

Rockefeller Insights

Around the Markets

It's Easy Being Green

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Breaking Free from T.I.N.A.

In the past few months, the word “uncertainty” has been plastered across all forms of media, notably as people express their outlooks on the US economy. The word choice seems redundant. Isn’t the future, by definition, unknown? Yet, as our lives have been uprooted by the pandemic and the road to normalcy is dependent on a few highly volatile factors with critical ramifications, e.g., the timing of a viable vaccine, we cannot help but cling to the one thing that we are sure about the future – its extreme uncertainty.

And just in case any investors feel somewhat fatigued after months of being on high alert to the “uncertainty” in what is to come, the recent rampant surge in new infections and associated economic damage serve as a timely and sobering reminder to maintain constant vigilance.

We believe that the acute awareness of the “uncertainty” around the path to recovery is what drives the pervasive feeling among US equity investors that “there is no alternative” (or “TINA” for short) to a few select mega-cap stocks with strong balance sheets and growing earnings. Correspondingly, the tech-heavy Nasdaq 100 index now trades about 18% above its close on February 19th.¹ Additionally, as the biggest companies keep getting bigger – driven by investors seeking a relative safe haven within the US equity market—23% of the weight of the S&P 500 Index is now concentrated in its top five names.²

In our view, it may be prudent for equity investors to consider moderately diversifying away from outsized holdings of these mega-cap US stocks. The key question, however, is where else can one invest to continue to maintain a defensive equity position while still having exposure to meaningful secular earnings growth potential?

We believe the rise of green technologies may be the answer that we have all been seeking for quite some time – a way to break free from the confines of TINA.

Never Let A Crisis Go to Waste

Sir Winston Churchill is credited for having once said: “Never let a good crisis go to waste.”³

Churchill’s quote was famously repeated during the global financial crisis (GFC) by Rahm Emanuel, then the Chief of Staff of President Obama. Emanuel further added – in reference to the GFC – that the “crisis provides an opportunity for us to do things you could not do before.”⁴ The severe economic recession then generated strong bipartisan support for aggressive government spending to jumpstart the economy. President Obama seized this rare opportunity to push through a fair amount of his domestic agenda in the form of fiscal stimulus, which included a \$90 billion investment in clean energy.⁵ Dubbed the largest energy bill in US history, the bill catalyzed growth in wind and solar power in the US and led to substantial reduction of carbon emissions in the following years.⁶

The phrase “never let a good crisis go to waste” gathered popularity among many economists, policymakers, and leaders in the private sector during the GFC.⁷ Recently, we have noticed a resurgence of this phrase. Increasingly, the attention is shifting toward what awaits us in the post-pandemic world. In our view, there appears to be a shared sense that beyond the current crisis lies significant opportunities. Structural changes have already begun to emerge, transforming the world for decades to come. Among all the participants, policymakers, we believe, have the most power and tools to initiate changes that may be subtle at first but might evolve into material shifts in social,

¹ Bloomberg, 8/19/2020

² Bloomberg, 8/19/2020

³ McKinsey & Company 12/1/2014

⁴ The Wall Street Journal, 11/21/2008

⁵ American Recovery & Reinvestment Act of 2009, Pub.L.111-5

⁶ Energy Post 2/22/2019

⁷ Forbes, 11/24/2008

economic, or technological conditions in the long term. Our role as strategists is to envision the new landscape beyond the current crisis and find attractive investable opportunities. We believe that the new era has a tint of green.

The New Era Has A Green Tint

In the past eight months, the COVID-19 pandemic has swept around the globe, leaving no countries untouched.⁸ As many governments have rolled out aggressive fiscal stimulus to combat the economic damages from the pandemic, the United Nations has been urging policymakers to “build back better.”⁹

Specifically, the UN Climate Chief urged governments, as they roll out their economic financial support, to make those plans as green and sustainable as possible. She described the current crisis as a “restart, a window of hope... an opportunity for nations to ... shape the 21st economy in ways that are clean, green, healthy, safe, and more resilient.”¹⁰

Today, many policymakers - with leaders of the European Union members at the forefront - have seized the current crisis as a unique window of opportunity to reshape their countries’ economies by adopting ambitious climate policies and accelerating the transition to decarbonization, which is the reduction of carbon dioxide emissions.

This is not an idealistic pursuit by leaders of advanced economies. Infrastructure and research spending in renewable power (e.g., wind and solar energy), automotive (e.g., electric vehicles), industrial processes (e.g., hydrogen, carbon capture and storage), and building renovations (e.g., heating and insulation) - backed by unprecedented fiscal power - will translate into a

significant boost to GDP and employment in the short term. In the long term, besides the obvious benefits of curbing climate change, substantial upfront investments will bear fruit by establishing structural economic and even political advantages such as innovation-fueled sustainable growth and energy self-sufficiency. In the financial wreckage wrought by the pandemic, a new era is beginning.

In our view, attractive investment opportunities will emerge from the current crisis as well as continuous efforts and commitment to climate action in the post-COVID world over at least the next three decades.

While policymakers in different countries and regions are likely to take varying climate actions, we expect many to design their climate objective in line with the Paris Agreement.

The Paris Agreement, finalized in 2015, aims to bring all nations into a common cause to undertake ambitious efforts to combat climate change.¹¹ At the heart of the Paris Agreement lies its long-term goal to limit global average temperature to well below 2°C above pre-industrial levels.¹² The temperature goal had been selected based on consistent findings: a level of global warming close to 2°C would have catastrophic global effects such as monetary damage, increased mortality, species loss, environmental degradation - to name a few.¹³ Scientists accumulated evidence that greenhouse gas (GHG) emissions from energy production (e.g., the burning of fossil fuels) cause global temperatures to rise.¹⁴ Extensive research thus far argues that, in order to have a realistic chance of keeping the rise in temperature below 2°C, countries around the world collectively need to achieve net zero greenhouse gas emissions by 2050.¹⁵ Nearly 200 countries have signed on to the Paris Agreement.¹⁶

⁸ World Health Organization (WHO), 8/19/2020

⁹ The UN Department of Global Communications, 4/22/2020

¹⁰ United Nations Climate Change, 4/22/2020

¹¹ United Nations Climate Change, 8/19/2020

¹² IPCC’s preferred base period is 1850 - 1900

¹³ Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5°C, 2019

¹⁴ Natural Resources Defense Council, 7/16/2019

¹⁵ United Nations Climate Change, 8/19/2020

¹⁶ United Nations Climate Change, 8/19/2020

Based on estimates by Morgan Stanley, approximately \$50 trillion (yes, with a T) capital expenditures ("capex") towards research and implementation of clean technologies is needed to achieve net zero global greenhouse-gas emissions by 2050.¹⁷ If we assume a 10% post-tax return on capital employed ("ROCE"), this suggests a stunning creation of \$5 trillion of annual earnings once the capital is fully invested. To put things in context, the increase in earnings is approximately 5.5% of 2019 global GDP.¹⁸ If successful, the path to net zero carbon emissions will not only have a critical and lasting impact on society and humanity but will also trigger a comprehensive and profound transformation of the global economy. Innovative green technologies will likely advance to become the new dominant industry – as software has been in the past 10-15 years – in the decade to come.

In the following, we examine factors that have accelerated the decarbonization movement as well as recent major climate actions. We also highlight the industries and market participants that are the most likely to benefit from the green movement via significant revenue and earnings growth over time.

The Stars Are Finally Aligning

Achieving the ambitious goal of net zero greenhouse gas emissions by 2050 requires simultaneous climate actions across multiple industries. As some green technologies like hydrogen are still in early development stages, incremental reduction in carbon emissions is currently led by the more mature green technologies such as variable renewable energy, i.e. solar and wind.

Power generation (i.e., the generation of electricity and heat) accounted for over 40% of total global carbon emissions in 2018.¹⁹ Fossil fuels, such as oil, coal, and natural gas, comprised over 80% of global

power generation in 2019, while only 13% was produced from renewable energy sources, with less than 2% from solar and wind.²⁰

The sizable upside potential in its adoption makes renewable energy the cornerstone of decarbonization. The encouraging news is that solar and wind were the two fastest growing renewables from 1990 to 2018, with average annual growth rates of 36% and 23%, respectively.²¹

The political backing and public support for decarbonization seems stronger than ever. The momentum behind even some of the more radical actions to combat climate change is gathering speed. Three decades after climate change first became front-page news, why finally now? The acceleration in decarbonization efforts, we believe, is driven by several factors:

Cost

As recently as 2010, it still consistently costs more to generate electricity from solar and wind than from fossil fuels. Years of subsidies and technological advances have paid off. Between 2010 and 2019, the cost of electricity from utility-scale solar photovoltaic (PV) systems fell 82%, while the cost of electricity from onshore wind declined 44% worldwide.²² In most parts of the world today, renewable energy has become the lowest-cost source of new power generation (subsidy-free).

It's worth noting that the use of solar and wind energy is still somewhat novel. This suggests that even without major technological breakthroughs we can expect to see significant further cost reductions through incremental improvement in operational efficiency, design, materials, and locations. The International Renewable Energy Agency ("IRENA") expects cost reductions of around 55% for solar PV and offshore wind over the

¹⁷ Morgan Stanley, 10/21/2019

¹⁸ IMF

¹⁹ IEA CO₂ Emissions from Fuel Combustion Review 2020

²⁰ IEA Renewables Information Statistics Report 2020

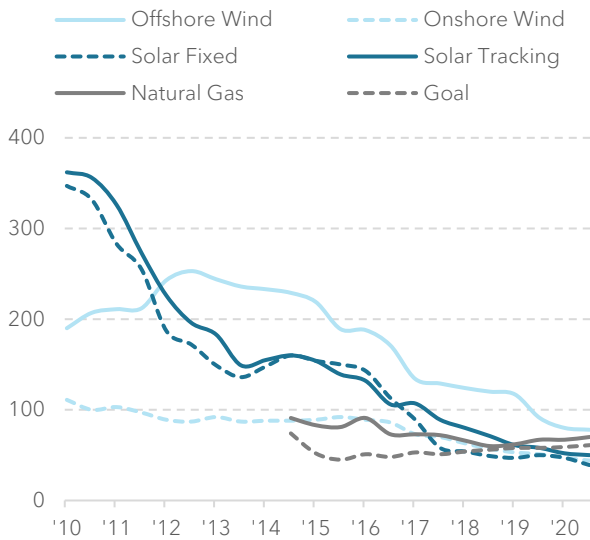
²¹ IEA Renewables Information Statistics Report 2020

²² IRENA Global Renewables Outlook 2020

next decade.²³ Improving economies should continue to drive strong growth in solar and wind energy generation across the world.

Levelized Cost of Electricity

(\$ per megawatt hour; source: BloombergNEF)



Resilient and Uncorrelated Demand

There appears to be a consensus among investors in the energy sector that the long-term decline of the oil industry is inevitable. The trouble for oil producing companies began in 2014, when the boom in US shale gas production contributed to a plunge in oil prices. The COVID-19 crisis hit the oil industry with a sharp contraction in both demand and prices. Global oil demand, 60% of which comes from mobility and aviation, fell 5% YoY in the first quarter of 2020.²⁴ In fact, demand fell across the board for not only fossil fuels such as oil, gas, and coal but also nuclear power and biofuels.

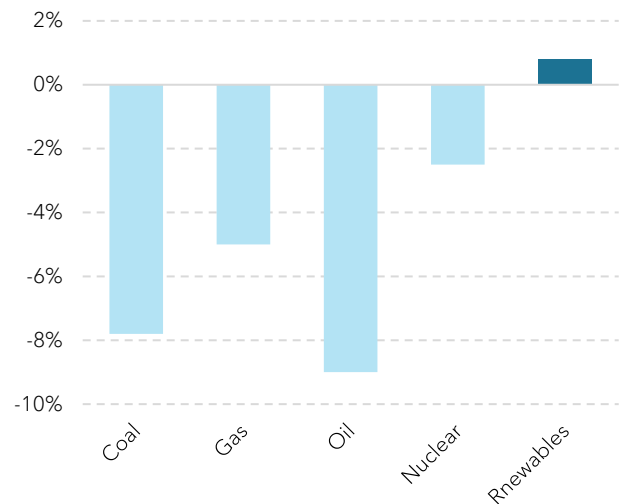
Variable renewable energy ("VRE"), like solar and wind, was the only source that posted growth in

demand. Its 1.5% YoY increase in the first quarter was a reflection of the additional output from new solar and wind projects that were completed in 2019.²⁵ In most countries, VRE receives priority in the electricity grid.²⁶ Because VRE output accounted for only a small percentage of global electricity usage, its output was insulated from the impact of lower electricity demand.

We believe that VRE will remain resilient to the fluctuations in global energy demand during and after the current crisis. The production of VRE largely depends on the availability of natural resources (i.e. weather), making it uncorrelated with changes in economic activity and energy demand. Renewable energy businesses will likely emerge from the crisis in the best financial position within the energy sector. We also expect to see more participants in the traditional fossil fuel space expand their coverage to include VRE.

Projected Change in Primary Energy Demand by Fuel in 2020 Relative to 2019

(International Energy Agency Global Energy Review 2020)



²³ IRENA Global Renewables Outlook 2020

²⁴ IEA Global Energy Review 2020

²⁵ IEA Global Energy Review 2020

²⁶ The US Department of Energy, Integrating Variable Renewable Energy in Electric Power Markets, 4/1/2012

Fighting Inequality Through Job Creation

The pandemic has had markedly different social and economic effects on households by income and wealth group. The crisis has exacerbated inequality, and the consequence may be lasting for years if not generations.

While policymakers have plenty of levers to stimulate the economy, such policy tools are in general less effective at reversing the widening inequality gap. Fiscal stimulus programs that boost unemployment benefits and offer paycheck reliefs are constrained by the rapidly rising government debt-to-GDP ratios. On the monetary front, the Fed issued a series of aggressive monetary policies, notably rate cuts and forward guidance – both of which are intended to keep borrowing costs low – as well as massive asset purchasing programs. Such actions, however, significantly lifted asset prices relative to their fundamentals and these valuation benefits are disproportionately felt by the wealthy who tend to own more financial assets. New research by scholars at Princeton, Harvard, and the University of Chicago argue that just as inequality creates a need for stimulus, stimulus eventually creates more inequality.²⁷

Increasingly, there appears to be a growing consensus among economists and policymakers that public investments in climate projects, e.g., renewable energy, may be more effective at creating jobs and lifting wage growth.²⁸

Statistics show that in 2016, jobs in clean energy industries offered higher wages than the national average and were widely available to workers without a college degree. For those workers, occupations within clean energy industries (e.g., as electricians, installers, repairers, and power plant operators) offer an 8%-19% increase in income.²⁹

Additionally, renewable energy businesses tend to be more labor intensive than their traditional fossil fuel counterparts. In 2019, clean energy sectors (e.g., renewable energy, energy efficiency, etc.) collectively employed nearly 3.4 million workers, representing about 40% of the workforce across the entire US energy sector and outnumbering fossil fuel employment by more than three to one.³⁰ This is particularly impressive given that renewable energy only accounted for 12% of US energy production in 2019.³¹

Furthermore, the number of clean energy jobs added in 2019 was nearly five times greater than fossil fuel jobs.³² While the fossil fuel industry has been in decline, the clean energy industry is rapidly expanding. Take coal as an example. A recent model using US national data finds that in 2018, 74% of coal energy could have been produced more cheaply with local wind and solar. Note that this economic comparison includes the cost of replacing coal plants with new wind and solar energy. By 2025, the percentage grows to nearly 90%, even as federal tax credits phase out. Building renewables in the immediate vicinity of coal plants implies wind and solar could create local jobs and expand the tax base.³³

Awareness

Temperatures have been rising, particularly recently. 2010 to 2019 was the hottest decade since record keeping began 140 years ago; in particular, 2019 was the second hottest year ever recorded, continuing the planet's long-term warming trend.³⁴

Rising temperatures in not just the atmosphere but also the oceans have contributed to the continued mass loss from Greenland and Antarctica, and the increasing frequency of extreme climate events.³⁵

²⁷ Indebted Demand, by Atif Mian (Princeton University), Ludwig Straub (Harvard University), and Amir Sufi (the University of Chicago), 3/26/2020

²⁸ The Economist, 7/25/2020

²⁹ Brookings Institution Research, 4/19/2019

³⁰ E2, Clean Jobs American 2020 Report, 4/15/2019

³¹ US Energy Information Administration (EIA), 7/1/2020

³² E2, Clean Jobs American 2020 Report, 4/15/2019

³³ Energy Innovation / Vibrant Clean Energy, 3/1/2019

³⁴ NASA, 1/15/2020

³⁵ NASA, 1/15/2020

A slew of natural disasters, such as the wildfires in Australia, California, and the Amazon forest as well as consecutive years of devastating hurricanes due to warmer oceans, have drawn media coverage and public awareness.³⁶ People are feeling the change and starting to connect the dots. In the past few years, public interest in and concern about climate change has increased dramatically.

In 1896, Swedish scientist Svante Arrhenius became the first person to investigate the relationship between carbon dioxide emissions and global climate.³⁷ Over a century later, in the midst of a pandemic and one of the most severe global economic recessions, the interests of governments, corporations, and the public finally seem to be aligning. And here comes the green era.

Europe's Man on The Moon Moment

Researchers at Yale and Columbia reported in 2020 that the world's ten most clean, environmentally conscious countries are all in Europe.³⁸

Most of the green innovations have come from Europe. Compared to Americans, Europeans on average have a smaller carbon footprint.³⁹ Culture and history clearly play a role. The centuries-old narrow streets in Rome cannot accommodate much traffic. In many countries where space has always been a premium, people are more conscious of creating waste – there is not abundant open desert space for landfills.

The European Green Deal, introduced in December 2019, marks the first commitment by a major global economy to achieve net zero greenhouse gas emissions by 2050.⁴⁰

The COVID-19 crisis has served as a catalyst to increase the centrality of the Green Deal as a key policy to jump start the European economy. In July 2020, leaders of the 27 EU member countries agreed on a €1.1 trillion seven-year budget for the bloc as well as a €750 billion recovery fund, which provides financial assistance to countries hardest hit by the pandemic. The EU budget provided guarantees to finance the Green Deal, as approximately 30% of the total €1.8 trillion funding is earmarked for climate related projects.⁴¹

In our view, the EU Green Deal will mobilize trillions of euros in capital from the private sector into investments that already feature attractive economies and therefore require little subsidies, e.g., solar and wind power generation and distribution.

The cost curve of decarbonization is non-linear, with the marginal cost rising quickly at higher levels of decarbonization. We expect most of the public funding will go towards supporting the more advanced green technologies in order to develop solutions (e.g., hydrogen, electric vehicles, and carbon capture and storage or CCS for short,) required to achieve net zero emissions.

The EU's recovery plan highlights hydrogen as an investment priority.⁴² Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water. Due to its high mass energy density, hydrogen is an extremely effective medium for energy storage and distribution and can be used to provide electricity and fuel for transport.⁴³ Today, hydrogen is commonly produced using natural gas. The EU expects to devote significant funding towards promoting research and innovation to develop a clean, renewable hydrogen power source, produced using mainly solar and wind energy.⁴⁴

In Europe, transport (e.g., automotive) created more carbon emissions in 2018 than electricity and

³⁶ The New York Times, 8/17/2020

³⁷ BBVA / MIT Reviews, 2/19/2019

³⁸ 2020 Environmental Performance Index (EPI).

³⁹ Yale Environment, 9/28/2009

⁴⁰ The Economist, 12/14/2019

⁴¹ International Institute for Sustainable Development, 7/22/2020

⁴² European Commission Hydrogen Strategy, 7/8/2020

⁴³ European Clean Hydrogen Alliance

⁴⁴ European Commission Hydrogen Strategy, 7/8/2020

heat power generation.⁴⁵ This due to the Europe’s remarkable adoption of solar and wind energy over the years. A large scale roll-out of electric vehicles (“EVs”) powered by renewable energy will significantly reduce carbon emissions. This is another public investment that is critical to achieving net zero emissions by 2050.⁴⁶

Certain processes in the steel, cement and chemicals industries require fossil fuels. Carbon capture and storage (“CCS”) - permanently removing carbon dioxide from the atmosphere through absorbent materials or biomass and storing it underground - is another technology that is required to achieve net zero emissions.⁴⁷

European Commission President Ursula von der Leyen described the EU Green Deal as “Europe’s man on the moon moment.”⁴⁸ By building on its strength as a global leader on the climate and environmental front, Europe may have just taken its first step towards establishing a stronger global presence on the economic and political front, as well.

Decarbonization is Electrifying

In any economy, spending is necessary to drive corporate earnings, employment and wage growth, which in turn create additional spending. In the US, consumer spending is in a slump, tied to recovery of the labor market and consumer confidence – neither of which is likely to rebound quickly from the effects of COVID-19. Government spending via infrastructure projects typically takes years to work through the system. In the corporate sector, capex has had slowing growth rates.

US Total Capital Expenditures YoY Growth

(source: Federal Reserve)



One bright spot on the capex horizon is likely to be the accelerating investments in decarbonization. Spurred by a combination of government policies toward cleaner energy and enthusiastic private sector support, this movement is likely to boost capex and have a favorable impact on job creation and stock prices for those companies involved in the processes.

The investing public has clearly led the charge in implementing climate change solutions, encouraging company managements to incorporate investments in green energy into their business plans. Despite the COVID-19 outbreak in 2020, shareholder resolutions related to climate change exceed those of 2019 on an annualized basis.⁴⁹ Investors are shifting capital away from hydrocarbon assets, thereby lowering the relative cost of capital for renewable projects.

Investment firm Goldman Sachs notes that green infrastructure investments are 1.5x-3.0x more capital-intensive and labor-intensive than traditional energy for each unit of energy

⁴⁵ European Environment Agency (EEA), 12/17/2019

⁴⁶ European Environment Agency, 8/3/2020

⁴⁷ The Economist, 8/17/2020

⁴⁸ The Parliament Magazine, 12/11/2019

⁴⁹ Goldman Sachs, 6/16/2020

produced.⁵⁰ In its view, following the goals set out in the Paris Agreement could lead to creation of between 15 million and 20 million jobs in the global energy industry by 2030, not including indirect employment beneficiaries.⁵¹ And their analysts expect capex in renewable power to surpass that spent on oil & gas production as soon as 2021.

Key Pathways to Greener Energy

Assuming there will be available capital and a favorable regulatory environment for the transition to cleaner energy, what types of investments will be needed in order to reach various milestones?

Renewables

The most obvious source of investment is increased transition to and utilization of renewable power – chiefly wind and solar, but also hydro and geothermal. Renewables are the lowest cost decarbonization opportunity and therefore the growth curve is expected to be steep.⁵² A broad scope of projects will be needed to successfully transition from carbon-based power generation. Investments in onshore and offshore wind farms, solar generation and panel installation, extra storage capacity, and upgrading the resilience and digitalization of power grids will likely absorb most of the spending on renewables.

The intermittent nature of wind and solar creates more volatility in supply and therefore greater demand for back-up plants and additional mechanisms that ensure stability. Additionally, the electrification of vehicles and buildings should increase demands on the power grid, arguing for greater spending on grid resilience. Faster charging rates and higher concentrations of EVs will require grid upgrades.

Electrification

Legislation that caps CO₂ emissions, particularly in Europe, has led to increased spending on electrification particularly in the transportation industry. In 2018, there were approximately 1.3 million EVs on the road globally; that number is forecast to grow to around 113 million by 2030.⁵³ Electrification of buildings is important too because electric equipment is more energy efficient. Capex will be needed to transition existing space and water systems.

Major auto manufacturers and component parts companies continue to improve the design and production of EVs. Additional capex in EVs is focused on improving the technology (for improved driving distance and performance) and cost reduction of batteries. One such improved technology may be the use of silicon carbide semiconductors to help improve miles per charge and power delivery.

Carbon Capture and Storage (CCS)

Despite best efforts toward renewables and electrification, carbon emissions are likely to be with us for several decades. The International Energy Agency estimates that coal and gas will still account for around 25% of power generation capacity in 2040.⁵⁴ Therein lies the opportunity for CCS.

CCS is a relatively new technology and requires a large capital commitment. In Europe, there are plans for some CCS facilities to be used to produce clean hydrogen (aka “green hydrogen”).⁵⁵ If they are successful, we expect that spending on these technologies will increase, particularly as capture and separation costs decline over time as technology improves.

⁵⁰ Goldman Sachs, 6/16/2020

⁵¹ Goldman Sachs, 6/16/2020

⁵² Goldman Sachs, 6/16/2020

⁵³ Morgan Stanley, 10/21/2019

⁵⁴ Morgan Stanley, 10/21/2019

⁵⁵ Morgan Stanley, 10/21/2019

Hydrogen

Although not a decarbonization strategy today, there is a lot of interest in hydrogen as a material way to reduce carbon emissions in industrial processes, transportation and utilities. Green hydrogen that is produced from renewable energy is especially interesting. The cost of green hydrogen is high and currently there is little infrastructure in place for its storage and transportation. As renewable energy costs continue to decline, we expect to see accelerated investment in hydrogen as an alternative fuel source.

Hydrogen is used to produce chemicals. Refineries use it to lower the sulfur content of diesel fuel. Most commercially used hydrogen is produced from fossil fuels. If green hydrogen could be substituted, industrials could decarbonize. Fuel cell vehicles store hydrogen in their tanks and convert it to electricity instead of using batteries. Hydrogen fuel cells are light in weight and can be refilled in under 15 minutes, providing a more logical source of clean power for long-distances.⁵⁶ Hydrogen is therefore attracting interest as a fuel for trucks, buses, taxis, and trains.

Here Comes the Sun... And the Wind

It would be impractical to try and identify all the direct and indirect participants in the green energy evolution. Nonetheless, some discussion of various key industries is relevant, beginning with utilities. After all, utilities are likely to remain a key conduit through which customers access all types of energy.

Most utilities in the US have targeted goals for reducing CO₂ emissions, along with expectations for increased spending on renewables.⁵⁷ In 2019,

wind and solar comprised 7% and 3% respectively of power usage in the US. While that is up from 4% and 1% five years ago,⁵⁸ there is still a long runway for growth. The median spend on renewables for most US-based utilities is 14% of capex over the next 4-5 years.⁵⁹ This could go higher if any new legislation is approved.

Although many individual utility companies are involved in wind and solar development, it is worth noting a few that are undertaking significant renewable projects. In the US Midwest, building wind farms and retiring coal plants may be economical for customers. In one example, DTE Energy**⁶⁰ commissioned the largest wind park in Michigan in Q2, and the company expects that renewables will comprise 15% of its fuel mix by 2021 and 30% by 2030.⁶¹

Many utilities servicing the Southeast US are accelerating decarbonization through a combination of investments in solar and gas to replace coal-fired plants. Perhaps the most familiar name to renewables-focused investors is Florida-based NextEra Energy**. A pioneer in the wind/solar space, NextEra's energy mix is already as much solar as oil/coal and the company plans to spend 57% of its 4-year capex budget on renewables—a \$30 billion investment.⁶² Company management also appears optimistic about the long-term potential of hydrogen. NextEra recently announced a pilot project to use solar energy in producing hydrogen that will then be used as a replacement for a portion of its natural gas production.⁶³

Oil: The Problem or The Solution?

Oil and gas producers have long been considered enemies of a greener planet, but could they also

⁵⁶ Wall Street Journal, 6/26/2020

⁵⁷ CreditSights 6/18/2020

⁵⁸ CreditSights, 6/18/2020

⁵⁹ CreditSights, 6/18/2020

⁶⁰ Any references to company or publicly traded names are strictly for illustrative purposes only and are not intended to be construed as a recommendation to buy or sell any security

⁶¹ CreditSights, 6/18/2020

⁶² CreditSights, 6/18/2020

⁶³ NextEra company transcripts, 7/24, 2020

contribute to the solution? The industry's survival may depend on its ability to adapt to a changing world. And stricter regulations, particularly in Europe, are likely accelerating their shift toward becoming cleaner energy providers.

Big European oil companies have all announced decarbonization programs. British Petroleum** and French giant, Total** have acquired or joined companies that install and run solar and wind projects.⁶⁴ Further, Shell** is building a new integrated clean power business. All three oil giants are also dabbling in hydrogen.

As with utilities, capex budgets for big oils are increasingly focused on renewables. However, new cleaner energy goes beyond renewables. Europe's major oil companies are all setting targets for reduction in carbon intensity of energy products and for lower methane and greenhouse gas emissions.⁶⁵

European big oil companies' share of low-carbon capex as a percentage of total spending has risen from 2-5% in 2018-2019 to around 10-15% for 2020-2021.⁶⁶ Although many capex budgets were cut significantly in 2020, spending on new energy projects has remained largely untouched.

Total has now surpassed many utilities in its ability to generate low-carbon electricity. Bank of America analysts estimate that the company's renewables portfolio represents almost 25% of the company's \$100 billion market value. To achieve Total's target of 50GW of clean power generation by 2030, the company expects to spend around \$7 billion per year, far in excess of the current \$2 billion it spends annually on new energy.⁶⁷

Many large oil companies in the US and Europe are also involved in carbon capture projects. It makes sense that big oil firms see carbon capture investments creating a more favorable environmental profile for the industry.

Oil & gas producers will need to balance the demand for low cost, reliable energy while at the same time lowering greenhouse gas emissions. The industry is likely to undergo a significant transformation over the next decade as the demand for greener energy accelerates; we expect more consolidation in the industry and a widening gap between winners and losers.

Green Solutions Cast a Wide Net of Opportunities

While utilities and oil companies are obvious participants in the quest for cleaner energy, the path there will involve companies across a wide array of sectors, including, industrials, technology, basic materials, and financials sectors.

Industrials/Renewable Energy Equipment

Renewable energy equipment is a rapidly growing industry that supports the production of energy without combustion. Solar companies such as First Solar** manufactures modules that convert sunlight to energy or manufacture and install solar panels. They have benefitted from residential tax credits that are due to roll off soon unless an extension is approved. However, we see increased interest in solar from commercial and industrial clients and expect solar companies to be involved in harnessing the demand for hydrogen as it materializes, creating opportunities in transportation and industrial end markets.

Other companies within the renewable equipment industry, such as US-based Bloom Energy**, use fuel cell technology to generate electricity. Bloom invented the first power generator using solid-oxide fuel cells that convert natural gas or renewables into electricity without pollution-causing combustion.⁶⁸ Other fuel cell manufacturers generate electricity

⁶⁴ Wall Street Journal, 7/2/2020

⁶⁵ BofA Global Research, 7/24/2020

⁶⁶ BofA Global Research, 7/24/2020

⁶⁷ BofA Global Research, 7/24/2020

⁶⁸ Bloomberg, 8/15/2020

from hydrogen gas that is used in the industrial sector to power electric lift trucks and materials handling equipment.

Wind economics have improved concurrently with a growing number of industry providers. Europe has been a leader in wind technology, and it is no surprise that we find many industry participants there. Danish-based Vestas** has been a leader in providing wind turbines for over a decade; there are several European providers of wind technology, blades, and cabling systems to support both onshore and offshore wind projects.

Electrification of buildings involves upgrades or retrofitting of HVAC systems, lighting, appliances, and electrical equipment, along with process and controls systems to monitor and measure usage. Upgrading the power grid is another opportunity for process control companies.

Technology

The success of a green energy solution goes beyond the production of energy to include the efficient distribution of power. Technology is likely to be increasingly utilized to measure and monitor processes and solutions. US-based Autogrid Systems** applies artificial intelligence and data analytics to its software that provides utilities with supply/demand patterns. This allows the utility to make distribution adjustments, thereby reducing fossil capacity needs. Similarly, other companies develop software that can be employed in managing EV transportation fleets (including school buses and shuttle buses) to ensure that vehicles have sufficient battery charge and to optimize driving patterns for more efficient energy usage.

The semiconductor industry is an integral participant in the shift toward electrification. The market for silicon carbide chips that help improve mileage and efficiency in EVs is new and growing rapidly. US-based Cree Inc** has plans to build the world's largest silicon carbide fabrication facility to

support the EV industry.⁶⁹ Other semi manufacturers sell systems that improve battery management and cost effectiveness within EVs.

Basic Materials

The key component within EVs is the rechargeable battery. Except for Tesla**, most of the battery manufacturers and suppliers are Asian companies, including some well capitalized technology conglomerates.

The component suppliers, however, are mostly chemical companies with expertise in mining lithium, cobalt and copper. For example, Albemarle** is one US company with 37% revenue tied to lithium,⁷⁰ but there are many other global companies exposed to the EV battery industry.

Financials

Lastly, projects that target increased use of renewables and shifts to electrification require sufficient financing in order to succeed. The scope is large enough that private, public and government sector involvement will be necessary. Energy Capital Partners is a private equity firm focused on energy infrastructure projects that also provides funds for utilities in their environmental clean-up efforts and is involved in battery recycling. One area of concentration is in renewable power generation, supporting projects that span wind, distributed and residential solar, hydro, geothermal and waste-to-energy. Hannon Armstrong Sustainable Infrastructure Capital** was the first investment company to go public as a clean energy Real Estate Investment Trust in 2013. It provides capital and advisory services to companies in the energy efficiency, renewable energy, and sustainable infrastructure markets. The current

⁶⁹ Morgan Stanley, 10/21/2019

⁷⁰ Bloomberg, 8/15/2020

portfolio includes assets that are approximately 75% onshore wind and 25% energy solar.⁷¹

Green Bonds Becoming More Popular

Green Bonds are another source of financing for projects that seek more efficient and cleaner energy consumption. They were first issued in 2007, developed with the intent to fund projects that have environmental benefits. The Wall Street Journal reports that there are currently half a trillion dollars of outstanding Green bonds,⁷² with issuance of \$81 billion just in the first half of 2020.⁷³

Green bond issuers range from banks, utilities, and energy companies, to governments, insurance companies, technology firms and others. The largest issuer of Green bonds through the first half of 2020 is Toyota Motor Credit with \$2.5 billion.⁷⁴ Germany is expected to issue €12 billion in the second half of 2020.⁷⁵ Credit card giant Visa issued its first Green bond recently with proceeds allocated to projects such as environmental sustainability for business offices and data centers.⁷⁶ Given the high growth in data centers, “green finance” that directs investments to those areas has been a fast-growing segment of this industry.

While there are many opportunities for investors to find securities that may align with their interests in sustainability, it is worth noting that there is currently no generally accepted standard for what constitutes a “Green” bond. Therefore, investors may find a wide variety of differences among funded projects in this asset class.

Green Energy Investments May Offer Defensive Growth in Portfolios

The movement toward greener energy utilization is likely to accelerate over the near-term as the economy recovers from the recent pandemic. We also expect robust investment in green energy to last for the next few decades. The long pathway of opportunities and the convergence of available capital, citizen advocacy and government support, suggest that investments here could offer a “defensive growth” quality to portfolios.

More defensive investments such as Utilities could undergo multiple expansion as the market recognizes the added growth from renewables. And more typically cyclical industries such as Energy could benefit from having reliable cash flows from green projects, thereby offering more defensive characteristics. We also expect higher growth opportunities to appear in many areas, as companies innovate and experiment with new technologies or extend processes to new end markets.

We find that companies across a wide array of industries are playing significant roles in the manufacture, development, distribution and servicing of renewables, electrification of vehicles and buildings, hydrogen, and carbon capture. Investors have several ways to participate in their growth – through individual stocks and bonds, Exchange Traded Funds, managed funds, and private markets.

⁷¹ BofA Global Research, 7/6/2020

⁷² Wall Street Journal, 7/1/2020

⁷³ CreditSights, 7/29/2020

⁷⁴ Wall Street Journal, 7/1/2020

⁷⁵ CreditSights, 7/29/2020

⁷⁶ CreditSights, 8/11/2020



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