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Michael Jin, CFA
Managing Director,
Research Analyst,
TD Epoch

Thoughts on the Energy Transition and Shareholder Yield

The push to transition away from a reliance on carbon-intensive sources of energy has accelerated meaningfully in recent years, with the topic taking a prominent position in political discourse, economic forecasts and technological research and development. The next several decades will see a significant reduction in the use of coal, oil and natural gas, a surge in the use of renewables, a renaissance of nuclear energy, and an "industrial revolution" of many manufacturing and production processes that are carbon intensive. This secular shift will affect nearly every corner of global markets to some degree. Thus, understanding its drivers and impacts is essential to forming a long-term investment outlook. We believe the primary factors that will determine both the trajectory of the energy transition over time as well as the ultimate energy mix will be technology, economics, energy security, policies and regulations, and several disruptive known unknowns. In this paper we'll discuss how these factors will influence the energy transition going forward and highlight some of the investment implications for the sectors we view as most tied to this multi-decade process: energy, utilities, and materials.

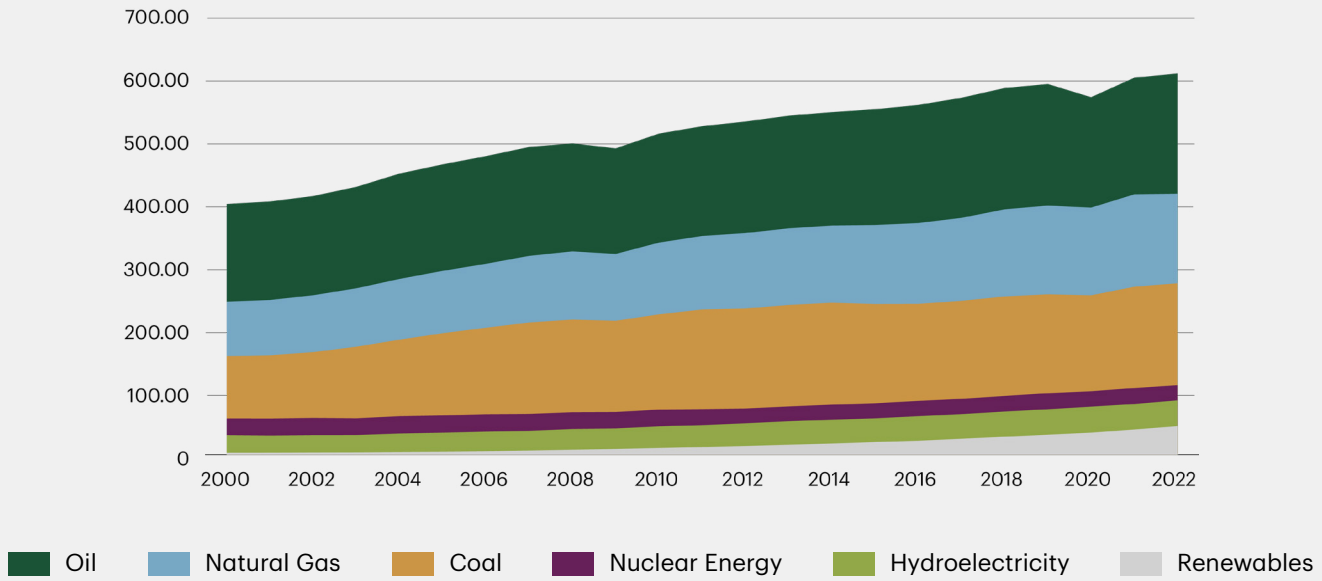
Current State of Energy Transition

Climate change concerns have been the primary driver of the energy transition (ET) efforts, with the end objective being a reduction in carbon emissions significant enough to decrease average global warming to two degrees Celsius or less by the year 2100. While the world has made some progress in recent years, the global energy consumption mix is still heavily tilted to carbon-emitting hydrocarbon sources, namely oil, coal and natural gas. **Figure 1** shows that around 80% of energy consumption still comes from these hydrocarbons, with non-carbon emitting sources, such as hydroelectricity, nuclear energy and renewables accounting for the other 20%.

As alternatives to hydrocarbon sources continue to take share of global production, the picture painted in **Figure 1** is likely to look very different decades from now. While predictions from various agencies and institutions differ in specific numbers and assumptions, they all qualitatively point to a much lower hydrocarbon mix and a much greater contribution from renewables and nuclear energy by 2050. Though this midcentury milestone is the year by which many countries and corporations have set their net-zero targets, there is little doubt that the energy transition will be far from "complete" by then.

Our expectation is that coal is most likely to be replaced first as it has the highest carbon intensity, which is defined as the amount of carbon emissions generated per unit of energy consumed. Natural gas is likely to linger around the longest as it has the lightest carbon intensity among the three hydrocarbons. Renewables and nuclear energy are expected to grow significantly to fill the gap, with renewables eventually representing the largest share of the future energy mix.

Figure 1 – Global Energy Consumption by Source



Source: BP Statistical Review of World Energy 2023

Factors Shaping the ET Trajectory

Predictions of future energy mix are made with many assumptions, some of which are highly uncertain. We believe the following factors are critical in making these predictions. The realization of these factors, at different points of time with varying magnitudes, most of which are unknowable today, will shape the trajectory of energy transition in the coming decades and determine the eventual energy mix equilibrium.

Technologies

First and foremost is the availability of technologies in several areas: the production and storage of new energies; the elimination of scope 1, 2 and 3 emissions; and the removal of carbon dioxide from the atmosphere.

On the production of new energies, solar and wind technologies have matured and achieved "grid parity," meaning they are as competitive as the traditional power generation methods, if not more competitive. The renewables are expected to grow and dominate energy production in the coming decades. Another source of new energy is nuclear. Given how expensive it is to build a new nuclear power plant, the availability of small modular reactor (SMR) technology may become the true catalyst needed to start a nuclear renaissance. In addition to costs, mixed public opinion on the safety of nuclear energy production is another hurdle to broader adoption. When these issues are resolved, nuclear power could also become a significant part of future energy mix. Lastly, while hydroelectricity is a clean source of energy, it is not expected to grow meaningfully due to the limited availability of natural water supplies that are feasible for implementation. It will remain an integral part of total energy mix, albeit with its contribution mostly stable.

Energy storage is essential to complement the growth of intermittent renewables. For grid stability, batteries provide short-duration storage in hours and days. For seasonal differences in energy demand, such as winter heating, hydrogen is likely to be the better choice than battery to replace natural gas as the long-duration storage solution. Batteries are also central to the electrification of transportation. EV battery technology advancement, in energy density, charging time, and costs, is still a necessary condition for energy transition within the transportation industry.

The full elimination of scope 1, 2 and 3 emissions will essentially require another Industrial Revolution. This is simply because of the countless ways in which CO_2 is generated. To completely eliminate carbon emissions would basically require revolutionizing the industrial processes that we have been dependent on for decades or centuries. It is impossible to list all the technology advancements required here, as some of them are not even on the drawing board. The key takeaway is that, without vast technological advancement, we are unlikely to see the full elimination of scope 1, 2, and 3 emissions.

Lastly, the direct removal of carbon dioxide from the atmosphere is the ultimate contingency plan if the aforementioned goals are only partially achieved. The nascent solid or liquid direct air capture (DAC) approaches are based on known adsorption science and are energy intensive. Their deployment will depend on the availability of carbon-free energy and CO_2 storage, and possibly a functioning global carbon market. Technological advancement is being highly sought after, with X-Prize offering up to $100 million for as many as four promising carbon removal proposals.

Disruptive technologies could significantly alter the trajectory of energy transition. We will discuss them in the "known unknowns" section below.

Economics

The economics of energy transition are not just a function of the costs of current and future technologies, which are undeniably important, but also the costs of the legacy hydrocarbon energy sources being replaced. Traditional energy sources will remain competitors to new energies for decades to come and, as such, the prices of commodities such as oil, gas and coal will continue to play a central role in the speed of energy transition, conceivably slowing the process if declining demand lowers prices. Of course, of equal importance are the costs of commodities such as silicon, steel, copper, lithium, uranium, corn, and many others, which are used in ET technologies, and whose fluctuating prices will make adoption more or less feasible, inevitably influencing the trajectory of the energy transition. Understanding all the factors influencing the commodity prices is just as important as understanding the evolving economics of technologies.

Another wildcard is the cost of carbon dioxide, also known as carbon tax, which serves as a penalty on greenhouse gas emissions. When applicable through

a regional or global carbon market, it could become an important factor that can significantly shift the balance of power between the old and new energies.

Energy Security

The war in Ukraine has showcased the impact of geopolitical events on energy transition by highlighting another variable in the calculus: energy security. The uncertain gas flows through the Nord Stream pipelines prior to the explosion, the loss of flow after, and the resulting high prices of natural gas and electricity throughout the year, have made the European Union and other countries realize the importance of energy security. Coal plants and nuclear power plants were utilized as temporary solutions to secure energy supply. Liquified natural gas (LNG) regasification stations were built in haste. Luckily, Europe survived the winter at the mercy of the weather.

The long-run solution for the EU to be permanently free from Russian oil and gas is to build more locally sourced clean energies, namely renewables (solar and onshore/offshore wind) and maybe new nuclear. The rest of the world are thinking just the same.

With every country/bloc striving for energy security, the cost of energy transition becomes higher as each builds local redundancy to meet peak seasonal demand. Fragmented redundancy is simply less efficient and more expensive than a global redundancy. Yet, this seems to be inevitable. As governments set the next rounds of energy policies and regulations, security in energy supply has become an important factor of consideration.

Policies & Regulations

Governments are taking all of the above factors (technology, economics, energy security) into consideration when setting energy policies and regulations. For example, the U.S. Inflation Reduction Act (IRA), which authorized $391 billion in spendings on energy and climate change, focuses explicitly on these three factors. The IRA allocates funds to improve access to technologies such as carbon capture and sequestration, and hydrogen, reduce the cost of new energies by providing tax credits for solar, wind and nuclear, and build up domestic clean energy supply chain, for example, in solar panels and batteries.

An inflow of investments to the U.S. followed the passage of the IRA, and other countries took notice. For example, the European Union is considering setting up funds to counter the subsidies offered by the IRA so that global companies would consider moving production to Europe as well. It's reasonable to assume that other governments looking to attract capital to their economies will implement similar programs over time, generating a positive spiral effect globally and creating a tailwind for the energy transition.

As it will likely cost tens of trillions to hundreds of trillions of dollars over several decades to complete the decarbonization journey, there is certainly room for at least several IRA-sized policy packages from major economies around the world. Each one of them, just like the IRA, could profoundly impact the path of energy transition.

Known Unknowns

Each one of the aforementioned factors contains at least a few colossal hidden known unknowns that may have the potential to greatly alter the trajectory of energy transition, positively or negatively.

For example, positive known unknowns may include the commercialization of nuclear fusion (particularly after a major scientific breakthrough in late 2022), low-cost graphene batteries, and massive green policy announcements from major economies, all of which could greatly accelerate and improve the energy transition outcome.

Examples of negative known unknowns might include a major nuclear accident that could roll back public sentiment toward new projects, persistently high costs of energy transition metals such as Lithium, or a regional or proxy war involving major economies. Each could lead to a major delay or even a failure in reaching the energy transition goals.

While these known unknowns are not the base case of our investment scenario analysis, we certainly need to spend time monitoring and analyzing them due to their potential to disrupt the ET process.

In the following sections, we will illustrate the impact of energy transition on our investments by focusing our discussion specifically on three sectors – Energy, Utilities, and Materials.

ET Implications for the Energy Sector

The energy sector consists of companies involved in oil & gas exploration, production, transportation, and the refining & marketing of petroleum products.

In the long run, demand for oil & gas will become significantly less than what it is today. As such, oil & gas companies must eventually embrace the energy transition by developing and growing new sources of earnings to make up for the declines in legacy cash flows.

However, the near-term view is that both peak oil & peak gas are still years or decades away. Consequently, growth is still attainable, particularly for companies advantageously positioned in the right locations (e.g., Permian) and/or products (e.g., LNG). Most oil & gas companies still have time to define and execute on a transition strategy.

Facing this unavoidable path forward, most oil & gas companies are implementing rather similar strategies that involve keeping one foot in the legacy hydrocarbon value chain and putting another foot into the emerging new energy businesses. The new energy businesses are broadly defined as any energy-related operations that participate in the reduction of carbon emissions. These could include renewables power (i.e., solar and wind), biofuels, battery storage, hydrogen, carbon capture and sequestration and others. Companies are aiming to scale up the new energy businesses profitably so that cash flow will one day become substantial enough to more than replace the declines in oil & gas. The main differences among various strategies presented so far are (1) the types of new energy businesses to focus on (2) the speed of capital deployment into the new energy businesses, and (3) the pace of withdrawal from the old hydrocarbon value chain. As such, some companies appear to be more advanced in ET than others. However, the aggressiveness of a company's strategy is largely a function of its location and how much support it gets from regional policies and regulations. Therefore, a step change in policies in one geography (for example, the passage of Inflation Reduction Act in the U.S. in 2022) could help laggards to leapfrog leaders. As more energy transition policies are to be unveiled in the coming years, it is unwise to pick the eventual winners based solely on currently known policies and regulations or a company's current transition strategy.

With that in mind, the Shareholder Yield strategies remain actively invested in the energy sector, focusing on companies with strong balance sheets that allow them to manage the cash flow volatilities from the energy transition and the cyclicality of the sector. We prefer companies with exposure to regions with production growth. For example, we own a major oil & gas company whose production growth in the Permian leads to higher cash flow. We also own several midstream companies that are benefiting from the growth in U.S. shale production, which translates into higher volumes through their pipelines, storage sites, and other midstream facilities. These companies generate stable cash flows from mostly fee-based sources that allow them to pay attractive and growing dividends.

Furthermore, we look for companies that can generate sustainable cash flow to comfortably cover their dividend so that excess cash flows are available to invest in the new energy businesses. A good example of this is a large French integrated energy and petroleum company that we hold in the Shareholder Yield strategies. First, we believe peak gas lies further in the future than peak oil, with LNG likely to be in high demand for Europe and Asia for decades to come. The company's leading market position in LNG should produce a strong source of

cash flow to support its ET investments. Second, the company's strategy of developing a global electricity supply business from a portfolio of wind and solar projects (in the order of tens of gigawatts) should eventually generate substantial cash flow to offset future declines in oil & gas.

ET Implications for the Utilities Sector

In the long run, as stated above, renewables and nuclear are expected to become the dominant contributors to energy supply. While some view this shift as a challenge for the utilities sector, we believe the energy transition will fuel a secular tailwind for regulated utility companies for the following reasons.

First, significant growth in renewables is already taking place as of now. Utility companies are getting approvals from regulators to build solar and wind farms and add them into their rate bases, which in turn drives earnings and cash flow growth. Tax credits provided by the U.S. IRA have made renewables projects even more attractive. This is still the beginning as decades of renewables growth are needed to change the energy mix.

Second, while not quite matching the present rate of growth in renewables, nuclear power is also gaining traction, as IRA tax credits for both existing and new nuclear power plants spur further investment into the industry. We believe we are on the precipice of a global nuclear renaissance that will continue to accelerate in the coming decades. Utility companies, as the natural owners and operators of the nuclear power plants, will benefit greatly from this continued expansion.

Third, as is evident in the rapidly growing EV segment, the mass electrification of the transportation system will lead to much higher demand for electricity over time. The electrification of the industrial/manufacturing processes will add incremental demand as well. Utilities will have to supersize their generation, transmission, and distribution capacities to accommodate the growing demand for electricity, and the buildout of the infrastructure required to meet heightened demand will see enormous capital injections into the sector. A great portion of this capital will end up in the rate bases, generating even more earnings and cash flow growth for the utility companies.

Gas utilities, though perhaps not experiencing a direct tailwind effect from ET, remain good investments today as demand is still growing and peak gas is further ahead than peak oil. Coal-to-gas switching continues to be a secular trend in emerging economies such as China and India. In the long run, gas infrastructures could also be repurposed to transport hydrogen.

It's important to distinguish between regulated and unregulated utilities when discussing implications for the sector from the energy transition. For Shareholder Yield, we look for companies that operate in constructive regulatory environments, where regulators understand the need to support the energy transition and provide attractive allowed returns to promote the buildout of infrastructure. We typically avoid unregulated utilities such as independent power producers (IPPs), as their environmental expenditures are generally not recoverable and generate little or no return.

An example of the type of utility we prefer is an American regulated electric utility company that generates strong cash flow growth not only from modernizing the transmission and distribution grid, but also from the investments in regulated renewables (solar and wind) that will be added to the rate bases and earn attractive allowed returns. The company is phasing out coal-fired generation, from 10% of total capacity in 2022 to 4% by 2028. To replace coal-fired generation and meet new demand from the electrification of transportation and industrial processes, it is looking to spend $8.6 billion or 22% of its total capex from 2023 to 2027 to bring over 5GW of solar, wind, and storage capacities online by 2027. The early part of the energy mix shift, from coal to renewables, has already been approved by the regulators, contributing to the underlying growth for the company. The energy transition has in fact become a tailwind for the company and many other utilities we own in Shareholder Yield.

ET Implications for the Materials Sector

The materials sector covers a broad spectrum of industries, and the implications of the energy transition vary greatly among these different subsectors. Mining companies that extract coal will be most affected, as coal is the only segment in the sector that directly connects to energy production. The next most affected group is comprised of energy transition "enablers," examples of which would be miners who extract certain metals and minerals and industrial gas companies. The third group consists of various companies that produce chemicals, construction materials, glass, paper, and packaging materials, who are indirectly impacted through the evolution of their manufacturing and production processes.

Of the primary current hydrocarbon energy sources, coal has the highest carbon intensity and, as stated earlier in this paper, we predict it will be the first to disappear in the long run. Renewables are replacing coal in power generation in developed countries, and a secular trend of coal-to-gas switching in emerging economies is also underway, further reducing demand. As a result, the Shareholder Yield strategies are generally staying away from the coal mining sector.

Apart from coal, companies in the materials sector do not produce any forms of energy. From an investment perspective, we separate these companies into two major groups.

"Enablers" of the energy transition are companies that have technologies or products that could positively contribute to the energy mix shift. One example is an industrial gas company that has decades of experience in the production, transporting, and storage of hydrogen. The hydrogen gas is colorless and odorless, which makes leak detection rather challenging. Its wide flammability range in air, which is between ~4% to ~75% by volume, requires stronger safety measures for handling. Hydrogen embrittlement of steel and other metals at various conditions leads to elevated infrastructure costs. The company's leading market position and decades of experience in grey hydrogen put it in an advantageous position for producing blue and green hydrogen and forming clean-hydrogen partnerships. The Shareholder Yield strategies are invested in one multinational chemicals company headquartered in Ireland, not only for its attractive industrial gas business model that generates strong cash flow to pay for dividends, buy back shares, and invest for growth, but also for its potential in "enabling" hydrogen growth.

Other "enablers" include companies producing metals that are critical to ET technologies, such as copper, lithium, nickel, and cobalt. We are actively monitoring certain companies in these industries for their involvement in the energy transition.

The second group we'll discuss are materials companies that are further removed in their contributions to, and effects from, the change of energy mix. They are companies that produce basic chemicals (e.g., petrochemicals and plastics, inorganic chemicals), specialty chemicals (e.g., ingredients), fertilizer and agrichemicals, glass, paper and packaging, construction materials (e.g., cement), steel, aluminum, and precious metals (e.g., gold, silver, platinum). These companies' production or manufacturing processes generate Scope 1 and 2 emissions, with some of them emitting significant amounts of carbon dioxide. As these companies will eventually have to bear the costs of eradicating Scope 1 and 2 emissions, economically viable replacement technologies or processes are needed for the group to move forward with energy transition. For this group, recycling is one important approach to help reduce carbon emissions, by avoiding the consumption of virgin raw materials that often generate high carbon emissions. For example, paper recycling helps to reduce the usage of virgin fiber; and plastic recycling reduces the use of virgin resin made from oil and/or natural gas liquids (NGL). We are selectively investing within this group, with a preference for companies with favorable industry structure, leading market positions, and feedstock cost advantages, in their respective subsectors. These characteristics allow the companies we own to generate strong cash flow to cover an attractive dividend, invest for growth and for energy transition, and return excess cash to shareholders with buybacks and/or debt reduction.

Conclusion

The Energy transition is a dynamic and multi-decade process characterized by many iterations of changes and broad global impacts, both direct and indirect. To pick the winners and losers along the energy transition process, investors must understand the inter-linked technologies, ever-changing economics, and intricate policies and regulations. We also need to anticipate the known unknowns, and actively manage our investments as we move forward in time.

For the Shareholder Yield strategies, we believe generating free cash flow, returning cash to shareholders, and growing with the energy transition are not contradictory forces. Many companies can achieve all of the above, with some of them even benefitting from the energy transition as a secular tailwind. We see plenty of investment opportunities for Shareholder Yield and are excited to find those companies that are a fit for the strategy.

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