

## AI and Electricity demand

A common misconception is that Benjamin Franklin discovered electricity in 1751 during a thunderstorm when he flew a kite with a key attached. Historians among us might point out that Thales of Miletus first discovered static electricity in 500 B.C. by rubbing together amber and fur. However, the first human use of electricity predated Thales by almost 2000 years, when ancient Egyptians would touch electric catfish with a metal rod. The electric shock produced by the catfish, also known as the Thunders of the Nile, is believed to have been used as a therapeutic remedy for arthritis. These fish's specialized organs called electrocytes transmit proteins to move positive sodium and potassium ions out of the cell, building an electrical charge. Animals with these organs use an electric pulse to stun prey. It is a reminder that humans neither invented nor were the first to harness electricity for their purposes. Yet there is no denying that since humans learned to harness current electricity, it has become one of the most important innovations in modern society.

Electricity has become so central that the United States uses approximately 4 trillion kilowatt hours a year. Per person, that's 11,000 kilowatt hours annually with the largest demand coming from air conditioning.<sup>1</sup> Everything from stoves to cars, appliances and mechanical products is getting electrified. Electrification of products is key to a decarbonized economy because unlike other energy sources, (i.e. gasoline,) electricity can be produced in a non-carbon emitting way. Since 2000, total electricity usage in the United States has remained relatively flat due to increased efficiency and manufacturing offshoring. During the period of flat electricity demand, electricity production shifted away from fossil fuels. As a result, since 2017 the United States has experienced GDP growth *and* declining greenhouse gas emissions.<sup>2</sup>

This is largely due to the declining use of coal, one of the most greenhouse gas-emitting fuels, to produce electricity. In 2000, domestically, coal produced 50% of electricity; in 2023 it produced less than 20%. Since climate change is a global issue, it is worth noting that during that same period globally, coal used to produce electricity increased worldwide.<sup>3</sup> In the United States, electricity generated by coal has been replaced almost entirely by natural gas and renewables. Last year, the United States added 56.1 GW of new electricity capacity (largely to offset retiring facilities). Of that new capacity, all but 14% was from renewable sources, and 53% was from solar alone. Despite flat electricity demand, this shift has led to significant growth in utility-scale solar which has seen a 20% compounding growth rate over the past decade.

Redwood Grove remains compelled by the long-term growth prospects of both electricity demand and solar companies. Solar remains one of the cheapest sources of electricity, even with battery attachments (which evens out intermittent generation known as the “duck” curve). Electricity demand is also growing in the United States for the first time in decades. This new demand is driven in large part by mega-cap technology companies supportive of renewable electricity generation. Finally, the

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<sup>1</sup> <https://www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php>

<sup>2</sup> <https://www.c2es.org/content/u-s-emissions/#:~:text=Trends%20in%20U.S.%20Greenhouse%20Gas,Notes>

<sup>3</sup> <https://blogs.sas.com/content/graphicallyspeaking/2021/10/20/which-countries-consume-the-most-coal/>

market's concerns reflected in lower valuations, appear largely transitory, while long-term trends and tailwinds intact.

Solar should benefit from growing electrical demand. As recently as eighteen months ago electricity demand growth in the United States was forecasted to be 1% from 2022 to 2050<sup>4</sup> with economic growth continuing to be offset by greater efficiency. That outlook has changed dramatically in the last twelve months as utilities have seen a spike in demand driven by the onshoring of manufacturing and new artificial intelligence data centers. FERC, which collects data from grid planners, now forecasts electricity demand to grow 4.7% annually over the next five years.<sup>5</sup> This demand can be heard on utilities' quarterly calls. NextEra Energy, one of the five largest utility companies in the United States, said on their annual investor day, "Power's prospects for growth going forward look really, really strong. Power demand has been flat for decades, but that's clearly changing. Our growth opportunity set is now two-fold. It's building new renewables to replace higher costs, less efficient generation, and to meet growing power demand. At [Florida Power and Light] and NextEra Energy Resources, renewables and storage are the low-cost option to customers, creating long-term growth opportunities for both businesses... The potential opportunity is big. Forecasts are projecting a tripling in renewables growth over the next seven years compared to what we've seen over the prior seven." This increased electricity demand, driven by artificial intelligence, is why Redwood Grove is invested in Portland General, a utility company in Oregon. In addition to having some of the most aggressive clean energy goals in the nation, Portland General service area has four major trans-pacific fiber cables which makes it a particularly compelling location for data centers.

This demand is being felt at the state level as well. States' economic development groups competing for industries of the future, like artificial intelligence, cloud computing, and advanced manufacturing, find that being able to deliver their high electricity requirements is the differentiator for new businesses to move to their state. Artificial intelligence's insatiable demand for electricity has been discussed widely. For instance, ChatGPT search uses 10x the electricity of a traditional Google search. Data center demand is expected to grow 160% over the next five years.<sup>6</sup> More data centers create demand for HDD and NAND memory storage which is a reason for our investment in Western Digital, the only manufacturer of both HDD and NAND drives.

While this is putting pressure on utilities, many of the companies adding data centers have clean energy goals. Utilities cannot just meet the demand with fossil fuel generation. Microsoft, Alphabet, Amazon, and Facebook, four of the largest AI and cloud computing companies, have some of the most aggressive net zero commitments. The increased electricity demand, lower cost production from renewables and net zero goals of the largest purchasers is all driving demand for solar. Even before the increased growth outlook utility-scale solar was growing 20% year-over-year. So why are many utility-scale solar companies trading at half the valuation of the market given the strong growth backdrop?

There has been a stack of short-term concerns for solar growth. First, rising rates made new renewable projects more expensive to develop. Second, interconnection backlogs were slowing the ability of constructed projects to go online. Third, pending tariff and antidumping rulings may threaten the supply of imported solar panels. And now, the increased probability of a presidential administration hostile to

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<sup>4</sup> <https://www.eia.gov/energyexplained/electricity/use-of-electricity.php>

<sup>5</sup> <https://www.utilitydive.com/news/electricity-load-growing-twice-as-fast-as-expected-Grid-Strategies-report/702366/>

<sup>6</sup> <https://www.goldmansachs.com/intelligence/pages/AI-poised-to-drive-160-increase-in-power-demand.html>

renewable energy casts a shadow over the long-term prospects of renewable energy. While headlining grabbing, these concerns have caused investors to lose the forest through the trees.

Rates have already been largely absorbed by the solar market through higher purchase prices and lower cost of panels. Interconnections are a priority for FERC which has established a new expedited procedure to handle the backlog to go into effect later this year. Changing solar tariffs are nothing new for the solar industry. Developers have reported an 18-month stockpile of panels in anticipation of a disruption, which historically has been ample time for supply chains to adjust to new tariffs.

Finally, the election. The unprecedented series of events to date has made forecasting a challenge. However, we have a reasonable proxy for a Trump administration in his prior four years. Despite being supportive of coal among other fossil fuels, from 2016-2020 coal usage as a percentage of electricity mix declined faster than it had in Obama's last term and twice as fast as it did under the Biden administration. The reason is that solar is about 30% cheaper than coal to produce a kilowatt of electricity. Conversely, solar deployment (and solar stock prices) increased under the Trump administration, largely due to lower interest rates and rising demand. In other words, the presidential election is a factor but it is not likely to be the determinative one.

Redwood Grove remains invested in renewable energy stocks like Array Technologies, Shoals Technologies, and NextEra Energy Partners all of which we believe will benefit from long-term increasing electricity demand, a continued shift to solar power, and the companies' valuations returning to their historical levels.

## Closing Thoughts

Redwood Grove's third quarter 2022 letter discussed the underinvestment and fragility of the US electrical grid. Growing electrical demand coupled with more frequent and severe climate-related disasters assures stress on the electrical grid and an increasing number of power outages. Power outages have significant economic risks that when realized impact certain equity valuations. Redwood Grove has found that market valuations and sell side analysts do not yet account for this long-term trend, instead using historical averages, underweighting power outages' growing probability.

So Redwood Grove was not surprised that as forecast this hurricane season started with a bang, or more accurately a Beryl. The storm was the earliest category five hurricane on record fueled by historically warm waters in the Atlantic. Luckily it reduced to a category one when it hit Houston. Still the local utility lost power for 2.3 million of its 2.6 million customers. Disasters like these have pushed underprepared utilities including PG&E and Hawaiian Electric to bankruptcy or near bankruptcy.

The subsequent demand for power generators in Houston was so high that the Harris County deputy sheriff was posted at Home Depot after they received a new shipment.<sup>7</sup> Generac, a portfolio holding, is the largest manufacturer of generators in the US with about 80% market share. The stock valuation had declined, attracting our attention and investment after a year of unusually low power outages. These power outages lead to increased demand for generators. Redwood Grove believes that this trend remains under-appreciated and will continue to provide a demand tailwind for Generac in the years to come.

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<sup>7</sup> <https://www.nytimes.com/2024/07/11/us/houston-beryl-power-generators.html>

We live in a world where the physical impacts of climate change are more apparent with each passing day. We believe the markets need to catch up in assessing this risk. In the meantime, this creates an opportunity for Redwood Grove and climate-focused investors to help their clients craft portfolios that avoid climate risk and allocate capital to companies that will accelerate the decline of emissions. We remain grateful for your continued trust in our team.

With gratitude,

*Red* *Grove*



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