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Market Outlook: The Addition Economy

Adam Bernstein, ESG/Impact Analyst
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Meeting the Markets Where They Are

Over the past few years, many people in the investing world have been talking about what is sometimes referred to as a **transition economy.** This is where a country or region looks to undergo a comprehensive shift from relying on traditional fossil fuel systems to more renewable forms of energy. The implications of a transition economy may also involve broader economic changes, including investments in new technologies, changing industrial / manufacturing practices, and broader regulatory and social adjustments.

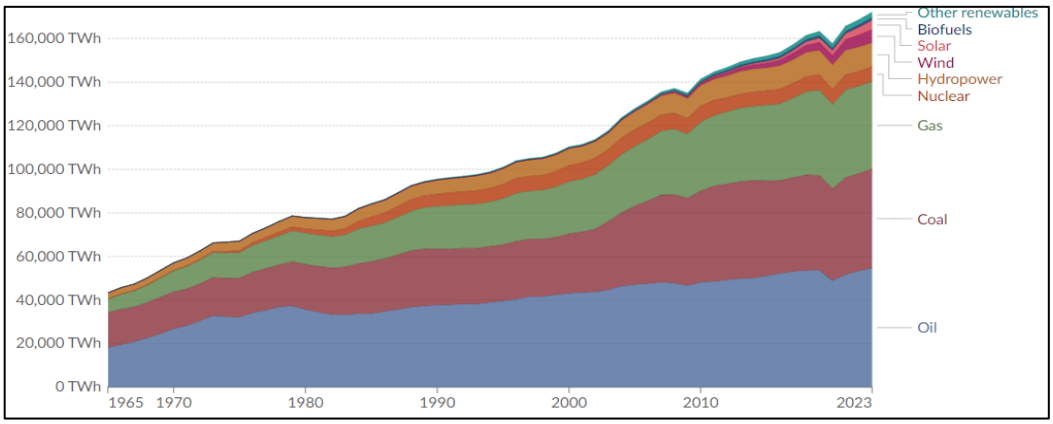
Yet, we feel that what has unfolded over the past several years more closely resembles what we would call an **addition economy.** This is a scenario where, despite the increasing integration of renewable energy sources, overall energy demand has continued to rise, in part due to such factors as new technologies and changing consumer and industrial behaviors.

So, while interest in renewable energy sources like wind and solar is accelerating, as total energy consumption grows, the global energy system's dependency on fossil fuels isn't decreasing proportionately. Fossil fuels still account for a large share of the global energy mix due to the expanding overall energy demand driven by economic growth, AI, EV adoption, and increased electrification.

We feel that it is important for investors to have a meaningful dialogue about what this means for the market and how we translate it into our investments because it has real asset allocation implications.

It is important to recognize that our energy system has always been in a state of addition, with each new energy source building on the previous. In the graph below, you'll notice we have not transitioned off any primary energy source in our history, but rather have only added new sources of primary energy.

Global Primary Energy Consumption by Source



Source: https://ourworldindata.org/energy-mix. 1/1/2024

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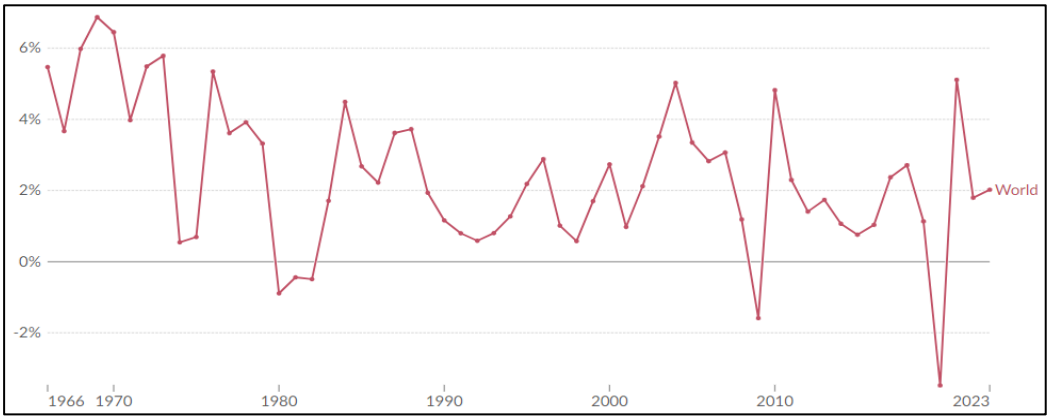
Our energy system has none the less undergone significant changes since the Industrial Revolution, reflecting our evolving energy needs. A century ago, our energy sources were largely homogeneous, but over time, they have diversified to encompass coal, oil, natural gas, nuclear power, hydropower, solar energy, wind power, and biofuels. Before the 19th century, traditional biomass such as wood, crop residues, and charcoal dominated global energy use. The Industrial Revolution marked the ascendancy of coal, followed by the introduction of oil and natural gas. By the early 20th century, hydropower emerged as a significant energy source, with nuclear energy joining the mix in the 1960s. The emergence of "modern renewables" such as solar and wind power occurred later, beginning in the 1980s.

Demand for energy has grown at a steady rate across many countries, as people get richer, and populations increase by ~2% annually since 1966. If this increased demand is not offset by improvements in energy efficiency, then our global energy consumption will continue to grow year-over-year in perpetuity.

Annual Change in Primary Energy Consumption



Source: U.S. Energy Information Administration (2023); Energy Institute. Ourworldindata.org/energy

The chart above illustrates the annual percentage change in global energy use. Whenever the red line is above the zero-percentage line, it means that energy demand is growing. Over the past half-century, global energy consumption has consistently increased almost every year, the only exceptions occurring in the early 1980s and 2009 following financial crises, and in 2020 during the COVID lockdowns.

We have historically experienced a gradual and modest increase in energy demand over time, and this demand has been effectively managed by the current system, avoiding undue stress on energy affordability, reliability, and resilience, but the demand equation and the strain on the grid is shifting. **In the US, consumer and industrial trends are substantially accelerating energy demand for the first time in decades**, reinforcing our need for more primary energy sources and efficiency gains. Artificial intelligence (A.I.) operates at a high and constant energy intensity, demanding considerably higher power consumption than typical cloud-computing operations. As a result, energy consumption by companies such as Meta, Amazon, Microsoft, and Google have tripled since 2018. Projections suggest that by 2030, the energy requirements of data centers alone could triple, accounting for 3% of global demand; however, this figure could escalate to 5% without substantial efficiency enhancements.

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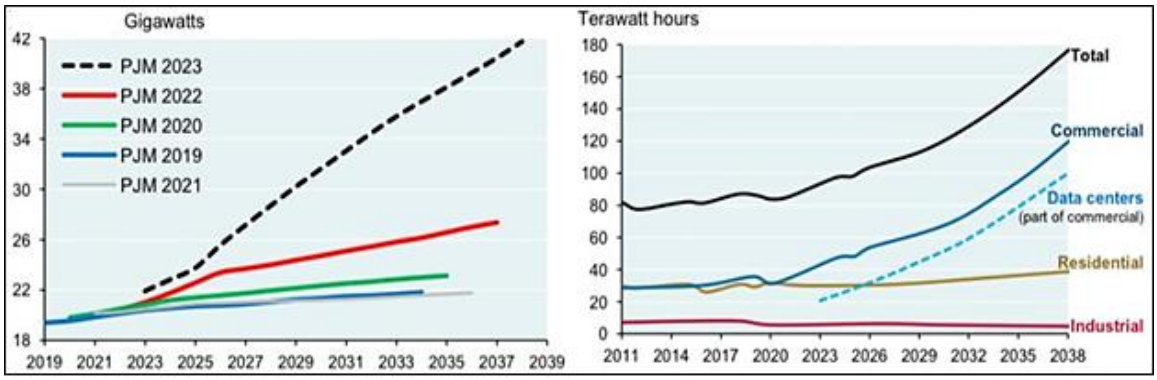
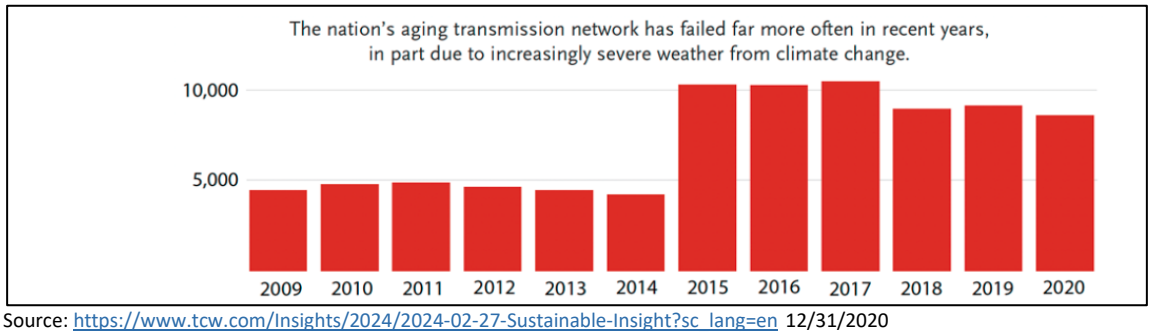
PJM Progression of Power Demand Forecasts for Dominion Resources



Source: PJM 2023 Power Demand Outlook, January 28, 2024. Dominion Resources Integrated Resource Plan, January 28, 2024

A.I. isn't the only reason for elevated energy demand and an energy grid upgrade. Investment in American manufacturing has surged to a 50-year high, driven by new federal tax incentives and legislation aimed at boosting domestic supply chains, microprocessors, and clean technology production. Simultaneously, millions of Americans are adopting electric vehicles and installing electric heat pumps in their homes. Temperatures are at record levels, intensified by global warming, which causes a spike in air conditioning use. **This combination of increased domestic manufacturing, residential and industrial electrification, and higher cooling demands has raised concerns about whether the electrical grid can keep up with the growing energy needs.**

U.S. Power Outages, 2009-2020



Source: https://www.tcw.com/Insights/2024/2024-02-27-Sustainable-Insight?sc_lang=en 12/31/2020

Since 1975, we have not found more oil or gas than we use on an annual basis. Today we are only finding 15-20% of what we use annually. We have been drawing down our reserves as a result, but demand is continuing to go up. In any place where we are producing oil, the amount we are producing is dropping. We have already depleted the best oil fields and this accelerating depletion math gets worse as we go to lesser fields. The charts below show you the drop off in production for oil and gas wells over time in different geographies.

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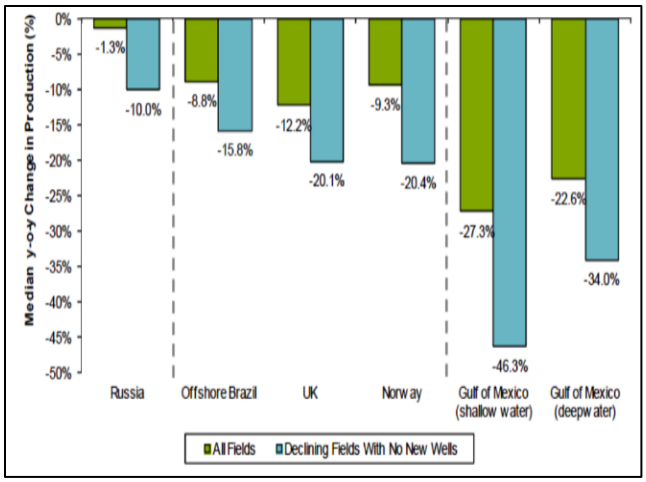
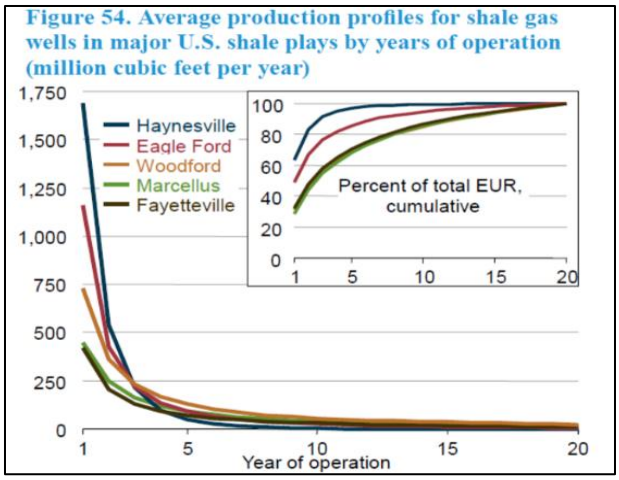
1-year declines in oil well production



Yearly declines in gas well production



Source: Russian Oil Ministry, ANP, HIS, BOEM, DECC, NPD, corporate reports and Bernstein analysis 12/31/23

Geology imposes natural limits, and in this case, nature is outpacing scientific advancements. Well productivity saw a boost of 12-13% annually from 2014 to 2017 due to innovative extraction techniques. However, recent data indicates that average well performance has plateaued and even declined in certain basins. Notably, the top-performing wells in four major shale oil basins have shown a significant drop in efficiency. Specifically, 12-month cumulative oil production per lateral foot for the best wells declined by 10-18% between 2017 and 2022. Average productivity did slightly increase in some basins, thanks to the industry drilling less poor-quality wells, but the sharp declines in the top wells suggest that resource depletion is accelerating.[1]

Change in 12-month Oil Cumulative Productivity per Lateral Foot: 2017-2022

	Midland	Delaware	Bakken	Eagle Ford
Top Decile	-10%	-12%	-12%	-18%
Average	+4%	-17%	+2%	-2%

Source: Sailing stone Capital Partners, 1Q23

With ongoing reserve revisions and declining well performance, it's evident that US shale is facing significant challenges. This is crucial because, prior to the pandemic, US shale oil was the primary driver of global oil demand growth and was largely responsible for new reserve additions globally. More than any other commodity, we believe oil shapes inflation and inflation expectations, and without the wall of US Shale supply to keep prices in check above certain price thresholds, surges in demand could be more inflationary than in the past decade.

Another way to assess the deterioration in traditional hydrocarbon supply and understand the shift in the energy mix is to understand the Energy Return on Energy Invested or "EROEI." Essentially, EROEI measures how much net or consumable energy a specific energy source produces, making it an effective indicator of efficiency. For over 200+ years, the EROEI has steadily risen, but in the past decade or so, EROEI has begun to decline. This is primarily because the most accessible and economically viable resources are usually exploited first. This trend is also inflationary for commodity inputs to our energy system because we will need more inputs to yield less return on energy invested in the future. **One thing is crystal clear, we need more**

[1] Sailing stone Q1 2023 commentary, pg. 7-8

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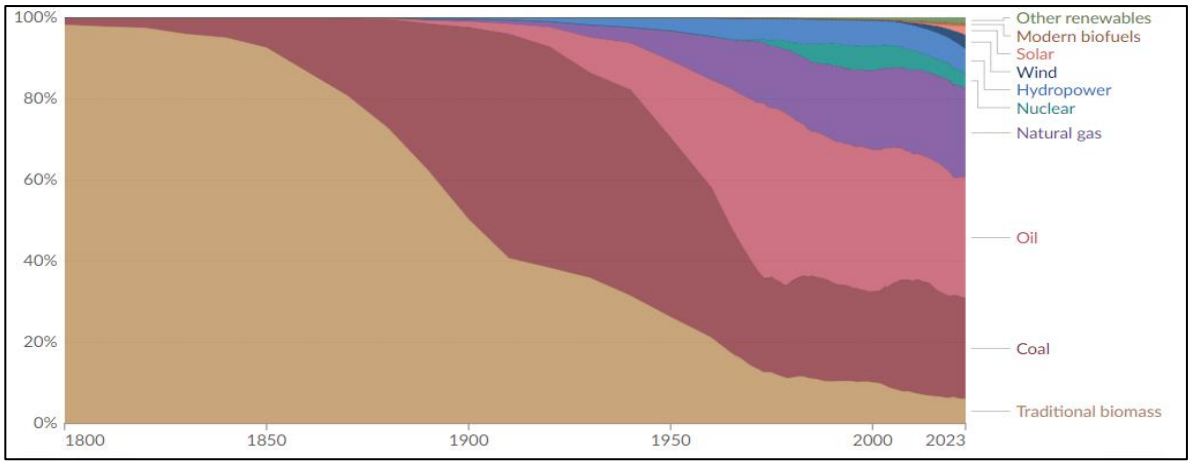
primary energy sources, particularly as a growing share of these sources may exhibit lower or declining efficiency.

As shown in the chart below, renewable energy as of 2024 still only makes up ~20% of global primary energy consumption despite most new capacity being added to the grid are renewables.

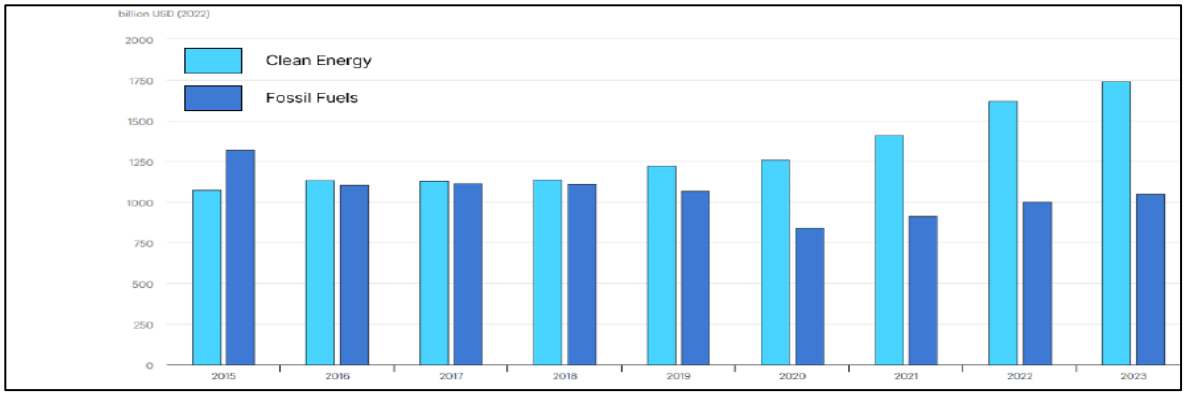
Global Primary Energy Consumption by Source



Source: OurWorldInData.org/Energy 12/31/2023

While overall investment has shifted substantially in support of energy transitions, the same cannot yet be said for investment in fuel supply. Demand for fossil fuels remains robust as the world emerges from a period of turbulence caused first by the Covid-19 pandemic and then by Russia's invasion of Ukraine.[2] Energy supply investment is a good predictor of future capacity expansion. As you can see from the chart below, traditional energy investment is still rising, although slower than renewable energy investments.

Global Investment in Clean Energy and Fossil Fuels



Source: IEA World Energy Investment 2024

In 2024, the U.S. plans to add 62.8 gigawatts of new electric-generating capacity to the grid, with 81% coming from solar and battery storage. **But despite renewables being a larger percentage of new additions, the absolute increase in traditional energy output is still higher** because

[2] IEA World Energy Investment 2024 Pg 88

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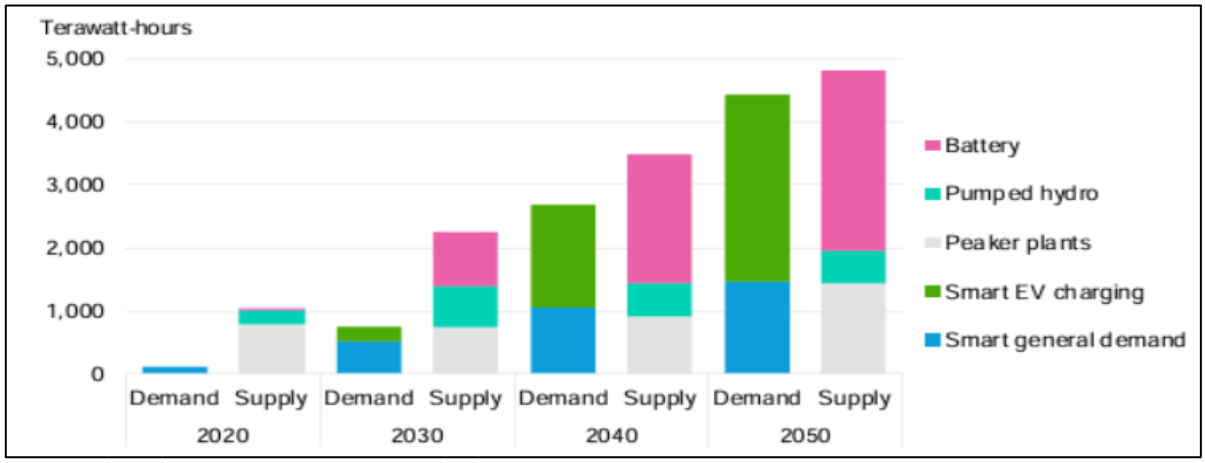
traditional energy has a much larger base, so even if its growing slower, it results in a higher total capacity expansion from traditional hydrocarbons.

Of the net new expansion planned for hydrocarbons, natural gas-fired power plants are what are being added at an accelerating clip. The intermittent nature of solar and wind energy, along with current battery storage limitations, necessitates "firming" renewables to ensure a consistent electricity supply. This involves using backup power plants, like gas peaker plants, which can quickly adjust output to support renewable energy fluctuations, maintaining grid stability, as shown in the chart below. This need to build redundant infrastructure is expensive and opens the door to why many investors and regulators are excited about the advancements in nuclear energy, which is considered to have a much higher energy density and capacity factor, meaning it will not require the same redundant infrastructure as renewables.

Power System Flexibility Sources, Economic Transition Scenario



Source: BloombergNEF New Energy Outlook 2024 Page 5

As we work to reduce global emissions, energy demand is expected to increase due to the declining efficiency (EROEI) of primary energy sources. Over the past 60 years, energy demand has grown by approximately 2% annually. Transitioning to 100% renewables would require an annual increase of about 4%, given their lower EROEI.[3] The International Energy Agency's (IEA) net zero pathway projects a 15% reduction in energy demand by 2050, which seems unrealistic compared to historical trends.[4] **Despite assumptions that energy demand will decrease, the reality is that future demand will rise as we strive to reduce emissions. We believe relying solely on renewables is ideal but impractical. A viable energy mix must include various sources, including low-emission hydrocarbons.**

It is also worth noting where the oil supermajors stand within the transition theme. ExxonMobil's recent acquisition of shale producer Pioneer Natural Resources and Chevron's deal to absorb Hess mark the largest consolidations within the U.S. oil industry in two decades. These moves are aimed at securing their market position and preparing to meet continued oil demand well into the mid-century by focusing on low-cost production. Despite the shift towards renewables, corporates clearly remain hesitant to diversify extensively into clean energy due to the lower returns compared to oil. Instead, they are exploring investments in sectors like lithium

[3] Sailing stone Q1 2023 commentary, pg. 7-8
[4] Sailing stone Q1 2023 commentary, pg. 7-8

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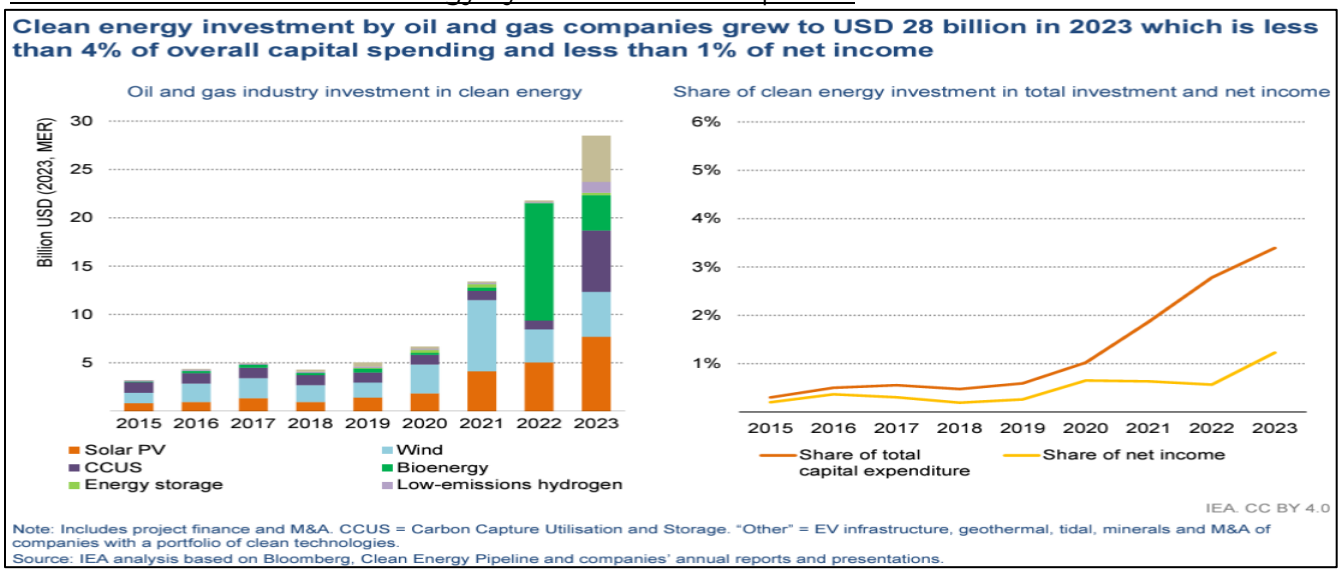
production for electric vehicles. For example, ExxonMobil plans to become a major lithium supplier by 2027, producing enough to support one million electric vehicles annually by 2030. Another way these oil giants might look to play on the energy transition is to invest in heavy metal mining, a business that has a more similar risk/return profile to their core business. This strategy highlights a cautious approach to the energy transition by the supermajors, based on the realities of our transitional so far. It is important to note that **consolidations do not guarantee faith in the growth of an industry. In our opinion, true confidence lies in investing in a sector's riskier markets. Limited appetite in traditional oil and gas is evident, even among those predicting prolonged oil demand**.[5,6]

Investment in Renewable Energy by Oil and Gas Companies



Source: IEA World Energy Investment 2024

The energy sector has seen significant changes in recent years, creating new investment opportunities that warrant reconsideration by investors. Despite the substantial increase in revenues and profits during the 2021-2022 price spikes, this did not translate into a similar rise in new capital expenditures. Instead, a larger portion of these profits was used for dividends, share buybacks, and net debt repayment. For instance, in 2023, oil and gas companies increased their dividends by around 30%, with less than half of their cash flow going towards capital expenditures for the second consecutive year. There was a notable trend towards consolidation in 2023, with many large M&A deals, especially in the US shale sector, reflecting efforts to streamline operations in specific basins and boost production levels in traditional energy supply. Big oil seems to be wrestling with marketing a declining product, but striving to be among the last standing. Anticipating reduced demand, they are focusing on being low-cost providers, making these deals viable even in a shrinking market. There is such a thing in commodities as a production cost curve; where if the cost of production is low enough, the risk is minimal. **In the current reality where redundant gas infrastructure is needed to support renewables, we believe investors will be hard pressed to not have exposure to the companies supplying the natural gas, throwing cold water on energy divestment campaigns.** Overall, the shifting

[5] https://www.ft.com/content/02fb0da4-a834-4ac5-80f0-a0107596bd37
[6] https://www.bloomberg.com/news/articles/2023-11-13/exxon-aims-to-become-a-leading-lithium-supplier-for-evs-by-2030#xj4y7vzkg

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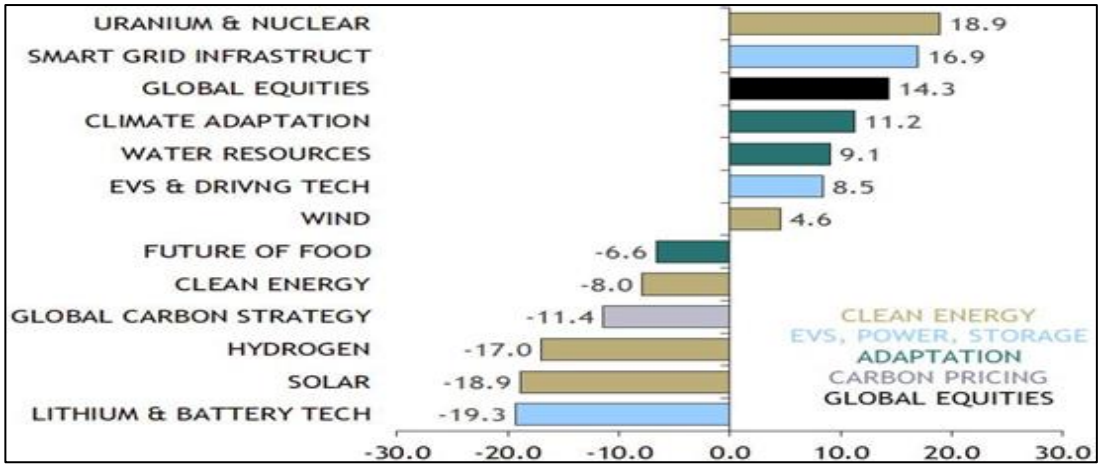
dynamics of the energy industry, marked by increased importance of commodities, growth in renewable energy generation, consistent demand, and higher returns to investors, highlight the need to reassess investment opportunities in this sector.[7]

At this point, we've talked about the transition economy, and the addition economy. **To tie this conversation together, I wanted to highlight some of the asset allocation ramifications and investment insights for these trends.** The chart below tracks the year-to-date performance of various climate change-related Exchange Traded Funds (ETFs), which consist of stocks targeting specific themes or indices, in order to gage what investors are telling us about the state of our energy transition.

YTD Total Return Performance of Climate ETFs



Source: ASRLtd, LSEG Datastream, Michael Penn. Data as of 7.12.24.

There is significant variability in climate change investments. Nuclear energy has risen by 19%, while lithium and battery technology have dropped by 19%, showing a no one-size-fits-all strategy. Different segments perform differently: nuclear and wind energy have outpaced hydrogen and solar. Surprisingly, wind energy stocks have outperformed solar stocks. Companies focused on climate adaptation, like pollution control and monitoring, have outperformed those in clean energy, indicating market concern over physical climate risks.

These observations help shed light on investor sentiment and the complex nature of climate change investment strategies. Being able to pace the actual path of transition is vital when investing in climate strategies. An investor who thought renewables were the only way to achieve net zero might have invested heavily in wind and solar, only to have had a horrible experience over the past few years, and ignoring the realities of economic growth and renewable hardening. Or an investor convinced that a higher price on carbon is the only way to align our world with the Paris Agreement might have invested in carbon futures, only to have been disappointed in the failings in those markets as the world shifted towards energy independence in the wake of the Russia-Ukraine War. **It's important to separate personal and institutional biases, favoring desired outcomes rather than fully considering the complexities of transitioning to a lower-carbon economy.** A pragmatic investor utilizing evidence-based

[7] IEA World Energy Investment 2024 Pg 88-126

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investment principals would have been able to identify and invest in a handful of profitable climate themes, such as:

Grid energy efficiency enabling companies, who thanks to the explosion in energy demand, have handily outperformed QQQ since 2020. An equal weight portfolio of 36 companies complied by Bloomberg's climate team aimed at improving energy efficiency outperformed the S&P 500 by a cumulative 71% from the beginning of 2020 through the end of this quarter with superior risk-adjusted returns.[8] Over the same period the portfolio also outperformed QQQ by 21%. This efficiency portfolio was able to achieve these results while having only a ~9% allocation to Nvidia, Microsoft, Apple, Broadcom, Alphabet, Meta, and Tesla, a basket that accounted for ~70% of QQQs total return over the period, making energy efficiency a great complementary theme to a more traditional technology allocation.[9]

Utilities are one of the best performing sectors of S&P this year. Seeing utilities outperform like this might make some investors nervous. Typically, when defensive sectors like utilities are in the lead, the rest of the market isn't doing so well. A recent stretch of mixed economic data has raised concerns about a potential slide into stagflation. The reality of what is driving the utilities rally has little to do with the health of the overall economy. Instead, the sector has emerged as the latest beneficiary of the energy transition and the artificial-intelligence craze. Data center expansion will require more power, and investors believe that utility stocks, particularly those focused on clean energy and nuclear power, will benefit from this expected surge in demand.

A lesser talked about component of the utility-energy demand-AI story is demand for water and subsequently the opportunity for water utilities. The typical data center uses about 3-5 million gallons of water per day, the same amount of daily water consumption as a city of 30,000-50,000 people.

Climate resiliency is another compelling investment theme that has performed well this year. It has been shown that the two major weaknesses of the US grid system are efficiency and resilience (to peak demand surges but also to climate events and extreme heat). For example solar panels, batteries, and power grids lose efficiency through heat, and it's estimated that grid technologies experiences "load shedding" of 0.1-0.5% loss in power per 1-degree Celsius increase. Planned outages due to heightened fire risk caused California utility provider PG&E to go bankrupt. As the climate continues to change and the world gets hotter, climate resiliency investments will continue to outperform (think hurricane glass companies for more frequent and severe storms, lake dredging and flood protection companies for more extreme rainfall, and air conditioning companies for warmer areas with poor air conditioning penetration rates). Climate resiliency only represents 7.4% of climate funds broadly, versus 90.1% for mitigation (2.5% multiple objectives), highlighting the increased investment required for climate resiliency.[10]

Many investors also remain underinvested in **commodities and natural resources** due to a lack of understanding of the energy transition, despite evidence showing the effectiveness of commodities and natural resource equities in safeguarding portfolios against inflation. If commitments to net zero are genuine and the energy transition proves to be inflationary, as the

[8] Bloomberg PORT. Function, as of 6.30.24
[9] Bloomberg PORT Function, as of 6.30.24
[10] Wellington Climate Adaptation Q2 2024 Strategy Deck page 4

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data suggests, investors will likely need to reassess their allocations to this sector. The massive amount of capital required to achieve grid stability to accommodate accelerating renewable penetration rates is inflationary. The faster the world deploys renewables the more expensive energy gets. There is a direct and linear correlation between renewable penetration rates and retail power prices, and rising tensions related to critical mineral supply chains amplify the underlying inflationary pressures.

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