BTR

INVESTMENT STRATEGY UPDATE

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ELECTRIC DREAMS

The year 2020 will be remembered for many things, including a meteoric rise in clean energy stocks. As they have come off their highs, we felt the time was right to assess the state of green investments. With many countries setting targets for economy-wide carbon neutrality and many car companies targeting the elimination of internal combustion engines (ICEs) from their lineups, the rally does feel more real than when such stocks last spiked, prior to the Great Financial Crisis. And that word, *spike*, does beg the question of sustainability (of high stock prices, that is). In this *Update*, we examine emerging trends in both battery electric vehicles (BEVs) and the electric grid overall, to see whether they are creating investment opportunities that are appropriate for our clients.

Electricity Is Everything

Power drives economic growth. In the past few years, the phrase "data is the new oil" has become shorthand for explaining the rise of technology companies and the struggles in the energy sector. However, it glosses over the real issue, which is that the modern economy uses more power – particularly electricity – than ever. It seems ridiculous that bitcoin mining alone has the same carbon footprint as New Zealand, but blockchain technology is a question for another time.

The point is that *electricity* consumption, which is currently less than a fifth of global *energy* consumption, grew more than 80% over the past 20 years, and looks set to accelerate over the next 20 years. How will this growth be achieved when many world governments are simultaneously trying to reduce carbon emissions? There are two elements to reconciling these conflicting trends. The first is to make more things run on electricity. The second is to generate as much electricity as practical from non-carbon-emitting sources.

Getting Around

Transportation is an obvious place to start, as it accounts for approximately one-quarter of global energy consumption and three-quarters of global oil consumption. How much of that could be made electric? More than half is used for personal transportation, and a variety of auto manufacturers have demonstrated that BEVs can fit this need. While BEVs currently comprise only 3% of global demand, the writing is on the wall, as mandates to eliminate sales of ICEs proliferate. Norway's goal of 2025 is the most aggressive and does seem achievable; BEVs are now a majority of annual vehicle sales there. Granted, Norway is a small, wealthy country, but it is demonstrating the technological feasibility of electrifying the personal transportation fleet.

The concept of electric vehicles is not a new one. Both ICEs and BEVs were invented in the 19th century. After a short while, ICEs became more popular, but after more than a century of their dominance, technology has developed to the point where BEVs are competitive in a variety of ways. They are quieter, they require less maintenance, and their superior torque provides more exhilarating acceleration. Their software can also be upgraded wirelessly. However,

BEVs are still not an easy sell. Current concerns include limited range, long charging times, and lack of charging infrastructure, as well as poor cold weather performance.

A battery is a relatively simple device. Although it can be made with many different materials, the lithium-ion battery has been clearly established as the superior technology for applications ranging from small electronics to BEVs to electrical grid storage. Lithium-ion batteries became dominant in part because lithium itself is very light but highly reactive. They have very high round-trip efficiency, which means there is little energy loss in the system. They also have high measures of depth of discharge, which means they can discharge a lot of their energy without negatively impacting their lifespan. Finally, they generate relatively constant voltage.

Cost, however, is probably the key issue that has kept BEVs from competing effectively against ICEs. The cost of a battery pack is in part a function of the materials used to make a key part called the cathode, and the battery pack accounts for about one-third the cost of a typical BEV. So, making BEVs cheaper than ICE vehicles is all about the batteries. According to Bloomberg New Energy Finance, cost per kilowatt hour has already dropped from more than $900 in 2011 to $137 today. The magic number seems to be around $100, which could be achieved as early as 2023. At that point, BEVs should start to dominate, even without subsidies.

While in many ways superior overall to ICE vehicles, there are still drawbacks to BEVs. There are no tailpipe emissions, but the source of the electricity used to produce and charge the car needs to be considered. A car built and charged with electricity generated by a coal-fired power plant does not eliminate all emissions. Even if the source of electricity is fully renewable, building and disposing of batteries is a messy business. Lithium and some of the other materials used to make cathodes aren't all that common and must be mined. Lithium-ion batteries can also be dangerous. Lithium deposits called dendrites can build up within a battery, causing short-circuits and fires. One of the causes of dendrite build-up is charging too rapidly, which obviously puts a limit on the efficiency of charging infrastructure.

The Grid

Speaking of electrical infrastructure, global electricity consumption by source breaks down as follows: 58% fossil fuels, 16% hydro, 12% wind and solar, 11% nuclear, and 3% other. That's already an impressive number for wind and solar, but assuming significant investment in hydro and nuclear is not in the cards, it will have to go much higher than 12% to address growing electricity needs while reducing emissions. Furthermore, as we saw with the California and Texas outages over the past year, ultimately it may not be practical to eliminate fossil fuel-based generation entirely. Wind and solar are clean but, by definition, intermittent. Electricity generation needs to be reliable, and whatever is not immediately used needs to be stored. However, as with BEVs, we know that renewable electricity is technologically feasible.

Anticipated growth in BEVs implies the need for a much more robust portfolio of electricity generation, transmission, and distribution assets. Currently, the U.S. can generate approximately 4,000 terawatt hours (TWh) of electricity in a year. Morgan Stanley estimates that by 2050, more than a third of that power would be required to charge a fleet of BEVs that will have grown from 1 million to 100 million. Granted, there is a lot of unused capacity available to charge BEVs overnight, but many cars will need to be charged during peak hours. The huge, anticipated growth in BEVs, along with all other needs in an ever more electricity-intensive society, will create a monumental need for new generation.

For that matter, there is an easy argument to be made that our current electrical infrastructure is not even adequate to meet today's needs. California was faced with rolling blackouts last summer for the first time since the Enron-related fiasco in 2001. The issue seems to have been that there was inadequate redundancy in a system that is moving aggressively to clean and renewable, but intermittent, resources. In other words, since the sun doesn't always shine and the wind doesn't always blow, there needs to be reliable capacity that can come online quickly to keep the lights on. Currently, that is provided by natural gas-fired power plants, but in the future, energy storage systems will take over more of that role.

Wind and solar power are the only renewable sources of energy that are growing, and aggressively pursuing solar, in particular, will continue to make sense. The Department of Energy has noted that more power in the form of solar radiation hits the earth in an hour than humanity consumes in a year. Capturing and storing that energy should be a priority, and it doesn't have to be in the form of massive solar farms out in the desert somewhere. With all the roofs of all the structures around the world just waiting for a set of photovoltaic panels, solar power can be highly distributed. Depending on how much electricity a business or household uses, a properly sized solar array coupled with a storage system may meet nearly all of its needs. And that brings us back to the discussion of batteries.

In addition to all of their other uses, lithium-ion batteries are also the core of Battery Energy Storage Systems (BESS). At about half of the cost of a BESS, batteries are an even larger portion of the total cost than for cars or electronic devices. Flexibility in the construction (which materials are used in the cathode) allows for variants that emphasize energy capacity or energy flow, depending on the application. A BESS engineered for high energy capacity might be placed near a generating station, while one engineered for high power flow might be placed strategically to help shift electric loads around the grid. Critically, the grid will need to be able to transmit not only data, but also the electricity itself, in two directions, whereas the current grid is essentially a one-way flow. It will take a combination of new renewable-generation assets, new and weather-hardened traditional-generation assets, extensive storage capacity, and a smarter grid to address America's--and the world's--long-term energy needs.

Investment Implications

Part of the reason for the success of clean energy stocks last year is that investments in companies focused on high environmental, social, and corporate governance standards (ESG) were extremely popular. The number of ESG funds exploded in 2019 and 2020, and last year cash flowing into them more than doubled to nearly $200 billion. That money needed to be invested and drove up stock prices as a result. Ongoing interest on the part of younger investors, particularly, will continue to provide support.

Batteries really need to be the focus of both the BEV and utility industries, so any company that can generate a true improvement in battery technology would be of interest, if the price is right. There is a company that went public in September that appears to have solved the dendrite problem. It is, alas, not generating revenues yet, let alone earnings.

Another way to go about investing in the growth of both battery usage and renewable energy systems is to invest in the raw materials that go into them. Lithium, cobalt, and silver are all candidates, but we must be careful, as batteries in particular can be re-engineered with different materials as the costs of these inputs change.

Building a more robust electric grid starts with expanding the generating assets. This would involve everything from large engineering and construction firms that build new traditional power generating facilities, to the installers of rooftop solar panels that represent more distributed power generation, as well as the makers of solar panels and wind turbines. The grid also needs to be made smarter, which involves a lot of sensors, communication equipment, and software. For that theme we look to both traditional industrial companies focused on electrical components, as well as technology companies focused on the Internet of Things and Big Data. Of course, we could also simply invest in the electrical utilities that are most aggressively pursuing renewable energy sources for their generation fleet.

As BTR is based in California, Tesla dominates the BEV landscape for ourselves and many of our clients, so we could not avoid a quick mention. Tesla also dominated the stock market in 2020, rising by a factor of 8. So, it's natural to assume it's the only game in town, but that would be far from accurate. While it is the current leader in global BEV sales, its share is only 18%. VW is not that far behind at 12.6% and has massive, planned investment in cars and in battery factories. Renault-Nissan-Mitsubishi is at almost 10%. Given Tesla's valuation (a nosebleed 223 times earnings), its production capacity (less than a million cars) relative to these two majors (20 million cars between them), and its falling market share in Europe, we are concerned about Tesla maintaining its position in the industry. We will see if its currently much smaller BESS business can justify the valuation over time.

Market Update

Although the stock market is trading near all-time highs, the bond market may actually be the bigger story right now. Overnight lending rates are at zero, and the Federal Reserve Board has confirmed that it intends to keep them there through 2023. Meanwhile, rates on ten-year Treasury bonds, which are not directly controlled by the Fed, have been rising steadily since last August, from barely 0.5% to around 1.7%. That is an enormous relative increase and has already had some negative impact on the more expensive areas of the stock market, particularly technology stocks. Given the steady vaccine inoculation effort and massive fiscal and monetary stimulus that has been injected into the economy, the bond market is clearly anticipating not only a quick and sharp economic rebound, but also rising inflation.

We have noted recently that there should be some headline inflation this year, but there is a material risk that the inflation we are seeing will eventually have more staying power. It is possible that building inflation pressures force the Fed to raise rates earlier than it is currently saying. Such an increase would not necessarily be bad for all stocks, but we do need to be prepared for a situation in which valuations contract further to reflect interest rates that will continue to rise. This contraction will likely take the form of continued rotation out of last year's winners and into stocks of more cyclically sensitive companies, and could also include a near-term sell-off in the overall market.