



Introducing ZAP: The Case for U.S. Electrification

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On December 18, 2024, we listed the [Global X U.S. Electrification ETF \(ZAP\)](#) on NASDAQ. ZAP seeks to invest in companies that potentially stand to benefit from increased electricity demand and electrification within the United States. This includes companies that are involved in conventional electricity generation, transmission, and distribution; alternative electricity generation and technology solutions; and the modernization, development, manufacturing, or implementation of grid infrastructure and smart grid technology (collectively, “the sub-themes”).

U.S. electricity demand is forecast to grow cumulatively by as much as 47% between 2024 and 2040, following two decades of near-stagnant growth^{1,2} This robust outlook stems from three key drivers: the rising adoption of power-intensive generative artificial intelligence (AI) technologies, increasing electric vehicle (EV) penetration, and anticipated expansion of domestic manufacturing activity.³ While utilities will likely turn to a range of power sources to meet this increased demand, the U.S. power sector is expected to become increasingly electrified with alternative energy sources like renewable energy, nuclear power, and energy storage systems. This transition necessitates substantial modernization and expansion of grid infrastructure to support growing capacity requirements, accommodate a more diverse electricity mix, and enhance grid resilience and reliability. Given these dynamics, we believe the electrification theme presents a compelling opportunity for investors seeking exposure to a transformation of the U.S. power grid.

Key Takeaways

- After almost two decades of stagnant growth, U.S. electricity demand is projected to increase from 4,012 terawatt hours (TWh) in 2023 to 5,900TWh in 2040, driven by generative AI, EV adoption, and growth in data centers and U.S. manufacturing activity.^{4,5,6}
- U.S. utilities will likely need to significantly expand power generation assets, and the country’s power grid will require upgrades and modernization to meet rising electricity demand and address other challenges, such as ageing assets.
- Companies that stand to potentially benefit from U.S. electrification include conventional electricity producers, alternative electricity producers, and those involved in the expansion and modernization of power grid infrastructure.

The U.S. Power Grid Appears to Be at an Inflection Point, Boosted by Data Centers, EVs, and Manufacturing

U.S. electricity demand is forecast to surge in the coming years, driven by converging tailwinds like data center expansion, manufacturing growth, and electrification of transportation.⁷ Over the long term, the United States’ annual electricity use could increase by nearly 1,900TWh between 2024 and 2040, which would be roughly 4.6x larger than the growth of the country’s electricity use from 2000 to 2023.^{8,9}

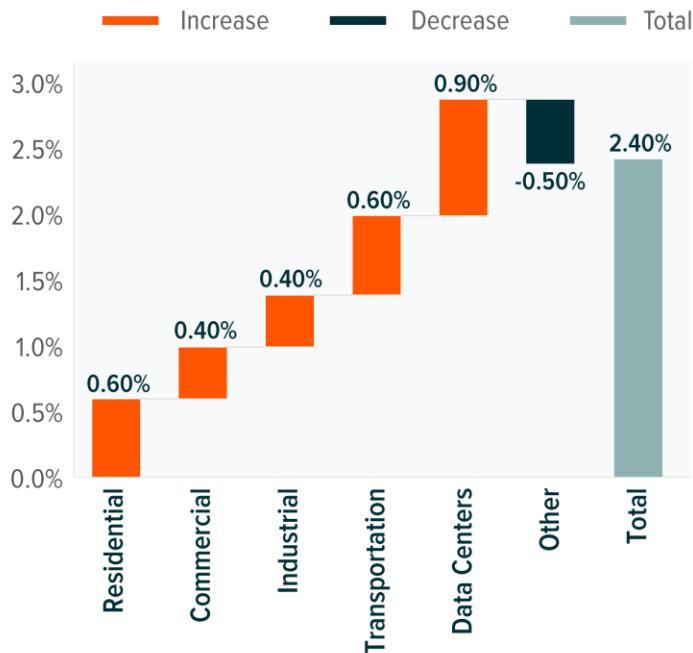
We are already seeing rising demand for power over the medium term as the potential impact of emerging demand sources becomes clearer. According to one estimate, through 2030, U.S. power demand could grow at a compound annual growth rate (CAGR) of 2.4%, which would far surpass the 0.40% CAGR recorded between 2010 and 2023.^{10,11}

The U.S. Federal Energy Regulatory Commission (FERC) expects a similarly robust increase in U.S. power demand through the end of the decade, with nationwide demand forecast to increase by nearly 16% from 2024 to 2029. FERC expects that the country’s five-year nationwide summer peak demand growth could total 128 gigawatts (GW).¹² Just one year ago, FERC was projecting only 39GW of summer peak demand growth in its five-year outlook.¹³ Peak demand equates to the amount of power generation capacity required during the single-highest moment of demand for power.¹⁴

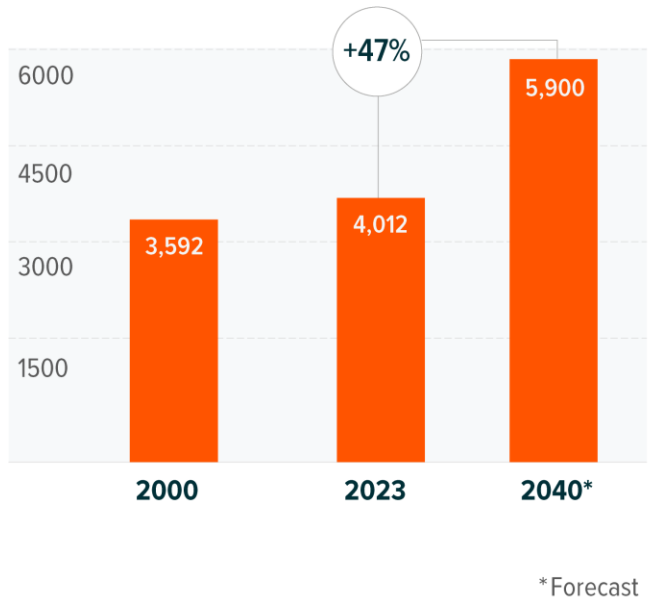


U.S. POWER DEMAND IS FORECAST TO SURGE DUE TO EXPANSION OF DATA CENTERS, MANUFACTURING, AND EVs

PROJECTED U.S. POWER DEMAND CAGR, 2022-2030



U.S. POWER DEMAND, 2000-2040 (TWH)



Sources: LHS: The Goldman Sachs Group, Inc. (2024, April 28). Generational Growth: AI, Data Centers and the Coming US Power Demand Surge. RHS: NextEra. (2024, October 23). Third Quarter 2024: Earnings Conference Call. [Presentation]; U.S. Energy Information Administration. (2024, December 10). Short-Term Energy Outlook.

AI and Data Centers Central to Increasingly Positive Growth Outlooks for the U.S Power Sector

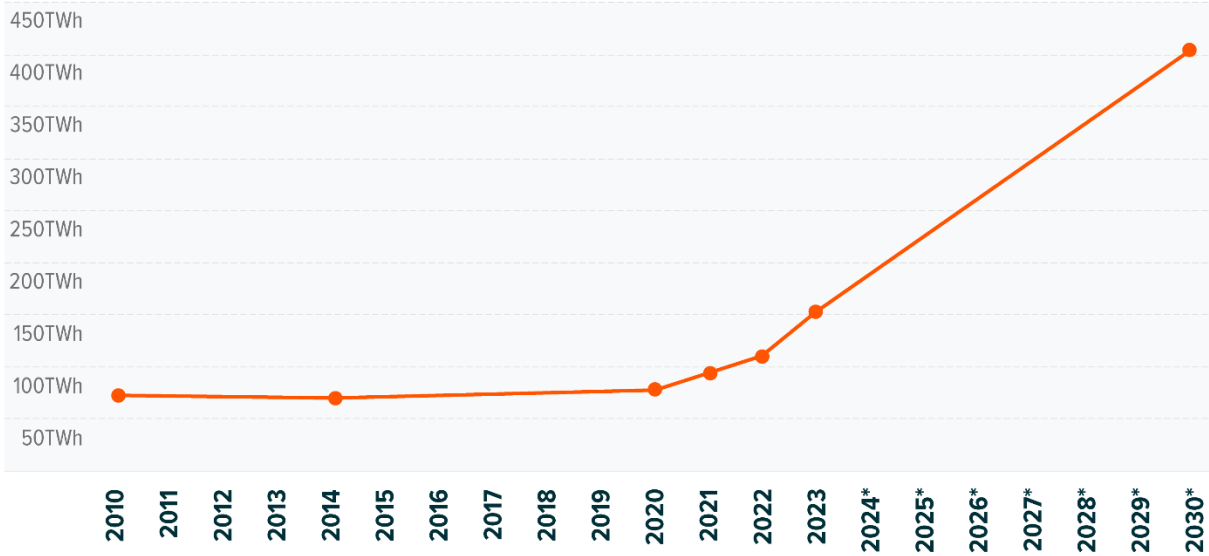
As the world's largest data center market, the U.S. is set for significant expansion, driven by growing applications of generative AI. Not only is the number of data centers rising, but they're also getting bigger and requiring more power. Notably, one ChatGPT request uses roughly 10 times as much energy as a standard Google search, which underlines the energy-intensive nature of AI processing.¹⁵

Electricity consumption from U.S. data centers could increase 2.75x from around 152TWh in 2023 to 404TWh in 2030.¹⁶ By the end of the decade, data centers could account for 9.1% of total electricity consumption in the U.S., up from an estimated 2.5% share in 2022 and 4% share as of May 2024.¹⁷ In total, U.S. utilities will need to invest an estimated \$50 billion in new generation capacity to facilitate this data center demand growth.¹⁸



ANNUAL U.S. DATA CENTER POWER DEMAND COULD GROW 2.7X BETWEEN 2023 AND 2030

U.S. DATA CENTER POWER DEMAND



* Forecast

Source: EPRI. (2024, May). Power Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption.

In early 2024, Virginia-based utility Dominion Energy reported that requests for energy demand from proposed data center campuses range from 300 megawatts (MW) up to several gigawatts (GW).¹⁹ Historically, the utility has connected around 15 data centers totaling 1GW annually on average. Currently, Dominion’s data center requests total around 50GW.²⁰ Georgia Power, the largest subsidiary of Southern Company, now projects load growth of 36.5GW over the next decade – roughly double what the company was projecting in its Integrated Resource Plan (IRP) from October 2023. Data centers account for 31GW of the expected load growth.²¹ For further context, Georgia Power’s entire power generation fleet currently stands at around 14GW, so meeting this added demand could require the company to more than double its capacity.²²

EVs and Manufacturing Also Driving Up U.S. Power Demand Outlooks

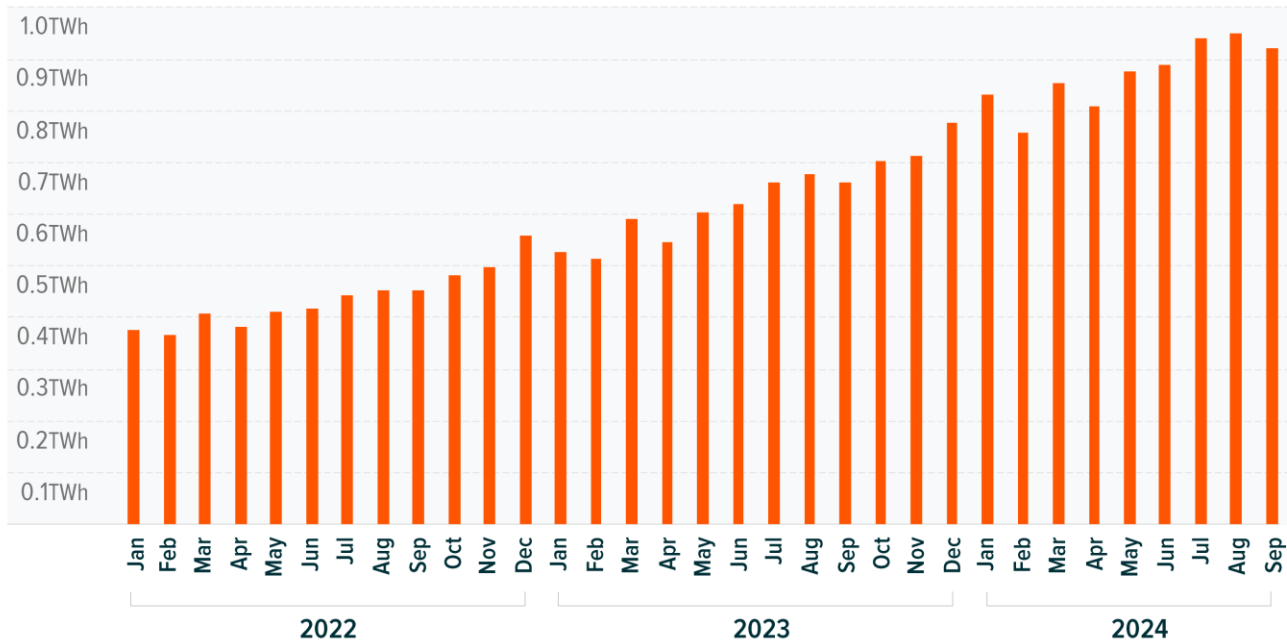
The ongoing electrification of transport is also a key factor driving U.S. power demand outlooks. In the first nine months of 2024, U.S. electricity consumption from light-duty battery EVs and plug-in hybrid EVs combined grew by 32% compared to the first nine months of 2023.²³ On average, a single EV in the United States consumes around 4,310kWh of electricity per year and, by 2030, light-duty EV sales in the U.S. could total well over 5 million units annually.^{24,25} Looking at the entire U.S. transport sector, electricity consumption could increase from 18.3TWh in 2023 to more than 130TWh by the end of the decade.²⁶





MONTHLY ELECTRICITY CONSUMPTION BY LIGHT-DUTY EVS IN THE UNITED STATES CONTINUES TO CLIMB

MONTHLY LIGHT-DUTY EV ELECTRICITY CONSUMPTION



Sources: Global X ETFs with information derived from: U.S. Energy Information Administration (EIA). (2024, October). Electric Power Monthly: Table D.1. U.S. Estimated Consumption of Electricity by Light-Duty Vehicles Types, 2018 – September 2024.

The United States’ anticipated manufacturing resurgence is also expected to result in notable power demand growth. This is particularly true for advanced manufacturing processes, such as those involving electronics or semiconductor production. For example, Taiwan Semiconductor Manufacturing Co (TSMC)’s Phoenix, Arizona manufacturing facility is being designed to use up to 1,200MW when it becomes fully operational, which would be the equivalent of about one large nuclear power plant.²⁷ There are at least 21 semiconductor manufacturing facilities in the planning stages nationwide.²⁸

Similarly, dozens of facilities are being developed for wind, solar, EV, and battery manufacturing due to supportive policies from the Inflation Reduction Act, CHIPS Act, and Infrastructure Investment and Jobs Act.²⁹ It is estimated that of all the industrial energy consumption in the United States, roughly 76% goes to manufacturing.³⁰ The National Renewable Energy Laboratory (NREL) forecasts that U.S. industrial energy consumption could grow by nearly 16TWh by 2034.³¹

Alternative Energy Resources Can Benefit from Expanding Demand

Meeting the added power demand from these industries is expected to require the buildout of a variety of power generation facilities, from natural gas to renewables and nuclear power. For example, in April 2024, Georgia Power fast-tracked the construction of 1.4GW of fossil-fuel fired power plants to help cover part of near-term data center power demand growth.³² Yet, many utilities and companies are also increasingly turning towards alternative electricity sources as electrification within the power sector gains pace. In contrast, Dominion Energy plans to cover 80% of its capacity growth over the next 15 years with carbon-free, alternative electricity sources, including renewables, energy storage, and nuclear power.³³

Solar power, wind power, and energy storage systems are scalable, can be placed close to demand centers, and are often cost-competitive with more traditional power sources.³⁴ Renewables can help companies meet added power demand while also helping them advance towards their clean energy targets. Because of this, tech giants and AI leaders like Microsoft, Google, and Meta are already top clean energy buyers and, in our view, they could remain top purchasers as they look to secure more clean power for AI operations.³⁵



Companies outside of tech are also switching to electrified power sources for their operations. In October 2024, NextEra, the largest renewables developer in the United States, signed deals with two non-tech companies to supply up to 10.5GW of renewables and storage capacity by 2030 for their operations – some of the largest contracts in the U.S. renewables industry so far.³⁶ NextEra forecasts U.S. renewables and storage capacity additions could grow 3x from 140GW installed over the past seven years to up to 450GW over the next seven years.³⁷

In addition to renewables, companies like Microsoft, Amazon, and Google are exploring nuclear power for data center operations.³⁸ In particular, small modular reactors have the potential to be more cost efficient, easier to build, and safer than traditional plants. They can also be built closer to the point of demand. While commercial operations likely will not begin until the 2030s, in our view, tech companies' interest in nuclear power could help accelerate their commercial development.³⁹

AMAZON AND MICROSOFT AMONG THE COMPANIES SIGNING AGREEMENTS FOR NUCLEAR POWER SUPPLY

Amazon Buys a Nuclear-Powered data Center From Talen

NAME/PROJECT	LOCATION	EXPECTED # OF BUILDINGS	
CUMULUS DATA ASSETS	SALEM TOWNSHIP, PENNSYLVANIA	15	

DETAILS

On March 4, 2024, Talen Energy sold Cumulus Data Assets to Amazon Web Services (AWS) for \$650 million. The 1,200-acre campus is powered by the nearby 2.5-gigawatt Susquehanna Steam Electric Station, a nuclear plant operational since 1983 and licensed through 2044.

Microsoft Signs 24/7 Nuclear Power Deal with Constellation

NAME/PROJECT	LOCATION	CURRENT # OF BUILDINGS	
BOYDTON CAMPUS	BOYDTON, VIRGINIA	11	

DETAILS

On June 20, 2023, Microsoft signed a deal with Constellation Energy to supply nuclear power to its Boydton, Virginia data center, targeting near 100% carbon-free operation. Constellation will provide up to 35% of the center's power through its carbon-free energy matching platform.

Sources: Global X ETFs with information derived from: Nuclear News. (2024, March 7). Amazon Buys Nuclear-Powered Data Center from Talen.; Judge, P. (2023, June 30). Microsoft Signs 24/7 Nuclear Power Deal with Constellation for Boydton Data Center. Data Centre Dynamics.

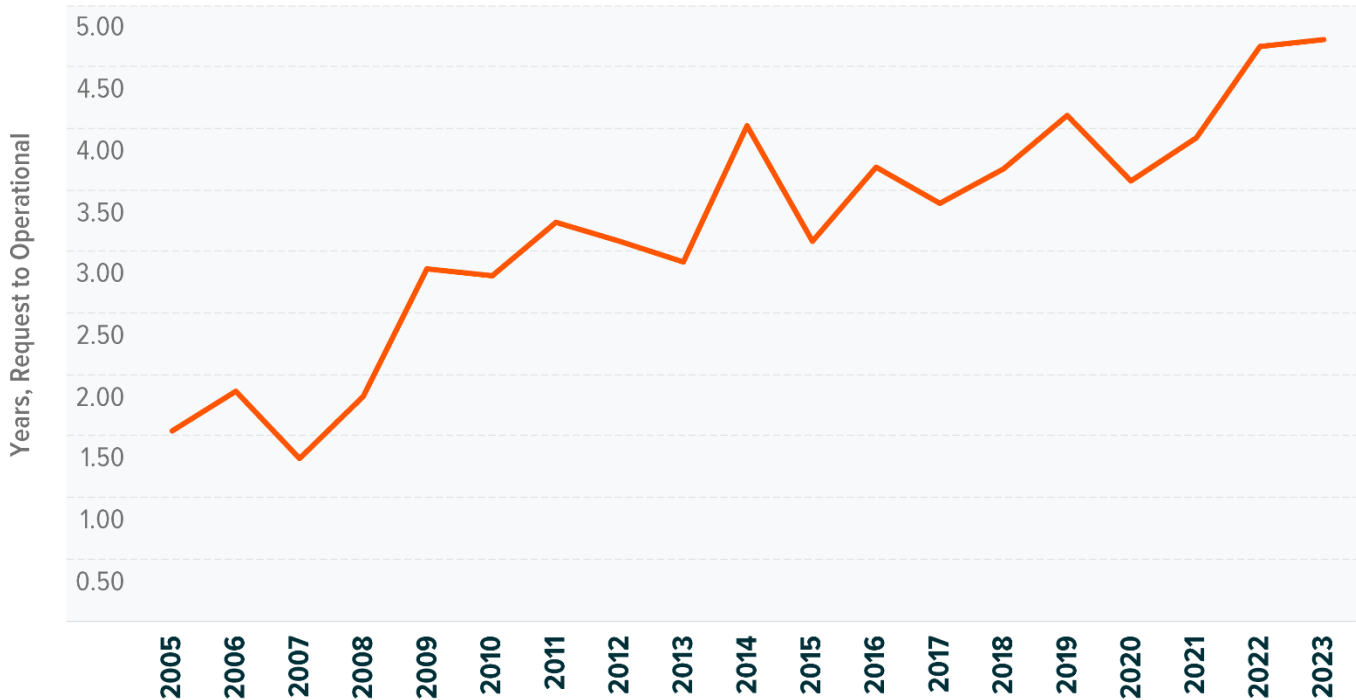
Grid Upgrades Critical to Service Growing Electricity Demand

The country's current power grid infrastructure is outdated, disconnected, and at capacity in many areas, which could create headwinds to realizing power supply growth forecasts. In particular, roughly half of the country's grid infrastructure assets are at least 20 years old.⁴⁰ Additionally, in 2023, developers had waited on average 4.7 years to connect new facilities, which is one year longer than the average wait time three years prior.⁴¹ In order to avoid delays that could hamper the adoption of disruptive technologies and reshoring of manufacturing, U.S. power grid infrastructure development needs to accelerate.



AVERAGE INTERCONNECTION REQUEST WAIT TIME IS RISING FOR POWER FACILITY DEVELOPERS IN THE UNITED

AVERAGE INTERCONNECTION WAIT TIME



Sources: Berkeley Lab. (2024, April 10). Grid connection backlog grows by 30% in 2023, dominated by requests for solar, wind, and energy storage.

While the U.S. power grid faces these challenges, it also presents one of the biggest potential opportunities. Planned transmission expansion investments increased from \$9.2 billion in 2022 to \$15.1 billion in 2024, and yet investments will likely need to ramp up much more quickly to avoid slowing electrification efforts.⁴² Between 2024 and 2030, the U.S. likely needs to invest an estimated \$1 trillion into grid infrastructure.⁴³ Companies that could potentially benefit from the expected rise in grid infrastructure investments include those that provide grid products and services, such as Hubbell Incorporated, Quanta Services, and Eaton Corp.

ZAP: An ETF Targeting U.S. Electrification

The Global X U.S. Electrification ETF invests in companies from the sub-themes outlined below. It seeks to track, before fees and expense, the Global X U.S. Electrification Index (the "Index"). For inclusion in the Index, companies must be listed in the United States and must earn at least 50% of their revenue from the United States.

- **Conventional Electricity:** Companies primarily engaged in the generation, transmission, and distribution of electricity using traditional energy sources such as fossil fuels (e.g., coal, natural gas, and oil) and nuclear power, that deliver electricity to residential, commercial, and industrial customers.
 - To be considered for initial inclusion in the Index, Conventional Electricity Companies must be significant-play companies. This means that they must be earning greater than or equal to 75% of revenue attributable to one or more of the core businesses of the sub-themes in aggregate. A constituent company may remain in the Index to the extent that it derives at least 50% of its revenue from one or more of the core businesses of the sub-themes in aggregate (a "pure-play" company").



- **Alternative Electricity:** Companies that primarily engage in generating electricity from non-traditional, cleaner energy sources (e.g., wind, solar, low-carbon hydrogen, biomass-fired power), as well as other technology solutions (e.g., small modular nuclear reactors).
 - To be considered for inclusion in the Index, Alternative Electricity Companies must be pure-play companies.
- **Grid Infrastructure and Smart Grid Technologies:** Companies primarily engaged in the expansion and modernization of power grid infrastructure (e.g., high-voltage direct current (HVDC) transmission infrastructure), as well as the development, manufacturing, and implementation of the infrastructure, technologies, and systems that transport electricity and enhance the electrical grid, such as electrical components, energy storage devices (e.g., batteries, compressed air, flywheel, gravity-based, and other energy storage technologies), electric vehicle charging equipment, smart meters, etc.
 - To be considered for inclusion in the theme, Grid Infrastructure and Smart Grid Technologies companies must be either pure-play companies or diversified-play companies. Diversified companies must be earning between 25% and 50% of revenue attributable to one or more of the core businesses of only that applicable sub-theme.

Conclusion: U.S. Electrification Presents Secular Growth Opportunities

The progress and adoption of disruptive technologies like AI, electric mobility, and the revitalization of the U.S. industrial base are critically dependent on the transformation of the U.S. power sector. This transformation involves integrating new power sources, such as renewables and nuclear energy, as well as energy storage systems, to meet increasing demand, alongside upgrading the grid and transmission infrastructure to support demand in key regions. These changes present significant potential growth opportunities across the electricity generation and transmission spectrum. The Global X U.S. Electrification ETF (ZAP) provides exposure to the U.S. Electrification value chain, including to companies leading the charge in electricity generation, grid modernization, and the deployment of alternative energy technologies.

Related ETFs

[ZAP – Global X U.S. Electrification ETF](#)

Click the fund name above to view holdings. Holdings are subject to change. Current and future holdings are subject to risk.

Footnotes

1. NextEra. (2024, October 23). Third Quarter 2024 Earnings Conference Call. [Presentation]
2. U.S. Energy Information Administration. (2024, December 10). Short Term Energy Outlook.
3. ICF. (2024, September 12). Power surge: Navigating US electricity demand growth.
4. NextEra. (2024, October 23). Third Quarter 2024 Earnings Conference Call. [Presentation]
5. U.S. Energy Information Administration. (2024, December 10). Short Term Energy Outlook.
6. ICF. (2024, September 12). Power surge: Navigating US electricity demand growth.
7. Ibid.
8. U.S. Energy Information Administration. (2024, December 10). Short Term Energy Outlook.
9. ICF. (2024, September 12). Power surge: Navigating US electricity demand growth.
10. Goldman Sachs. (2024, May 14). AI is poised to drive 160% increase in data center power demand.
11. Global X Analysis with data from: U.S. Energy Information Administration (EIA). (2024, March). Monthly Energy Review.
12. Grid Strategies. (2024, December). Strategic Industries Surging: Driving US Power Demand.
13. Ibid.
14. EnergySage. (2023, December 6). Peak demand: What is it and why does it matter?
15. Goldman Sachs. (2024, May 14). AI is poised to drive 160% increase in data center power demand.
16. EPRI. (2024, May). Power Intelligence: Analyzing Artificial Intelligence and Data Center Energy Consumption.
17. Ibid.
18. Goldman Sachs. (2024, May 14). AI is poised to drive 160% increase in data center power demand.
19. Dominion Energy. (2024, May 2). Q1 2024 Earnings Call [Presentation].
20. Power Grid International. (2024, October 21). Dominion Energy powers 'Data Center Alley.' Here's how they feel about surging demand.
21. Heatmap. (2024, November 20). Georgia Just Released Eye-Popping New Energy Demand Estimates.
22. Georgia Power. (2024). 2024 Facts & Figures. Data as of December 31, 2023.
23. U.S. Energy Information Administration (EIA). (2024, October). Electric Power Monthly: Table D.1. U.S. Estimated Consumption of Electricity by Light-Duty Vehicles Types, 2018 – September 2024.
24. EVBox. (n.d.). How much electricity does an electric car use?. Accessed December 5, 2024.
25. Rho Motion. (2024, October). Q3 2024 EV & Battery Quarterly Outlook.
26. Rystad Energy. (2024, June 24). Data centers and EV expansion create around 300 TWh increase in US electricity demand by 2030.
27. IndustryWeek. (2024, March 12). The Success of US Chip Manufacturing Hinges on Our Electric Grid.
28. Ibid.
29. American Clean Power. (n.d.). Clean Energy Investing in America. Accessed on December 12, 2024.
30. U.S. Energy Information Administration (EIA). (n.d.). Use of energy explained. Data Last Updated July 13, 2023.
31. Center for Strategic & International Studies. (2024, October 28). Powering the Commanding Heights: The Strategic Context of Emergent U.S. Electricity Demand Growth.
32. Utility Dive. (2024, April 17). Georgia Power receives approval to add 1.4GW of natural gas generation.
33. Dominion Energy. (2024, October 15). Dominion Energy Virginia releases comprehensive long-term plan to meet growing power demand with reliable, affordable and increasingly clean electricity.
34. Lazard. (2024, June). Levelized Cost of Energy+ (LCOE+) June 2024.



35. BloombergNEF. (2024, February 13). Corporate Clean Power Buying Grew 12% to New Record in 2023, According to BloombergNEF.
36. Recharge. (2024, October 24). 'Urgent need': NextEra 10GW deals among largest in US clean power history.
37. NextEra. (2024, October 23). Third Quarter 2024 Earnings Conference Call. [Presentation]
38. Observer. (2024, October 24). Big Tech Is Betting on Nuclear Energy to Fuel A.I. Ambitions – But There's One Problem.
39. Ibid.
40. International Energy Agency (IEA). (2023, October 17). Electricity Grids and Secure Energy Transitions.
41. Berkeley Lab. (2024, April 10). Grid connection backlog grows by 30% in 2023, dominated by requests for solar, wind, and energy storage.
42. Grid Strategies. (2024, December). Strategic Industries Surging: Driving US Power Demand.
43. Farhat, E., Savic, M., MacDonald, F., & Chediak, M. (2024, July 14). The World's Power Grids Are Failing as the Planet Warms. BloombergNEF.

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Carefully consider the fund's investment objectives, risks, and charges and expenses before investing. This and other information can be found in the fund's full or summary prospectuses, which may be obtained at globalxetfs.com. Please read the prospectus carefully before investing.

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