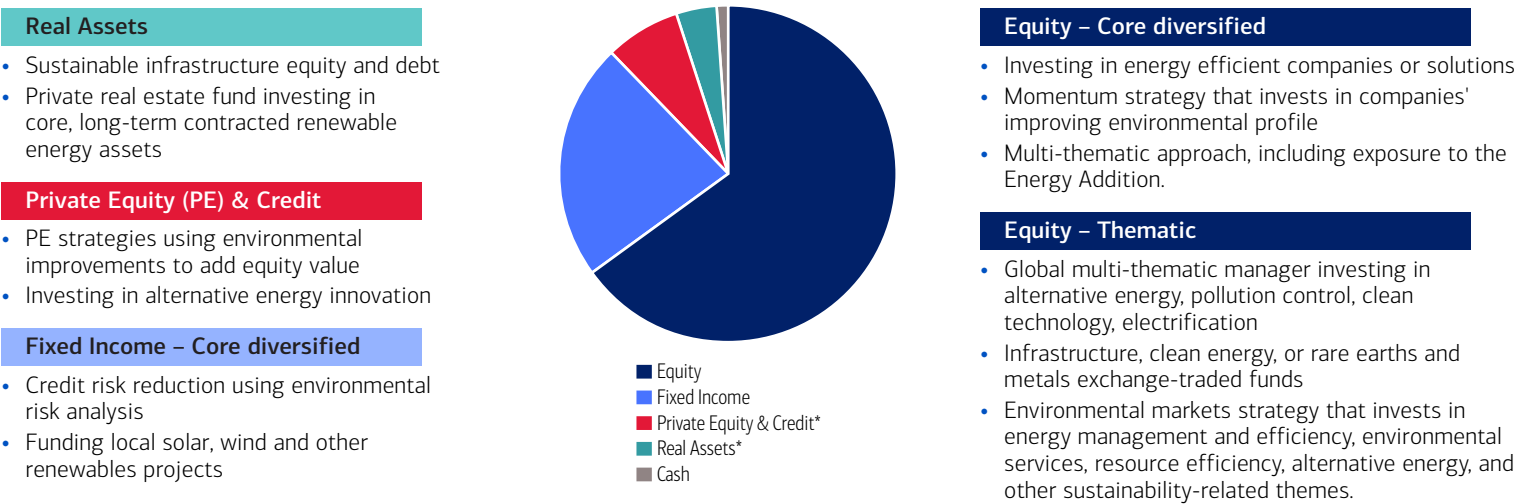
Execution—not capital—may be the Energy Addition’s primary constraint. Grid, equipment, mineral, permitting, and labor bottlenecks direct spending toward utilities, infrastructure, industrials, natural resources, and engineering services. Exhibit 4 and 5 outlines ways to access these potential opportunities.

Exhibit 4: The Energy Addition Bottlenecks Point to the Potential Investment Opportunities.

Bottleneck	Constraint	Potential Opportunity
Grid and transmission	Interconnection delays and aging infrastructure	Transmission and distribution utilities, grid-enhancing and interconnection technologies, smart-grid equipment, storage, demand response and grid buildout
Supply chain	Shortages of turbines, engines, transformers, and inverters	Turbines, transformers, inverters, power electronics, energy efficiency, industrial capacity and domestic manufacturing
Critical minerals	Limited supplies of copper, aluminum, electrical steel, and battery minerals	Mining, refining, recycling, mineral processing, efficient chemistry and material-substitution technologies
Execution capacity	Labor shortages and lengthy permitting, sitting and construction timelines	Engineering and construction, permitting services, workforce training and reskilling, project development, and digital project management

Source: Chief Investment Office as of September 10, 2026.

Exhibit 5: Energy Addition Allocation Illustration.



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As with every potential investment opportunity, a balanced view of risks is warranted. More efficient AI models and computing infrastructure could temper projected power demand, affecting the pace and scale of investment. Permitting, sitting, interconnection, labor, and supply-chain constraints may delay both data center and energy development. Concerns about energy and water prices, pollution and chemicals could also increase community opposition and regulatory scrutiny, affecting not only data center timelines and returns but also those of energy projects.

CIO VIEWS

We remain constructive on this major industrial transformation. Rising electricity demand will require a diversified energy mix shaped by technology, security, reliability, policy, and economics. The central challenge is deploying solutions at scale, creating long-term potential opportunities across generation, transmission, storage, grid modernization, components, and enabling infrastructure, where specialized active¹⁷ management may help investors navigate complexity.

¹⁷ Active management is an investment strategy where a professional manager, team, or individual makes hands-on decisions to buy, hold, and sell assets with the goal of outperforming a market benchmark.

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