HORIZON KINETICS

2nd Quarter Commentary

July 2021

What People Have Been Asking About

Not having had momentous new thoughts to offer you this quarter – we've done enough of that, these past couple of years, wouldn't you say? – I leaned heavily on questions that our portfolio and relationship managers have been fielding. Here is what people are asking about:

They've been hearing a lot about "transitory" inflation from the Federal Reserve, which was Fed Chair Powell's partial response to questions in recent Congressional testimony about the sharp rise in price indexes in the past couple of months. This term is now bandied about everywhere in the financial news. Are the inflation figures transitory; are they not?

People have also been hearing a lot about ESG investing, which is the convenient abbreviation for the Environmental, Social and Governance quality ratings. An ESG rating has rapidly become a precondition for any institutional investing, no less so than credit quality ratings for a bond fund. You can't even launch a new ETF without some form of ESG rating on it. There was a related question about the EGI – or 'Everyone Getting In' – phenomenon, whether a bubble is developing in renewable energy sector companies.

People have also been hearing about cryptocurrency mining, Bitcoin in particular, as being a massive consumer of electric power that accounts for an ever-larger carbon footprint. A concern, aside from the environmental impact, is of government sanction. Herewith, a trick. I expect to demonstrate, to your initial satisfaction, the very opposite: that bitcoin mining uses a small fraction of the electric power of data centers (where our YouTube videos reside), that it has been helping electric utilities to *reduce* their net energy costs, 'rescue' stranded power assets, support renewable energy projects, and reduce methane gas emissions. That it is plausible that Bitcoin might well end up with a role in ESG portfolios.

And a final question, which I put in the 'you can't win' category, was about the recent news that Texas Pacific Land Corp. is now included in over 30 indexes and ETFs. The question posed: isn't that a risk to the stock, since if it's in an index, then it can't it also be kicked out of the index?

These questions tell me that this is a good time for a refresh, to review some of the important elements that we've been incorporating into portfolios during the past few years. In almost each case, when we first introduced the element, it was so entirely absent from the public discussion that we were careful and incremental in proposing it, so as to avoid seeming extreme in our views. Who wants a portfolio manager with extreme views?

3rd Quarter Review, October 2017, excerpt from first Bitcoin commentary:

A prefatory remark first. Many of our clients have partaken of individual discussions with us about this topic, but we've not spoken broadly about it to date. The purpose here, for those not familiar with cryptocurrencies—and why would you be? — is simply to remove the mystery. I'll describe what they are and their relevance to you and your investments. It is simply an introduction.

And then I must—there is no question about it—make a brief defense of the suspicion, if not outright accusation, that the research and attention we have spent on this subject means we have strayed from our roots as value oriented, risk averse investors.

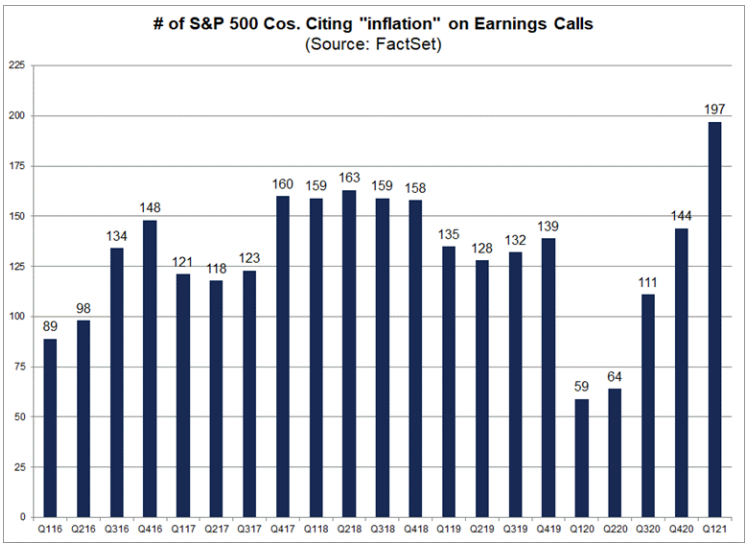
At each of those times, these topics were never mentioned in the financial press. Eventually they came to be sporadically mentioned. Then some more time would pass, and they came to be mentioned more regularly, but only as a curiosity, because of early mention by sufficiently prominent guests. That at least qualified them for the regular news cycle, even if they were of dubious merit. It's not wise to discuss an idea that other people aren't discussing, but you are permissioned to discuss it if a financial sector influencer has already brought it up. To review:

- *Bitcoin:* You might recall that in 2017, when we introduced the idea of holding a de minimis amount of bitcoin as possible insurance against financial risks that a standard-allocation portfolio would not protect against, it had to be carefully couched. Today, we no longer have to defend a charge of extremism, since bitcoin is now regularly quoted on Bloomberg Radio, right alongside the price of West Texas Intermediate oil and the 10-Year Treasury yield. It is by no means broadly accepted, but the topic is permissible, even if only for entertainment value.

- *Inflation:* When we introduced the idea that inflation could become the most serious risk facing portfolios in the foreseeable future, as an outcome of the Federal Reserve pushing money supply and debt creation toward historic limits, there was not a mention of inflation in the public discussion. The idea was generally derided. Now, although inflation is dismissed as "transitory", it is part of the discussion. Last month, FactSet reported that a record 197 S&P 500 companies cited the term "inflation" in their 1st quarter earnings call. The prior record was 163 companies[1]. Apparently, this database goes back to 2010.

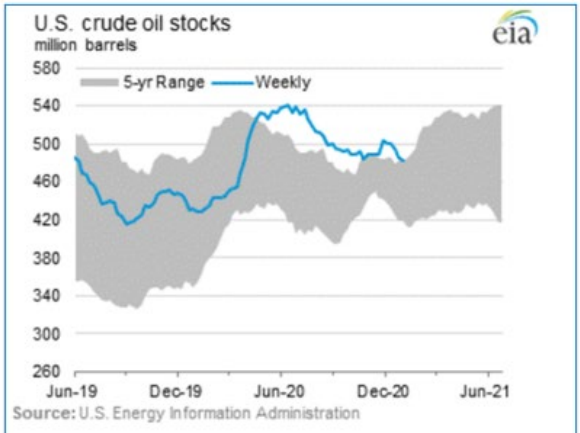
[1] https://insight.factset.com/is-higher-inflation-having-a-negative-impact-on-sp-500-earnings-for-2021?_hsmi=134500356&_hsenc=p2ANqtz--_anC7zWrraXqSO3ihjjFWuR2fFBgZcY_PvJ15oWqIWpu0iWFTYEegj_OUalPHixVeppSw3PCtBNse9FTQ-4Zb0wC16w

- *Oil prices:* Just over one year ago, the pressing question was whether the largest oil companies in the world might become stranded assets, victim to the divesting of energy stocks by financial institutions, to the displacement of oil by renewable energy technologies, and to the shockingly steep drop in consumption during the early months of the Covid-19 pandemic. Our suggestion that the important risk to protect against was not of permanently *low* prices, but of permanently *high* prices, of an oil price shock, was also completely absent from the public discussion. It remains so.



Yet, oil is no longer $42/barrel, as it was in July last year, or $20/barrel, as it was in April last year, the last times we covered this issue in some detail. Last week, it was over $70, which it hasn't been since 2018. We're now at a point where the excess inventories of last year have finally been drawn down to within a historically normal range – as was bound to happen – and many forms of travel are already back to historically normal levels – as was bound to happen. What happens after this current point, if these measures of demand continue to rise, but supply does not? Still, the concept of an oil price shock remains completely absent from the public discussion.

From 4th Quarter 2020 Commentary



The excess beginning last April is clear, just as it's clear that the levels are now at the border of the historically average range. There is little doubt that once demand and supply do come into balance, whenever that might be, there will be a supply deficit once demand thereafter increases further.

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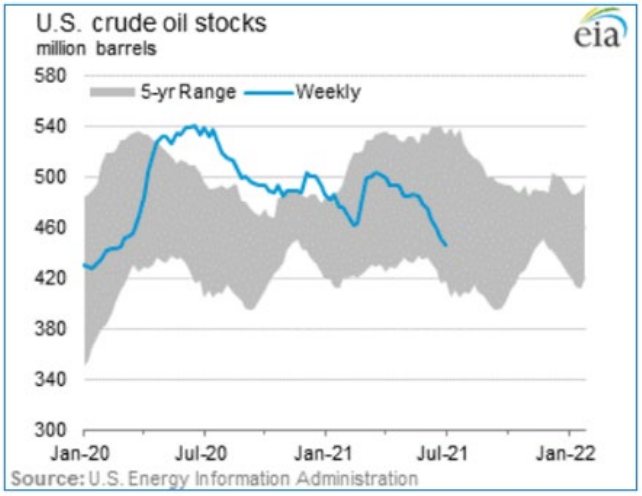


These questions about still very relevant but still not-top-of-mind issues, suggest that it's a good time to regroup and review the basis for these ideas, and update how they've been developing, how they are implemented in portfolios, and how and why these portfolios are different than 'the market'.

"Transitory" Inflation, What was Said by the Fed

What is the "transitory" inflation discussion about? On June 22nd, in his opening statement to a U.S. House of Representatives subcommittee on the Coronavirus Crisis, Federal Reserve Chairman Jay Powell used the term "transitory" to describe the recent rise in consumer prices.[2] The gist of it is that it is the coronavirus pandemic that has temporarily made various inflation index figures look higher than they should, because of rebound-from-the-bottom effects. The examples he cited:

> … a pretty substantial part, or perhaps all of the overshoot…comes from categories that are directly affected by the reopening of the economy, such as used cars and trucks, in particular. They're sort of a perfect storm of a very strong demand and weak supply... We see airplane tickets, we saw hotel prices, we see other things… that we would look to stop going up and ultimately to start to decline as these situations resolve themselves. *They don't speak to a broadly tight economy into the kind of thing that that has led to high inflation over time*[3].

That is intended to mean that "inflation will come down from around 3% this year to close to 2% next year and in 2023." [4] It'll all be ok, it's just supply chain and bottleneck issues.

No one at Horizon Kinetics is a trained economist. We don't employ computer modelling or try to predict upcoming CPI figures or seasonally adjusted employment figures. We're just interested in different sorts of information than the Federal Reserve appears interested in speaking about.

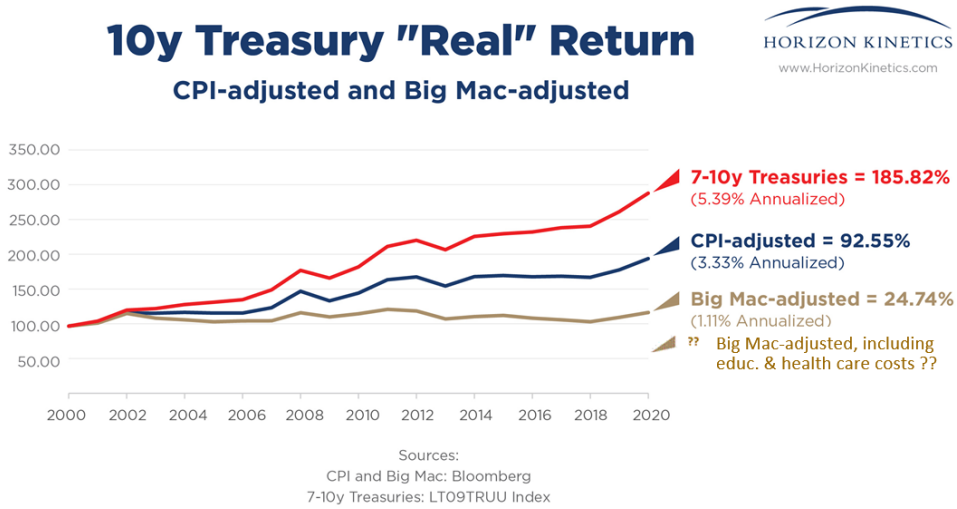
The Federal Reserve places great emphasis on the Personal Consumption Expenditures Index, the PCE, as a critical measure of inflation. The PCE is generally similar to the Consumer Price Index. It differs in various choices, such as about the items in the 'basket' of goods and services they measure, or their weightings. I don't know specifically why the Fed prefers the PCE, but in the past 10 years, the PCE is up 16.8%, while the CPI is up 20.6%. I'd prefer it, too. Except we avoid both of them, because they incorporate statistical techniques designed to understate inflation.

Fed Chair Jay Powell, to House subcommittee on the Coronavirus Crisis, excerpt:

Inflation has increased notably in recent months. This reflects, in part, the very low readings from early in the pandemic falling out of the calculation; the pass-through of past increases in oil prices to consumer energy prices; the rebound in spending as the economy continues to reopen; and the exacerbating factor of supply bottlenecks, which have limited how quickly production in some sectors can respond in the near term. *As these transitory supply effects abate, inflation is expected to drop back toward our longer-run goal*[2].

[2] https://www.federalreserve.gov/newsevents/testimony/files/powell20210622a.pdf
[3] https://www.rev.com/blog/transcripts/jerome-powell-testimony-on-feds-pandemic-response-june-22
[4] Per the vice chair of the Fed's policymaking committee, and also NY Fed President, John Williams

I'd take the Big Mac Index over the CPI, since that burger sandwich embodies a consistent, unmanaged basket of goods and services. The 'experienced' inflation it measures is simply the price that its customers pay, and that is twice as high as the CPI over the past 20 years. The chart below, also shown in last quarter's review, was adjusted to show an additional inflation vector.

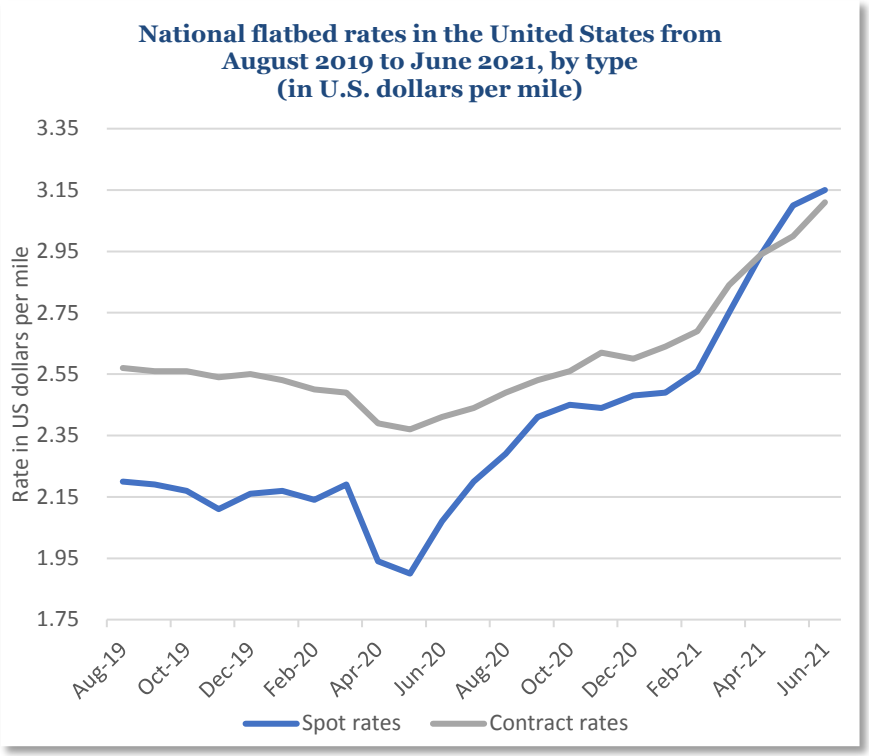


Because even the price of a Big Mac probably understates inflation. Ed Harrison, a perceptive and well-informed questioner at Real Vision, noted to me in a recent interview that the Big Mac Index doesn't include health care or education costs. In which case, on the off-chance that any of the trillions of dollars of bond index ETFs provide inflation-adjusted figures for their 20-year returns, they should probably revise them to be negative.

The Fed speaks of a temporary, pandemic-induced inflation. Yet, aside from the price of a Big Mac, which didn't need the pandemic to rise by 4% a year, a call-in questioner on the Real Vision interview asked what inflation index we use. I couldn't provide a fully satisfactory answer at the time, because we don't employ those types of published indexes. Those are handy tools if one wants a weekly or monthly index to measure what's already occurred, because they are all backward-looking, but not if you want something predictive. In deference to that question, though, here is one set of price indexes that I haven't used before, and probably won't again. But they do have a sort of all-encompassing aspect to them: shipping cost indexes.

Almost anything we put into our mouths, onto our bodies, touch, purchase or discard, has been shipped to the store where we purchased it. It was transported by truck and perhaps by ship as well. Shipping costs might only be several percent of the retail price of all those items that we buy, but that is not immaterial. That 3% or 5% or 8%, which is part of GDP, touches everything. In the almost two years from August 2019 to June 2021:

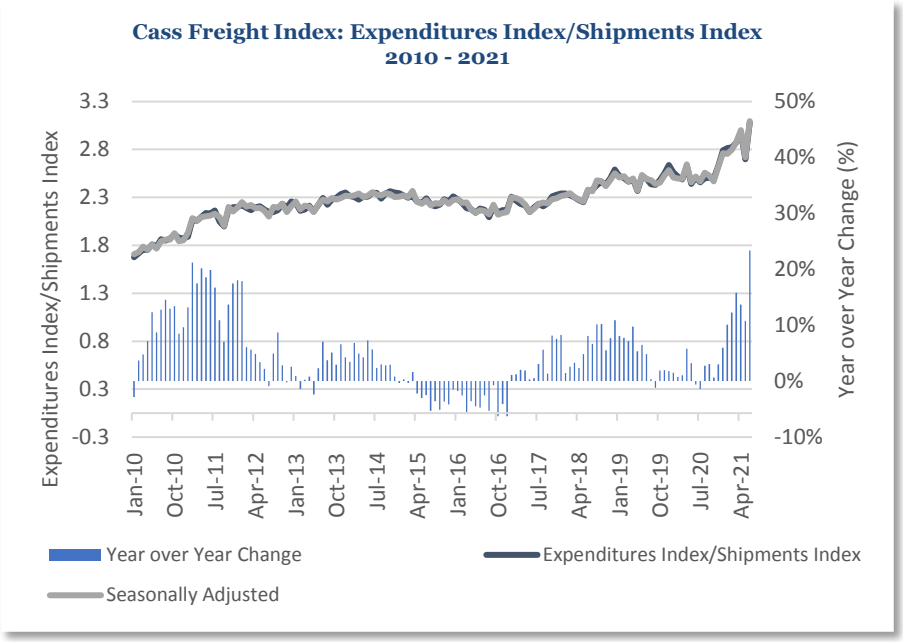
- Flatbed truck rates are up 43%; refrigerated truck rates are up 44%.



Source: Statista. Original Source: dat.com

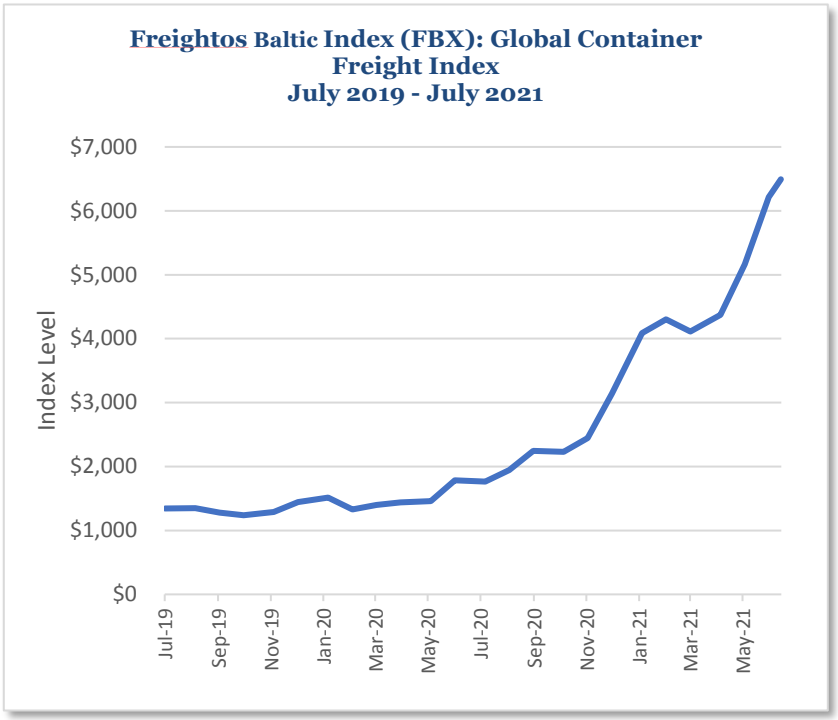
- A more comprehensive measure is the Cass Freight Index. It is based on actual freight invoices from companies in industries ranging from, among others, food and consumer packaged goods, to automotive, to chemical and heavy equipment. It is up 25% since August 2019.

  Even pre-pandemic, the Cass Freight Index, in the two 2 years Dec. 2017 to Dec. 2019, was up 12%.



Source: https://www.cassinfo.com/freight-audit-payment/cass-transportation-indexes/cass-freight-index

- The Baltic Dry Index of global marine shipping freight rates for dry bulk goods like iron ore and grain is up 42% since August 2019, and 114% from Aug 2018. On the other hand, it was lower in Dec 2019 than Dec 2017.
- The Freightos Baltic Index of global container freight shipping rates, which is how our Amazon-delivered clothing and flashlights get to us, is up 381% since August 2019.



Source: https://fbx.freightos.com/

It's quite possible that all of these broad-based price increases are a temporary rebound and bottleneck effect of the coronavirus pandemic.

But none of this is what we pay close attention to. Because these types of statistics are descriptive, they're a function of other inputs, and they're backward looking. They're not actually causative factors that lead to inflation.

An investor wants predictive information.

Here are updates on more basic, causative factors that we do pay attention to, lately, because you can't say "historical extreme" too often: the nation's money supply, the nation's debt, and the declining reserves of the handful of critical commodities that undergird every economy.

Each of these factors was contributing to the development of inflationary pressures well before the coronavirus crisis. And each of them has been exacerbated by the pandemic itself or by the government's policy response to the pandemic. You may judge if these factors seem to offer more clarity about the threat of inflation than statistics like, say, the seasonally adjusted labor force participation rate.

Money Supply and Inflation

The most incontrovertible evidence there is about the cause of inflation, drawn from two thousand years of documented history, is not mentioned in the Fed commentary: excessive money supply. Each time in history that a government debased a new issuance of a gold coin by adding a bit more of a cheaper metal, like copper – a base metal – and a little less gold, it meant people had to use more coins to pay for the same goods. Because the merchants knew there was less gold in the coin. So where do you get more coins from? Do you work harder? Do you spend less? That debasement reduces people's purchasing power; that's inflation.

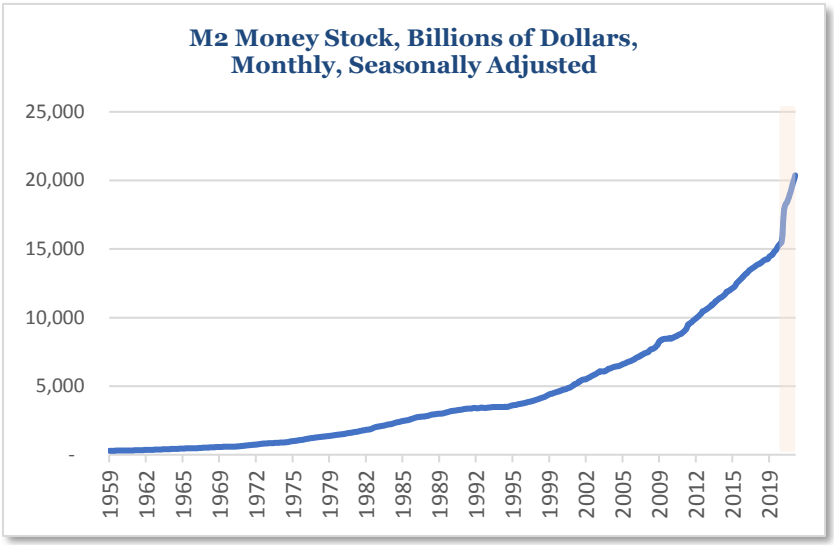
The same applies to issuing more paper currency than economic growth has warranted. Do that slowly enough, and maybe all you do over the course of 50 years is disappoint, or maybe ruin, people's

retirement plans and their ability to maintain their standard of living. So far, that's been the U.S. experience. Remember the 1-earner household? That version of debasement happens very slowly, which also makes it politically convenient. But from a distance, it's clear as day.

Take 1925, for example. The Bureau of Labor Statistics calculates that the CPI today, the general price level in society, is 15.9x higher than it was in 1925. That means the dollar held in 1925 has lost 94% of its purchasing power, as if it's worth only 6 cents today (1/15.9 = 0.06). That's an annualized debasement rate of 2.92%. That's why great grandma could say that they used to pay only 10¢ for a pound of bread in 1925 (NY City prices)[5]. The cheapest loaf of bread offered by Fresh Direct in Manhattan today is $3.79. But that's 37.9x more expensive than in 1925, not the CPI's 15.9x, which is an inflation rate of 3.86%. Experienced inflation beats the CPI again, like the Big Mac sandwich.

But if excess money creation goes on for too long or becomes too extreme – if the government pushes it too far – you don't just ruin people's retirement, you ruin the entire economy: economies tip into hyperinflation and currency collapse. Which is why, of the thousands of historical currencies, not one has survived until today.

Absent from the Fed's testimony last month was that the U.S. money supply expanded by 32% between January 2020 and May 2021, from $15.4 trillion to $20.4 trillion. Somewhere in the economy there is suddenly one-third more money volume, even though the economy is only 1.4% larger, so unless your bank account has gone up by about a third in the last year and a half, your share of the value of goods and services in the economy, your purchasing power, has shrunk by a quarter. Eventually, someone is going to ask you for more money than you used to pay for something. It might be life insurance; it might be food.



Source: Federal Reserve Bank of St. Louis

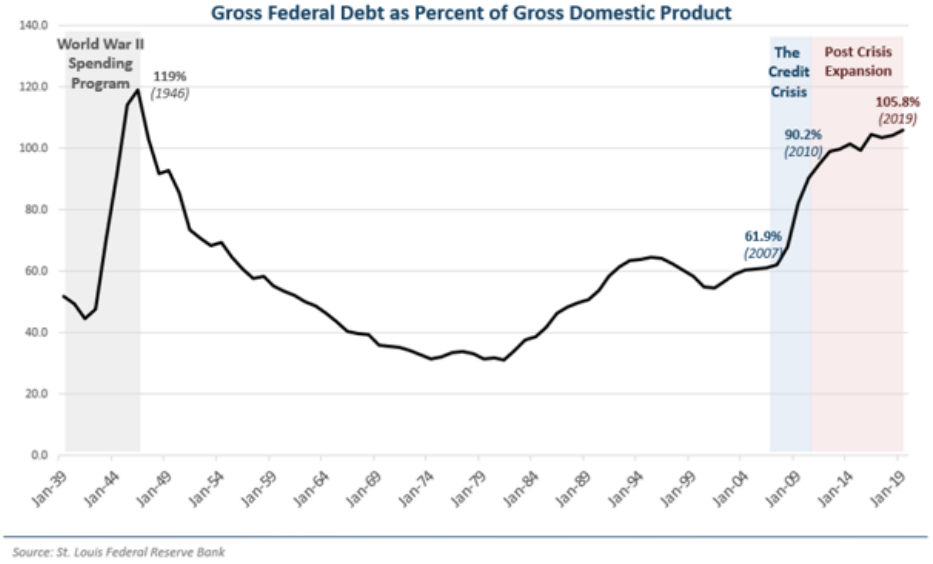
You might still think that this qualifies as transitory inflationary pressure.

[5] https://www.thepeoplehistory.com/20sfood.html

Debt vs. GDP; Yes, Also Inflationary

Except that it isn't so transitory, because the money supply increase went hand-in-hand with a massive increase in government debt issuance. Debt is not so transitory. Nor did the unusually large increases in debt and money supply start with the pandemic. At the end of 2007, just before the Financial Crisis, Federal debt was 63% of GDP. By the end of 2019, it was 106% of GDP. Total Federal debt had already risen 2.5x in the 12 years before the pandemic, which is an 8.0% annualized rate.

From 1st Quarter 2020 Commentary



Source: St. Louis Federal Reserve Bank

The CARES Act allocated $454 billion for the Treasury to make loans and investments through Special Purpose Vehicles that the Treasury seeds with some equity capital. The Federal reserve tops up these SPVs with up to 10 times that amount. With 10:1 leverage, that $454 billion could easily be another $3 trillion, even without any other spending, of which there will be plenty. So, the U.S. budget deficit will be in the many trillions of dollars. The debt/GDP ratio will balloon to Italy and Greece levels.

The Federal debt is now 127% of GDP (as of March)[6]. The prior all-time high was 119%, but that was in 1946, after the end of World War II. A difference between then and now is that Federal spending *decreased* dramatically after the war. As well, the war spending had funded an extraordinary expansion in the productive capacity of the nation's factories and in new technology, so that the post-war civilian economy expanded at a torrid rate. The combination of rising GDP and reduced spending rapidly reduced the nation's debt leverage.

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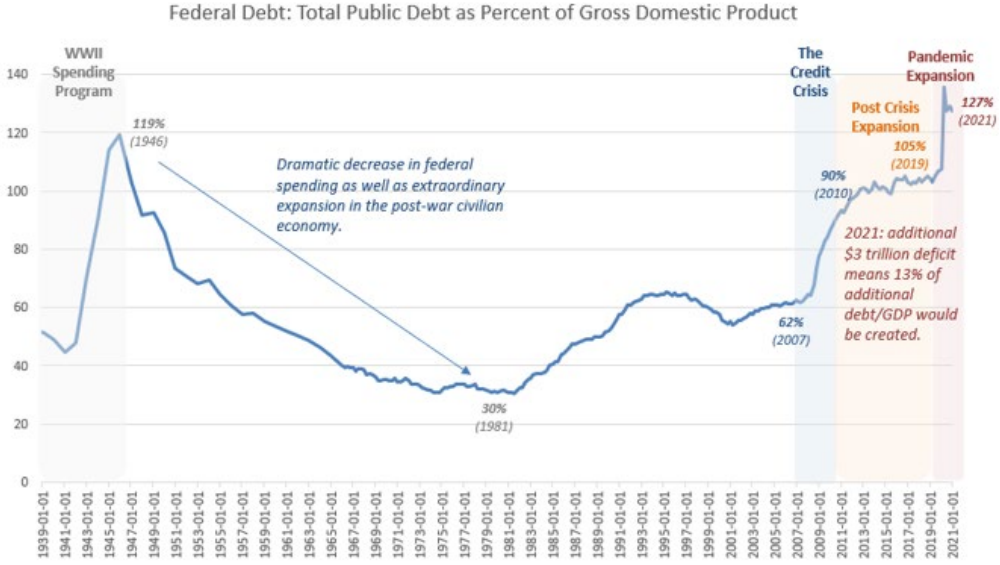


[6] Source: St. Louis Fderal Reserve Bank

Our current era's massive debt accumulation did not fund new productive capacity in the nation's factories and research facilities; it did not purchase robust economic growth. And there appears to be no expectation of a dramatic decline in spending. The Federal deficit in 2020 was $3.1 trillion. In its June 2021 review, the Congressional Budget Office, which was established as a non-partisan agency to provide budget and economic information to Congress, projects that if current laws governing taxes and spending remain unchanged, this year's budget deficit will also reach $3.0 trillion[7].

Why throw these numbers around? Because they might be describing a tipping point. Since the GDP is $22 trillion, this year's additional $3 trillion deficit would be about 13% of the economy, which means additional debt equal to 13% of GDP would be created.

One can speak of the economy outgrowing the debt, but during the very favorable past 10 and 20 years, GDP expanded at only a 3.7% rate[8]. No one seriously suggests that it will be more robust in the next 10 years than in the last 10. The amount of new debt being created exceeds the rate at which the economy can grow.

What if we go back to a more usual budget deficit instead of these $3 trillion figures? In 2019, the deficit was $984 billion. In the interest of simplicity, let's just say that it is politically, societally, mathematically feasible to back to that.

A $984 billion deficit would be 4.46% of this year's $22.06 trillion of expected GDP. That means the debt/GDP ratio rises by another 4.46%, which still exceeds the historical GDP growth rate. So, the economy couldn't 'outgrow' the rate of debt accumulation, and the debt/GDP ratio would only increase.

But that's not the end of it. A massive decline in government spending spells economic decline and lower tax revenue, which serves to increase the deficit. How massive would that decline in spending be?

2020 Federal Budget*	**$ billion**
Tax Revenues	3,400
Budget	(6,600)
Deficit	(3,200)
Reduce deficit to 2019 level of	(984)
Required spending reduction	***(2,216)***
As % of 2020 Budget	***-34%***

2020 Budget	6,600
Exclude from spending cuts: Non-discretionary items	
(Medicare, Medicaid, SocSec)	(2,327)
Defense	(714)
Net interest expense	(345)
Excluded from budget cuts	(3,386)
Remainder of budget available to cut	3,214
Required spending reduction, from above	(2,216)
As % of all other budget items	***-69%***

To reduce the 2021 budget deficit of $3.2 trillion to 2019's $984 billion, would mean cutting spending by $2.216 trillion. That's 34% of the $6.6 trillion spending budget.

But it's far more draconian than that. Excluded from any budget cuts would be the $3.386 trillion of non-discretionary spending (Medicare, Medicaid, Social Security), then there's Defense, and net interest expense which must be paid. Therefore, the remainder of the budget that's available to be cut would be

[7] https://www.cbo.gov/publication/57288
[8] Source: Horizon Kinetics research, St. Louis Federal Reserve Bank

$3.214 trillion. The required spending reduction, from above, is $2.216 trillion. That means a 69% reduction of every other budget item.

Not feasible, agreed?

There are other closed pathways, too. People – and the Federal Reserve – speak often about just when the central bank will raise interest rates in order to forestall inflation. But it's not a matter of raising interest rates in the active sense. It's a matter of allowing rates to rise, of permitting investors to again establish a market-based price. Because the Fed has been buying $120 billion of bonds every month, in order to push prices up and yields down. That's $1.44 trillion a year. That's 6.5% of GDP. In order to have the money to buy those bonds, the Fed has been creating that much more money, which is debasement, which is inflationary.

Yet, what would happen if the Fed were to stop suppressing rates? The interest rate on the Federal debt is the lowest it's ever been. If rates were permitted to rise by as little as 2% points, that would bring the 10-year Treasury yield to 3.2%, which is what it was as recently as 2018. That doesn't seem very high. Except, applied across $28 trillion of Federal debt, it would add $560 billion of interest expense to the deficit, and that would be 2.5% of GDP, which means that much more debt and cash creation. Plus, there is an additional $56 trillion of state, local and private debt in the country. An additional 2% interest expense on that would add another $1.1 trillion of interest expense burden each year: that's 6.5% of GDP. The additional interest expense would not be different, economically, than a $1.1 trillion tax hike on the populace. That's almost as large as total individual income taxes last year, which were $1.6 trillion. How could the economy handle that?

If this very simplified reasoning is correct, that raising interest rates at this late stage would be self-defeating, that there is no solution that way, then perhaps the Federal Reserve has already privately determined that it will not raise interest rates. The remaining pathway is for the central bank to inflate its way out, to continue the money supply increases, so that eventually debtors can pay back their fixed obligations with cheaper, more plentiful money. Which, after all, has been done throughout time.

If all this sounds circular, that's a characteristic of self-reinforcing cycles.

Who can know how this will develop? But a more fitting term than transitory might be structural. Which isn't good for the value of money.

About Fed Chairman Powell's Congressional Testimony – The Inflation Word Count Game! (suitable for persons of any age with earnings or savings)

A little earlier, I said that there was no mention of the money supply during Fed Chair Powell's eventful Congressional testimony a few weeks ago. That wasn't a literary device; there really wasn't any mention of it. I counted. If the meeting weren't a political construct, that would be an extraordinary phenomenon, since inflation was a central theme of the proceedings.

That meeting of the Select Subcommittee on the Coronavirus Crisis lasted 1 hour 27 minutes. It included questions from nine Republican and Democratic members. Excluding the time for opening and closing

remarks, there were 52 minutes for actual Q & A, more than sufficient time to pose some questions about the serious state of the nation's balance sheet, budget position, spending capacity, and inflation.

Presumably, the importance of any of these topics to the Committee will correlate with the number of times it was mentioned. Here's the count:

Inflation: 59 mentions, 49 by committee members, so this was much on their minds. Chair Powell's prepared remarks mention inflation only twice, plus an additional 8 times in response to questions.

Debt: 1 mention, in a question.

Money supply: 1 mention, but not a question to Chair Powell.

Deficit: 0 mentions.

Clearly, the Committee members were very much engaged in uttering the word inflation, but not so much in speaking about causes or remedies. Perhaps they had other objectives in mind.

Mariannette Miller-Meeks, Iowa (R):
The financial report the United States government published annually by the Treasury Department says unambiguously, "The current fiscal path is unsustainable. On our current path, debt is projected to exceed six times GDP by the end of the century and annual government spending will exceed 50% of GDP." Do you agree with the conclusions of this report? And if so, isn't this an additional, and one of our greatest avoidable crises that our country currently faces?

Chair Powell:
I think "unsustainable" just means that the debt is growing faster than the economy. That's been the case for a long time and I don't think that's controversial. The point I would make is that the time to work on that problem will come, and that time is when employment is high, unemployment is low, economic activity is strong, taxes are rolling in. That's the right time to go to work on a longer-term program that gradually moves us back to primary balance. Ultimately, just have to get the GDP growing faster than the debt and it has to do that for an extended period of time. That's how countries get back to a sustainable path.

For anyone interested in the one question and response that did use the term "debt", it is included at right[9]. Interestingly, the term debt was not directly Congresswoman Miller-Meeks's word; rather, she was quoting from a Treasury Department report. The Treasury Department's wording, despite its professional blandness, does manage to convey a sense of worry.

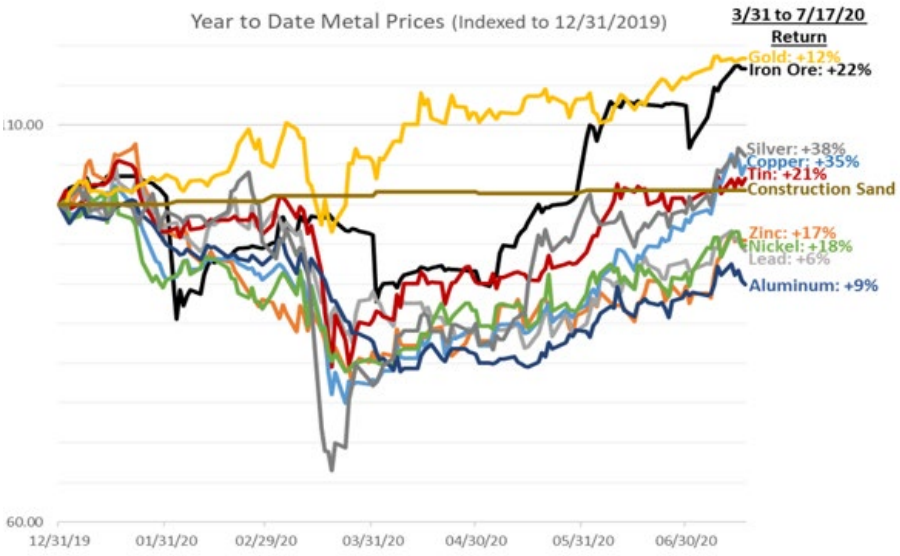
[9] Source: *https://www.cbo.gov/publication/57288*

Critical Commodities Supply vs. Transitory Inflation

The Sunday morning news programs this past weekend also much discussed the topic of higher prices. It was new fare for them. The assessment was that these are pandemic-recovery bottleneck issues, because people are now out and about, and demand is surging.

Exactly one year ago, though, for the 2nd Quarter 2020 Review, we displayed this chart of the startlingly rapid price increases in a range of metals. You will note that these were priced as of mid-July 2020, pretty much the *bottom* of about the deepest economic downturn ever, a 9.5% drop in GDP. People were not out and about at that time, and business activity was deeply depressed. Yet iron ore, copper, silver and tin, all of them industrial metals, were all higher than at year-end 2019, and 20% to 40% higher than their interim lows.

From 2nd Quarter 2020 Review



Source: Factset, St. Louis Federal Reserve

That price inflation has continued. As of last week, prices for a range of key energy, industrial and, new category, renewable energy commodities, are up – versus year-end 2019 – from, generally, 35% to 100%.

What explains that? The price behavior of commodities is governed by the same magic formula that explains prices for apartments, used cars, and stocks and bonds: supply relative to demand.

On the demand side, the need for certain key global commodities increases constantly, because the global population increases constantly and because standards of living in emerging economies increase.

There is also the add-on demand for certain key commodities for renewable energy projects. The scale of that raw materials demand, whether for lithium, nickel, cobalt, neodymium, silicon, copper, silver, or steel, among others, will mirror the scale of the new-build demand. They go hand in hand. Does anyone suggest that these projects will do anything but expand for decades to come? Likewise, there is the mirrored demand for the fossil fuels necessary for mining, smelting and processing those raw materials.

Key Commodity Price Changes
Pre-pandemic to Current - 12/2019 to 7/16/21

	Change
Energy	
Crude Oil, WTI	17.4%
Natural Gas	69.7%
Coal	115.1%
Industrial	
Iron Ore	288.6%
Steel	43.8%
Lumber	35.1%
Aluminum	37.6%
Renewable Energy	
Silicon metal*	54.2%
Lithium	79.8%
Silver	43.2%
Copper	55.0%
Nickel	36.6%
Neodymium	83.7%
Cobalt	60.3%
Molybdenum	93.9%
Indium	26.0%

* For period 12/19 to 4/21. Source: https://www.usgs.go
Source: tradingeconomics.com

The problem is that on the supply side, production for many of these commodities is *not* increasing. For many of them, that's related to cyclical price collapses of nearly a decade ago, and the consequent decision by producers to reduce spending and not develop new reserves. That disinvestment process has been happening for many years. Likewise, many years would be required to reverse that trend, even under ordinary circumstances.

But supply is subject to a recent add-on constraint, and that is political and regulatory pressure on the extractive industries to not increase their carbon dioxide and other greenhouse gas emissions. The goal for almost all of these companies, brandished in their most recent annual reports, is to decrease emissions by about 3% a year. The only way to accomplish that is to *not* expand production in any meaningful way. Even if they wanted to, such companies are unlikely to secure external funding for expansion projects.

Consider lithium, used in electric vehicle and utility-scale storage batteries. Global lithium production, which climbed dramatically for some years through 2018, has declined for two years running. Sustainability concerns are a factor here. A major producer in Chile has pledged to reduce its brine evaporation volumes by 50% by the year 2030, because brine extraction from underground wells is damaging the water tables, the environment, and farming in that region. With lower production and rising demand, higher prices should be expected.

Lithium Production Figures

Year	Metric Tons
2018	95,000
2019	86,000
2020	82,000

Source: Statista, retrieved 4/30/21

Here are some visual representations of these inexorable supply/demand stresses.

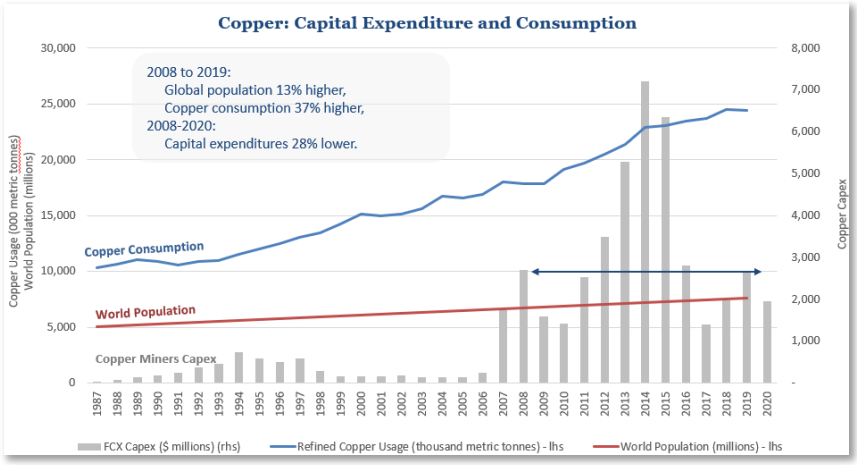
For copper miners, capital expenditures in 2020 were lower than 11 years earlier. Note, though, the steady-state rise in the global population over time. Consumption rose at a far greater rate than population. With all the electrification projects globally, demand for copper should increase even more rapidly.

The same for oil companies: lower capital expenditures than 14 years earlier while, of course, the same population expanded.

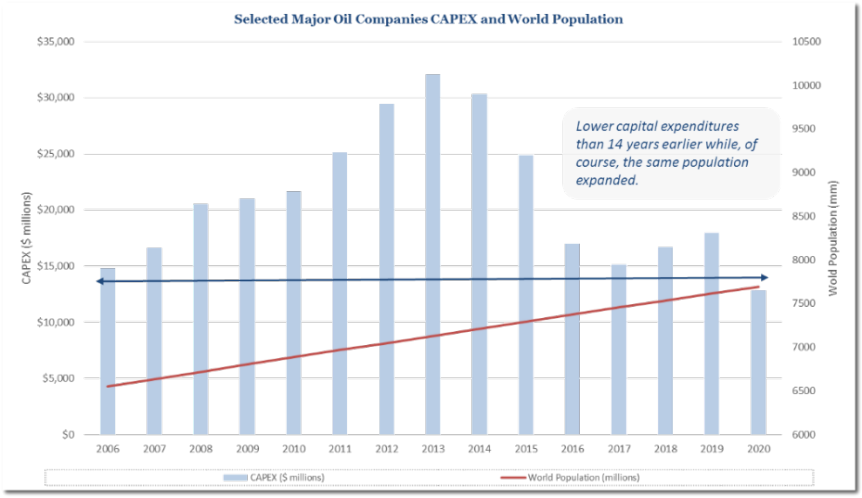
In the case of the oil companies, there's also the reserves history: stated reserves are now lower than in 2006, but global consumption is 15% higher.

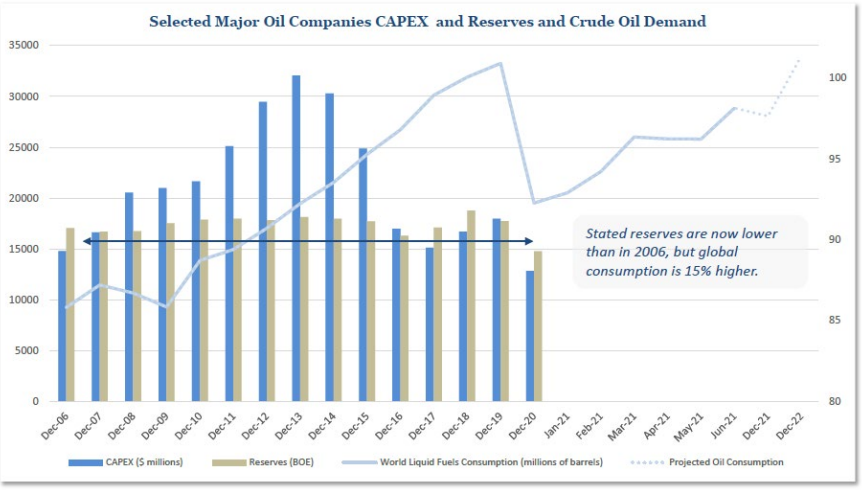
With that as background, recall the previous table of price changes in an array of key global commodities, from *before* the pandemic began through today. One must interpret: is that a temporary, supply-chain effect, or is it structural? If it's structural, it is beyond the Federal Reserve's power to control, and it isn't transitory. If it isn't transitory, then input costs will eventually invade output prices.

If one is looking for something transitory, the excess oil inventories of last year were transitory. Demand temporarily declined precipitously, supply declined more slowly, since producers are reluctant to shut wells for fear of damaging them, so inventories



Source: ICSG.org, Census.gov International Data Base, Bloomberg





CAPEX and Reserves are calculated based on an equal weight average of XOM, CVX, BP. Source: Bloomberg. World Liquid Fuels Consumption Source: EIA, balance of FY 2021, and F2022 are projections

swelled. The excess inventory disguised the ongoing recovery in demand and delayed oil price increases. The inventories were a temporary source of excess supply. That they would be drawn down was inevitable.

Inflation Beneficiaries vs. Index-Standard Companies:
Different Kind of Business Model, Different Kind of Portfolio

What does it really mean to say a company is an 'inflation beneficiary' or 'asset light'? In practical terms, how is that different than a regular company, and why have we been incorporating them into portfolios?

Because in a pure business analysis sense, the type of business that can prosper during a period of inflation has characteristics that inherently make them a lot better and safer, and I hope to show you how. Below, is a sampling of a dozen or so companies drawn from our equity strategies. They encompass a range of industries, and each is matched up with an S&P 500 company from the same industry group. It's for a compare and contrast exercise. In the Mining Sector, for instance, the S&P 500's exposure is Freeport-McMoRan; for us, Mesabi Trust is one of our 'higher-order' exposures to mining. Freeport is a copper miner; Mesabi gets iron ore royalties. The S&P has its version of Real Estate companies, Health Care, Aerospace & Defense, and Energy, and we've got ours[10].

Industry Group	Market Sector/Industry	S&P 500 Member; Standard Business Model	Inflation Beneficiary Model
Materials	Metals & Mining (base metals)	Freeport McMoRan	Mesabi Trust
Materials	Metals & Mining (gold)	Newmont	Franco Nevada
Real Estate	[Timber]	Weyerhaeuser REIT	CatchMark Timber Trust
	[Development]	AvalonBay Communities	Dream Unlimited
Consumer Discretionary	Automobiles	General Motors	AutoNation
Financials		Bank of America	Intercontinental Exchange
Health Care	Pharmaceuticals/Biotech.	Johnson & Johnson	Charles River Laboratories Int'l
Aerospace & Defense		Lockheed Martin (LMT)	CACI Int'l.
Consumer Staples	Food	General Mills	Archer Daniels Midland
Industrials	[Clean Energy/Renewables]	Sunrun, Inc.	Altius Minerals Corp.
Energy		ExxonMobil	Texas Pacific Land Corp.
Energy			PrairieSky Royalty Ltd.
[Marine Shipping }			Clarkson plc

[ ] = not in S&P 500 Index

In the next table, a handful of these pairings are evaluated, one alongside the other. There is a tendency, in investing, to want to perform such analyses with spreadsheets, with an identical set of data fields for each company, so that all of those fields can be infilled instantly from a financial database. The financial database gets the data from the companies' SEC filings. It's all very comprehensive and tidy-seeming.

But each business model has different characteristics and idiosyncracies. Even the same company can have contrary seeming characteristics. What if you're screening for profitable companies, and one company has net income losses every year, but has a very high free cash flow margin? Why is that? What

[10] *Companies listed are for illustrative purposes only. They may not be actual portfolio holdings*

if the answer is not in the data fields in the SEC filings, but is in a footnote that can't show up in a data field? There are too many variables in the real world to know about, define, and integrate into a database.

This comparison, then, will be an impressionistic one, a sketch, not a portrait. For each company there are a few important characteristics about the way it makes money. And they're not all the same. Does it take a lot of capital investment or assets to generate a dollar of revenue? Does it take a lot of employees to generate a dollar of revenue? Does the business have to purchase a lot of new plant and equipment each year just to stay in business, or can the profits be distributed or reinvested for expansion? A company with a high net profit margin might have no free cash flow, because its business demands high ongoing investment.

These are important business questions. They can suggest whether a company might suffer or benefit from a period of generalized inflation, or how badly it might suffer from a cyclical decline in its business. Will a cyclical decline just have an income statement impact, or will it reach into the balance sheet? We're looking for predictive attributes of how a business will fare, not just descriptive statistics like market cap or daily share price volatility.

An Exercise in Impressionistic Security Analysis

Freeport-McMoRan – *miner*
Employees: 24,500
Free cash flow margin, 2020: 12.4%
Cumulative free cash, 3 years: zero
Debt: 23.0% of assets
Dividend payments last 5 years, as % of share price 5 years ago: 5%

Mesabi Trust – *hard-asset royalty beneficiary*
Employees: zero.
Free cash flow margin: 90.2%

Debt: zero
Dividend payments last 5 years, as % of share price 5 years ago: 109%

General Motors – *manufacturer*
Employees: 155,000
Revenue/employee: $790,000
Revenue/$1.00 of PP&E*: $2.89
Avg. cap ex, last 3 years, as % of non-financial revenue: 6.64%
Free cash flow yield on PP&E: 11.1%
*Excluding finance revenue and assets

AutoNation – *dealer*
Employees: 21,600
Revenue/employee: $914,000
Revenue/$1.00 of PP&E*: $6.16
Avg. cap ex, last 3 years, as % of non-financial revenue: 1.42%
Free cash flow yield on PP&E: 33.5%
*Excluding finance revenue and assets

International Paper – packaging & paper producer
Employees: 49,300, of which 14,300 in unions
Manufactured products include: cellulose fibers, containerboard, corrugated paper packaging, papers, commercial recycling
Net margin: 2.3%
Free cash flow margin: 11.2%
Avg. cap ex last 3 yrs, as % of 2020 revenue: 5.83%
Avg. cap ex last 3 yrs, as % of 2020 FCF: 52%

CatchMark Timber– *stumpage fee collector*
Employees: 25
Additional business: asset mgmt. (timber) for institutional investors. Mgt fees as % of total revenues in 2018, 2019, 2020: 6%, 11%, 12%.
Net margin -16.8%
Free cash flow margin: 35.1%
Avg. cap ex last 3 yrs, % of 2020 revenue: 4.56%
Avg. cap ex last 3 yrs, $ of 2020 FCF: 14%

Bank of America – *leverage lender* Employees: 213,000 Revenue/employee: $401,540 Compensation + benefits + SG&A, as % of rev: 64.6% Net margin: 19.3% Net margin adjusted for 10x leverage: 1.9%	Intercontinental Exchange – *croupier fee collector* Employees: 8,890 Net revenue/employee: $678,965 Compensation + benefits + SG&A, as % of rev: 22.8% Free cash flow margin: 38.6%
Lockheed Martin -- *manufacturer* PP&E, as % of assets: 14.2% Average cap ex last 3 years, % of 2020 revenue: 2.31% Long term debt as % of assets: 23% LT debt + accrued pension liabilities, % of assets: 48.4%	CACI International – *high-clearance analysts* PP&E, as % of assets: 3.1% Average cap ex last 3 years, % of 2020 revenue: 0.94% Long term debt as % of assets: 24.5% LT debt + retirement obligations, as % of assets: 28.3%
Sunrun, Inc. – *residential rooftop panel installation* Renewables sector: solar panel installation Employees: 8,500 Revenue/employee: $108,500 Operating loss margin, 2020: -50.4%	Altius Minerals Corp. – *royalty buyer* Renewables-sector resources royalties: wind and solar projects, strategic metals, potash Employees: 15 Revenue/employee: CAD4,004,000 Free cash flow/employee: CAD1,852,000 Free cash flow, % of revenue: 46.3%

Source: Horizon Kinetics Research and Company reports as of most recent annual report

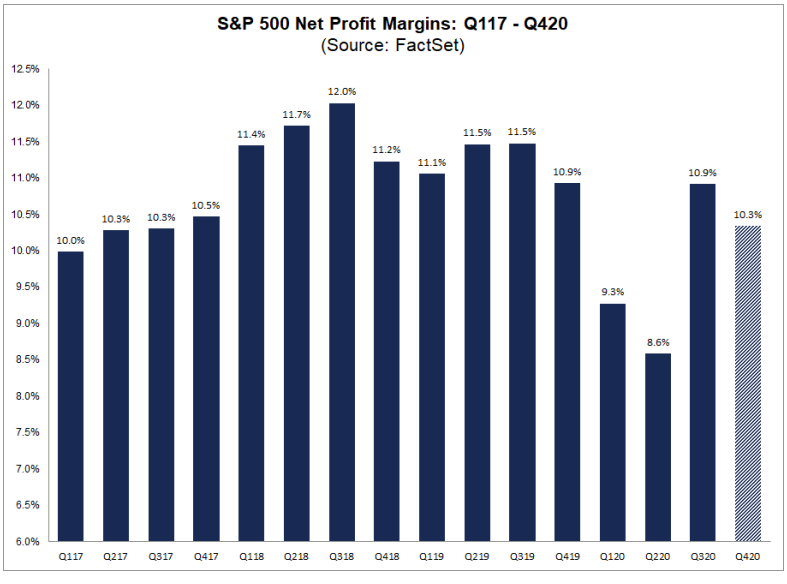
The comparative differences between these two approaches, the left-hand and right-hand columns, are pretty stark. Some of the common advantages of these asset-light inflation beneficiary companies:

- They can generate more dollars of revenue per dollar of assets invested. In an inflationary environment, that means that less of the operating assets on the balance sheet are vulnerable to replacement-cost increases.
- If less employee-intensive, the business is less subject to inflation in compensation or benefits. There is less risk of non-debt obligations, such as for pensions and post-retirement health care.
- With less physical operating assets required and less in the way capital expenditures, there's more free cash flow available to distribute or reinvest.
- Also shown was the highest form of asset-light business, which is a hard-asset company, like Mesabi Trust or Texas Pacific Land Corp: their revenues come directly from the asset itself, as processed by third parties. With no operating expenditures required, they are passive beneficiaries of any increase in the price of the commodity and any increase in production volumes by the third parties that bear the capital investment and operating costs. No other business model can replicate that level of profitability.

What this table did not cover is valuation. What's expensive, what's cheap? A good business that is too expensive is not a good investment. The most expensive business in the table is Sunrun. Sunrun is the nation's largest residential rooftop solar panel system seller/installer. Sunrun's valuation might also shed

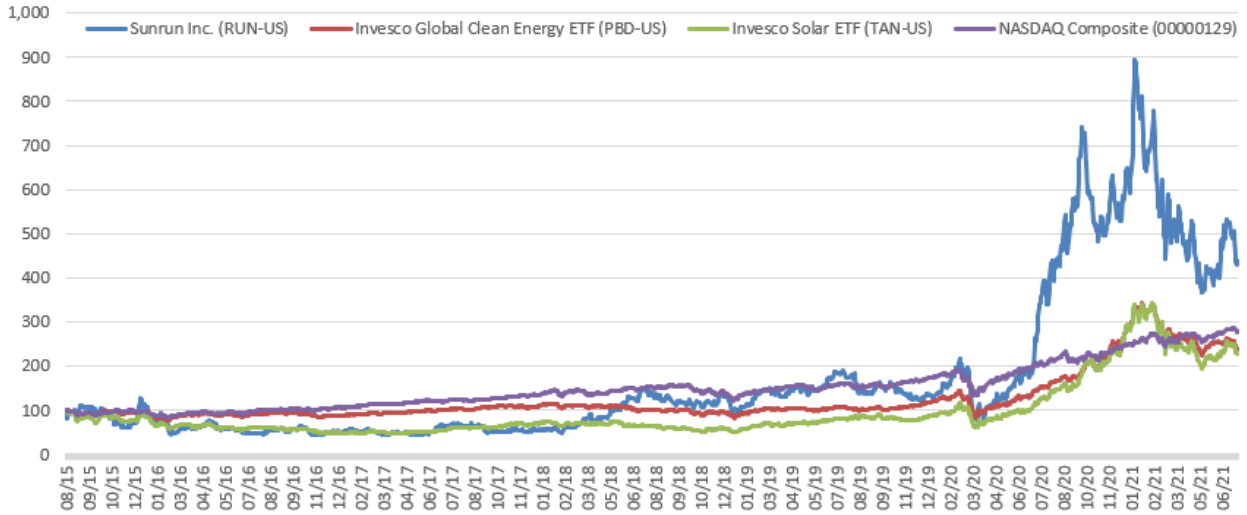
light, sunlight or otherwise, on one of the questions we started with, "Is there a bubble in clean energy stocks?" Let's try to see what too expensive is:

- **Sunrun** is a popular clean energy company. It's the 65th largest of 400 holdings in the iShares Core S&P Mid-Cap ETF (IJH), which has $63 billion of assets under management. It's #11 of 125 in one of the largest clean energy ETFs, the Invesco Global Clean Energy ETF, which has over $400 million of AUM. Sunrun itself has a stock market value of $9.5 billion.
- The company's thesis is that it can participate in the enormous market expansion opportunity for rooftop solar, which is still less than 1% of the U.S. residential electricity market. Solar panel installation growth in the next decade is projected to be 15%/year, leading to 13% penetration of U.S. houses. Installed systems would rise from 2.4 million today to 11.0 million by 2030.
- Thumbnail valuation:
    - To start at the top of the income statement, Sunrun shares trade at 10.3x *revenues*. The most profitable company in the S&P 500, Microsoft, trades at 13x revenues. Sunrun operates at a loss. Obviously, not only is tremendous growth anticipated, but tremendous profitability, too.
    - Let's simply accept that investors have correctly anticipated Sunrun's future success and make that the starting point for a valuation exercise.
        - If, 10 years from now, Sunrun is ultimately valued at 25x net income, and if today's $9.5 billion valuation is appropriate, that would require $380 million of net income ($9,500 million ÷ 25).
        - Let's say Sunrun will have the same net profit margin as the average S&P 500 company, which is 10%. That means it would need $3,800 million of sales to generate that level of earnings ($380 mill ÷ 10%).
        - Since sales are now $920 million, they would have to rise by 4.1x in the next 10 years. That would require annual sales growth of 15.2%.



    - You see how neatly that all works: investors accept the company's 10-year, 15% annual sales growth projections, and if a 10% net profit margin and a P/E of 25x earnings are reasonable, then the company will have a $9.5 billion market cap at that time. Except that is the current price. That means a 10-year return of zero.

- In order to get a 10% annualized return from the stock, Sunrun would need to be priced at a P/E of 65x its earnings 10 years from now, if at a 10% net margin. Or it would have to have some combination of lower P/E and higher growth and/or higher profit margin.



Source: Horizon Kinetics Research, Company Reports, Factset

- In the meantime, this is Sunrun's recent pattern of revenue growth and profitability (the company did recently increase its estimate of installed-capacity growth in 2021 from 20-25% to a new estimate of 25% to 30%):

	2020	2019	2018	Q1 2021	Q1 2020
Revenue Growth	+7.4%	+13.0%	+44.3%	+58.9% (vs Q1 2020)	
Operating Loss ($mill)	-$465	-$216	-$122	-$178	-$63
Operating Margin Loss	-50.4%	-25.1%	-16.0%	-53.3%	-29.9%
Interest Expense, % of sales	25.0%	20.3%	17.3%	22.2%	23.7%
Free cash flow margin loss	-139.6%	-122%	-115%	-162%	-154%

Source: Horizon Kinetics Research, Company Reports, Factset

For the time being, Sunrun loses an extraordinary amount of money, an amount that has been getting larger. Perhaps there are scale economies that will manifest in the future, so that it will attain profitability. Perhaps from the roughly one-half of Sunrun's revenues that are from long-term customer service agreements that run up to 25 years. For now, though, the company would seem to require a lot of external financing, and that is one of the greatest of business risks.

As to **Altius**, it has exposure not just to solar power, through royalty agreements to fund solar installations, but also to wind power, and to critical renewable energy raw materials, like copper, cobalt, and nickel, and to potash fertilizer, which is increasingly necessary as the world's per-capita arable land perpetually declines. Altius is more favorably diversified both as to growth possibilities and risk.

The table above (page 18) already displayed that Altius has a free cash flow margin of 46% – it is an immensely profitable company, though not an immense company. Its market cap is only $520 million, only 5% that of Sunrun. It is like Sunrun in one respect: it trades at a comparable price to revenue multiple, 11.5x. Except that Altius is not expensive; on a price/free cash flow basis, it is, at 24.8x last year's figure, about the same valuation as the S&P 500, despite being of far higher business quality.[11]

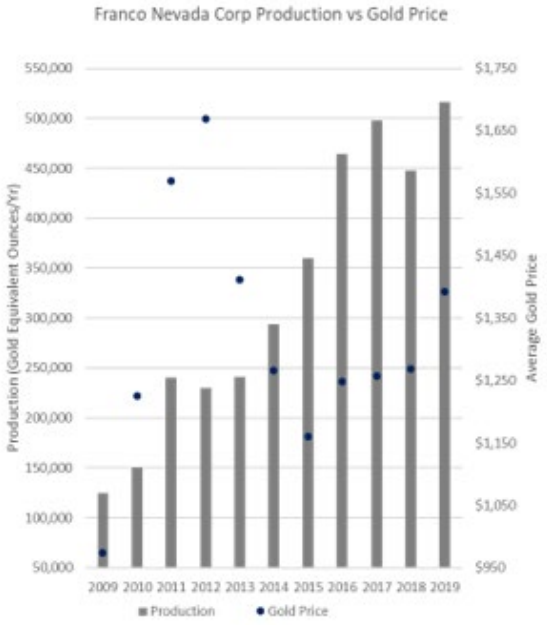
Another word about what "high quality" means in the business model sense. Say that a firm with significant capital to invest is attracted to the renewable energy sector. It wants to fund wind and solar power projects. One can see, by reference to Sunrun, that this could be a higher-risk activity for a lender, like a bank, or for an equity investor, like a venture capital fund.

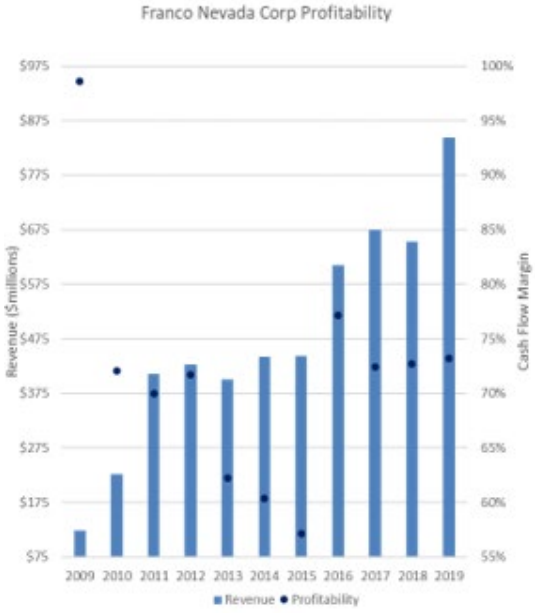
However, a royalty company does not require that the project it funds operates profitably. Altius receives a royalty on *sales*, in the neighborhood of 3%, for the life of a wind or solar project. The project can operate at breakeven or even a loss – so long as it operates. It is not entirely without risk, because some projects might fail, but presumably there is underwriting judgment at work.

Further, if the project, which will sell electricity, has been structured with price escalators to accommodate higher maintenance or other operating costs over time, that would simply be additional pure profit to Altius even if, at the project level, the increases simply cover the higher cost of doing business. That is an inflation beneficiary.

You can see why we are attracted to this model. Altius, by the way, does not seem to qualify for index inclusion; I have yet to locate it in an ETF.

At right are a couple of visual representations of the historical manifestation of the royalty profitability model.





Source: Horizon Kinetics Research, Company reports

[11] https://www.macrotrends.net/stocks/charts/SPXC/spx/price-fcf

Speaking of ESG Investing

This leads pleasingly into the topic of ESG investing. ESG is now a central issue in investing, and it has rapidly achieved near universal acceptance. It is also an exceedingly complex topic, much more than you'd think before you ask a question or two, so there will be only a few glancing comments today, just an introduction for future discussion.

There are only a few reasons to invest in companies or funds with an ESG focus. One reason is a sense of engagement in the environmental and ethical intent of ESG. Another is simply investing for investing's sake – engagement in profit-making – and using an ESG fund to do so. A third reason would be an externally-imposed policy decision: a manager who has been restricted to funds or companies with a certain minimum ESG rating; in this case, there isn't a sense of engagement so much as a business-as-usual frame of mind.

In all cases, though, you presumably want to know what you're buying. If the goal is simply maximal investment return, you should still be aware of the Sunrun valuation risk. The Sunrun risk level is not unusual in this hot market, which is replete with venture- and early-stage companies and ambitious growth expectations. This is a fairly straightforward challenge to meet – it just requires some modest amount of company-by-company analysis.

But if the goal is to support or encourage corporate behavior that is consonant with the goals of ESG investing, or to avoid association with bad behavior, you would be hard put to do that in an informed way using ESG ratings. You might think it should be easy, but it's not. Who actually establishes ESG ratings, and what are the criteria they use? Do the criteria differ from one rating agency to another – what if a company has a high rating from one agency and a low rating from another? Once a rater establishes the criteria, what methodologies or due diligence do they use to be sure that the companies actually do what they say they do?

You might wonder if such questions are too picayune, just a debate of statistical irrelevancies, because it seems simple enough: would you rather own a Berkshire Hathaway or an ExxonMobil?

Let's go to the specialists. Find a firm with the data collection capabilities and expertise to monitor whether companies are candidates for inclusion in an ESG index. An obvious firm would be BlackRock. It is the largest asset manager in the U.S., and its iShares ESG Aware MSCI USA ETF (ESGU), with $18.8 billion of assets under management, is the largest ESG ETF. This ETF has an ESG quality rating of 6.7, on a 10-point scale, which is superior to the S&P 500's rating of 5.8. It's probably no surprise that Berkshire Hathaway is the 19th largest holding, out of 353, in this ETF.

It probably ***is*** a surprise that Berkshire Hathaway is the 4th largest emitter of greenhouse gasses in the U.S. It might be more surprising that Berkshire Hathaway emits more than 2x as much CO_2 equivalent gas than ExxonMobil.[12] So, is Berkshire Hathaway worse than ExxonMobil in the "E" criterion of ESG?

[12] Statista.com, from University of Massachusetts (Political Economy Research Institute)

It's more complex than that. This data, by the way, is not a criticism of Berkshire Hathaway, as you'll see in a moment. It does point out why questions about criteria and methodology actually *are* important. Does the ESG rating you rely upon to make a decision actually represent what you think it does? Because one of the reasons for Berkshire Hathaway's high gas emissions is that it owns a large portfolio of regulated electric utilities. What do electric utilities have to do with it?

Of all the CO_2 emissions in the U.S. last year, 36% was from the transportation sector, 29% from industrial activity, 20% from the residential sector, and 16% from commercial. BUT, in order to provide electric power to all those customers, electric utilities burn fossil fuels. From its intermediary position, the utility sector accounts for 32% of all end-use CO_2 emissions. Of all the CO_2 emissions from natural gas last year, 38% of it came from electric utilities, and 90% of all the coal emissions came from electric utilities.[13]

That will invite questions about electric utilities. There will be surprises there, too. Can electric utilities even do anything about their fossil fuel consumption pattern – that is, is it in their power to even change? Solar and wind power account for only 4% of total energy consumption in the U.S., so there's not much immediate choice. There is a lot to understand before taking a single ESG rating at face value. This recalls a borrowed phrase we used to use for index investing, the trademark slogan of 35 years of radio and television broadcasts from a once popular clothing retailer: "an educated consumer is our best customer."

As for ExxonMobil, that is position #28 in the same ESG ETF.

There may be more effective and transparent ways to identify companies that are truly consonant with the aims of ESG investing and, at the same time, serve the aims of investing well.

The asset light business models we've been employing are not a dedicated ESG security selection methodology – more focused ones can be devised – but intrinsically they should rank quite high in an ESG framework. Many of them, such as the securities exchanges, have very simple and transparent operations and already function under government regulatory oversight, so that there is already a strict compliance structure in place, should the government wish to impose changes. Portfolio exposure to the auto sector (companies like AutoNation and IAA auctioneers) entails a parking lot and handful of sales personnel, not massive factories; our defense industry exposure (CACI, SAIC) is via intelligence analysts and IT systems integration and cyber-defense specialists, and communications engineers, not aircraft carrier and missile manufacturing; materials sector exposure is through one of the ultimate renewables: timberland. If I want broad exposure to interest rates, global exchange rates, and global GDP growth, I'd prefer an essentially unleveraged securities exchange with 4,400 employees (CME Group) than a 10:1 leveraged spread-based lender with 255,000 employees (JPMorgan Chase).

It's not the only way, and it might not be **the** right way, but it's a different way.

[13] U.S. Energy Information Administration

Speaking of Cryptocurrency (as an ESG-centric investment) (?!)

And this leads, surprisingly, to cryptocurrency, specifically, bitcoin mining. The impression exists that the Bitcoin network uses tremendous amounts of electricity, on the scale of small countries, and is a major contributor to greenhouse gas emissions. The public discourse focuses on the Bitcoin proof-of-work algorithm, which is the process by which transactions are validated. The fear is that as the bitcoin price rises, more miners are incentivized to enter the mining market, which will further contribute to bitcoin price increases. Essentially, the model is that of the vicious cycle in which there is no limiting factor.

As with any topic that is more complex than a casual observer even realizes, a seemingly obvious conclusion can be surprisingly different than reality.

First step, what is the Bitcoin network's power consumption?

Because of the transparency of the Bitcoin open-source network, the data necessary to calculate the system's total electric power use is readily available on the internet[14]. I'll be giving some detailed figures, so that some confidence may be had in how the answer is derived. To ease the narrative, some of them are footnoted. There are more detailed methods, with a few more steps in the calculations, but the answers are consistent.

The computing power or processing speed of a crypto mining server or rig is the so-called hash rate. The hash rate of the entire network as of yesterday was about 100 Exahash (EH) per second. Over the past few months, it has ranged from around 100-180 EH/s, so we'll use the high end of this range, just to be analytically conservative. Assuming that the mining is predominantly done with the Bitmain S19 Pro mining rig[15] (more on which below), then the entire Bitcoin network consumes roughly 5,318 megawatts (MW)[16]. That works out to 1.6 million rigs,[17] if you were interested in an idea of how many there are.

What exactly is 5,318 megawatts? This figure can be made relatable by using the standard benchmark that one MW is sufficient to power 100 average households. In that case, the Bitcoin network's current energy consumption of 5,318 MW is sufficient to power roughly 532,000 households. With 116 million households in the U.S., this represents 0.46% of total household demand. But households account for only about half of total U.S. power consumption, with governmental, industrial, and commercial users accounting for the balance. Therefore, the entire Bitcoin network consumes around 0.23% of total U.S. electricity usage. But Bitcoin is a global, not just a U.S., network. Since the U.S. might account for about 20% of global energy consumption, the Bitcoin network would be 0.09% of global consumption.

There's still an abstractness to such figures. Can we compare that level of power consumption with a more relatable use, some other activity that relies on the internet? In 2014, data centers consumed about 1.8% of total U.S. electricity[18], or almost 8x Bitcoin's current consumption. That's the electric power for our cloud computing, movie streaming, video and other data storage. Think Netflix, Zoom, YouTube.

[14] https://bitinfocharts.com/comparison/bitcoin-hashrate.html#3m
[15] https://www.asicminervalue.com/ for the power consumption of the S19 Pro, which is 29.5 watts/TH
[16] 180 EH/s network hashing power = 180 million TH/s. 180 mill TH/s x 29.5 w/TH for Bitmain S19 Pro = 5,310 mill watts = 5,310 MW.
[17] 180 EH/s total network hashing power = 180 million TH/s. 180 million TH/s ÷ 100 TH/s speed of S19 Pro server = 1,636,364 miners.
[18] https://ses.lbl.gov/publications/united-states-data-center-energy

Still, how can some of the widely publicized estimates of the Bitcoin network's power consumption have been so off the mark? Some of those were based on the assumption that all Bitcoin miners use the Bitmain Antminer S7 mining rig, released in 2015. That rig is two generations behind the current model. That's not a minor matter, because the current S19 Pro model is 10x more efficient – that is, it uses 90% less electric power per hash. That's a big difference in the greenhouse gas emissions someone might have calculated, assuming no other methodological errors were made.

What About the Vicious Cycle of Runaway Power Consumption Growth?

One of the most basic, first-order-of-business things someone would learn about the Bitcoin issuance protocol, it that it incentivizes a *reduction* in energy use. Every four years, Bitcoin mining experiences a so-called "halving." This means that the bitcoin block reward is actually reduced by one half. One year ago, in May 2020, the bitcoin reward of 12.5 bitcoin was reduced to the current 6.25. That rendered the previous generation of mining machines obsolete, since their profitability was diminished, or perhaps entirely eliminated. As a matter of plain dollars and cents, a miner who had a 25% profit margin in April 2020 was facing, in simplified terms, a 25% operating *loss* unless a more efficient server could be purchased. If a more efficient server could not be purchased, that miner would have to immediately turn off the server and cease operations.

Bitcoin mining *must* become continually more efficient; it is structurally incentivized to do so. That is why there has been a 70% reduction in power use per terahash in just the past three years. There is probably no piece of electrical equipment in the world that has achieved this level of power efficiency that rapidly.

Mining Server Electric Consumption	*Release Year*	*Power Consumption (watts)*	*Hashing Power (TH/s)*	*Power Efficiency (watts/TH/s)*	*Decline in Power Consumption*
Bitmain Antminer S7	2015	1,293	4.73	273	
Bitmain Antminer S9	2017	1,323	13.5	98	-64%
Bitmain Antminer S19 Pro	2020	3,250	110	29	-70%
Cumulative, since 2015					**-89%**

Source: Bitmain, Horizon Kinetics Research

Nevertheless, even this figure is only temporarily valid, because the next halving is less than 3 years from now, in May 2024, when the miner's block reward will be cut by another 50%, to 3.125 coins. Merely to survive, the industry must constantly reduce its consumption of electric power. There is a vicious cycle here, but in the opposite direction than most people think.

What's this Business About ESG-Centric?

The unrelenting incentive for Bitcoin miners to reduce electricity costs – which is their largest cost – is not limited to awaiting more efficient servers. A differentiating feature of this industry is that rigs can be set up in any location that has an internet connection. Another differentiating feature is that they are highly flexible electric power consumers, able to scale up or down with demand, and to do this almost instantaneously.

This unique profile as energy buyers enables them to devise strategies to tap into the cheapest energy sources, including those that might not be economic to any other possible buyer. It this way, Bitcoin

mining has been proving to be an unexpected contributor to efficiencies among electric utilities – helping to keep customer bills down and reducing utility greenhouse gas emissions – and has even found ways to directly reduce greenhouse gas emissions. So much so that it is possible to envision the Bitcoin network becoming a net-negative emissions business sector.

One of the ways this is done relates to the significant amounts of energy that are lost in the transmission grid from sources that are located far away from their end-users. Of the 27,000 TWh of electricity production in the world[19], about 6%, if we use U.S. electric grid figures[20], is estimated to be lost due to transmission and distribution inefficiencies. That would be 1,620 TWh of wastage, which would be roughly 85x the electric power that the Bitcoin network consumes. Inefficiency losses are expensive. Call it stranded energy.

When bitcoin miners find locations near these power sources, they purchase much of the energy that would otherwise be lost. This cannot be done with gold mines, steel mills, or almost any form of business that deploys substantial physical assets. As a result of discount-seeking strategies like this, Bitcoin miners usually pay 2 to 5 cents per KWh in order to earn a profit; whereas, consumers worldwide generally pay 15 to 30 cents. This is why consumers can no longer expect to earn a profit by running bitcoin mining machines in their basements. It is also why the notion that Bitcoin miners compete with consumers for energy is simply not correct.

Bitcoin miners also tend to seek out renewable power producers, which assists that industry as well. An electric grid that is dependent on solar radiation or wind does not function when the sun isn't shining strongly enough, or the wind isn't blowing strongly enough. That is why nuclear, coal and natural gas plants are essential to balance the load and avoid blackouts. Importantly, they must generate sufficient capacity to handle the *lowest* possible output by renewable sources, *not* their highest – because those "baseload" power plants are the power sources of last resort; the back-up power has to be there.

Therefore, those 'baseload' plants are in an always-on mode, with the consequence that they produce excess, unused power at night, when everyone's asleep and electricity consumption is low. Those plants are still burning their natural gas or coal while we're in bed and don't need the power. That's why utilities are willing to, desirous of, selling that excess power to a miner, even at highly discounted prices. In exchange, the miner might agree to turn off some or all of its rigs whenever the utility needs to accommodate a spike in demand. Such instructions are sent electronically and can be executed in moments. This type of arrangement serves to *lower* the all-in cost of electric power.

Miners also step in when renewable power sources produce at their highest levels, when much of that output might exceed what the electric grid can accommodate. During those periods, Bitcoin "subsidizes" the production of renewable energy when it isn't otherwise financially viable. That relationship can actually facilitate an acceleration of renewable energy infrastructure.

These load balance challenges for the electric grid get exacerbated as renewables become a larger portion of total power production. This past December, a group of three counties in Vermont – the state with the

[19] https://www.iea.org/reports/electricity-information-overview
[20] https://www.eia.gov/totalenergy/data/flow-graphs/electricity.php

6th highest number of solar installations per capita – placed a two-year moratorium on new renewable projects because the electric grid could no longer handle the power. This has had a negative financial impact on local utilities that invested in renewable projects. The planning director of the Dept. of Public Service proposed a per-kilowatt-hour surcharge on net-metered solar projects in the region.

No small number of large-scale Bitcoin miners try to place their servers near locked-in natural gas wells in order to use methane as a power source, methane that might otherwise be flared into the atmosphere. Atmospheric methane is estimated to have 80x the planet-warming effect as an equivalent amount of carbon dioxide, and natural gas wells are one of the largest sources of human-related methane emissions. By some calculations, there is enough flared methane worldwide to completely power the Bitcoin network many times over. With flared methane as an energy source, bitcoin mining could contribute greatly to a reduction of greenhouse gases.

Before I use too many more words, I'll use someone else's. In a couple of paragraphs, he nicely sums everything I just said, and much more effectively. To introduce him, I'll make the observation that many of the prominent early adopters of Bitcoin are people who are not institutionally constrained in their thinking or freedom of action. They have substantial capital to protect and think about their capital with a very extended time horizon. They are sensitive to the risk of purchasing power erosion of that capital over extended spans of time.

In our anecdotal experience at Horizon Kinetics, family offices, which fit that profile, took an early interest. In the public sphere, there are owner-operator companies like MicroStrategy, Square, and Tesla, which took a significant interest. What those companies have in common are CEOs who, through their own capital at risk in the form of controlling shareholdings, had the authority to do so.

An owner-operator with whom Americans would not be familiar is Kjell Rokke, Chairman of Aker Holding, a Norwegian industrial holding company with a 180-year history. The founding family owns two-thirds of the company, and Mr. Rokke is its largest shareholder. He recently established a subsidiary specifically to invest in bitcoin and projects and companies in the Bitcoin system, with a focus on the Bitcoin network's capability to reduce global energy waste, to advance the goals of the Paris Agreement treaty on climate change. He intends to continue to add significant amounts of capital to this subsidiary as it gains experience. In a shareholder letter, he described this new company, SeeTee's objectives:

> "SeeTee will establish mining operations that transfer stranded or intermittent electricity without stable demand locally—wind, solar, hydro power— to economic assets that can be used anywhere. Bitcoin is, in our eyes, a load-balancing economic battery, and batteries are essential to the energy transition required to reach the targets of the Paris Agreement."
>
> The letter goes on to say: "A miner uses electricity and is compensated with bitcoins. The financiers of mining operations will insist on using the cheapest energy, and so, by definition it will be electricity that has no better economic use. Bitcoin then acts like an economic battery. What otherwise was of

> little value locally, is turned into an economic asset that can be used globally. Extremely flexible demand from miners can optimise the local supply and demand for electricity, which may accelerate the energy transition by improving the economics for new renewable projects."[21]

It is plausible, with efforts such as these, that within a few years' time the larger part of the Bitcoin network's energy will be derived from stranded energy sources. Ultimately, the cryptocurrency could even have negative net emissions if methane (with its offsets) becomes a significant part of the energy supply mix. Bitcoin may yet have a prominent role in ESG portfolios.

TPL as an Indexed Company, and Other Developments

I confess to running out of time to fully prepare this last section, so pictures will speak for me, as well as some over-abridged news articles.

The table at the right shows that oil production in the U.S. is 13% lower, as of April, than it was at year-end 2019. As of April, production is 0.7% higher than at year-end 2020.

However, it will be observed, that oil production in Texas was 11% *higher* since 2019. And 4.5% higher since year-end 2020.

More interesting to holders of Texas Pacific Land Corp., oil production in District 8 of Texas is 20% higher than in 2019, and 4.7% higher than year-end 2020.

Crude Oil Production

(thousand barrels/day)

		Texas**	
	U.S.*	Statewide	District 8
April 2021	11,169	3,598	2,047
Dec. 2020	11,088	3,442	1,956
Dec. 2019	12,802	3,245	1,703
Apr '21 / Dec '20	0.7%	4.5%	4.7%
Dec '20 / Dec '19	-13.4%	6.1%	14.9%
Apr '21 / Dec '19	**-12.8%**	**10.9%**	**20.2%**

* https://www.eia.gov/petroleum/production/

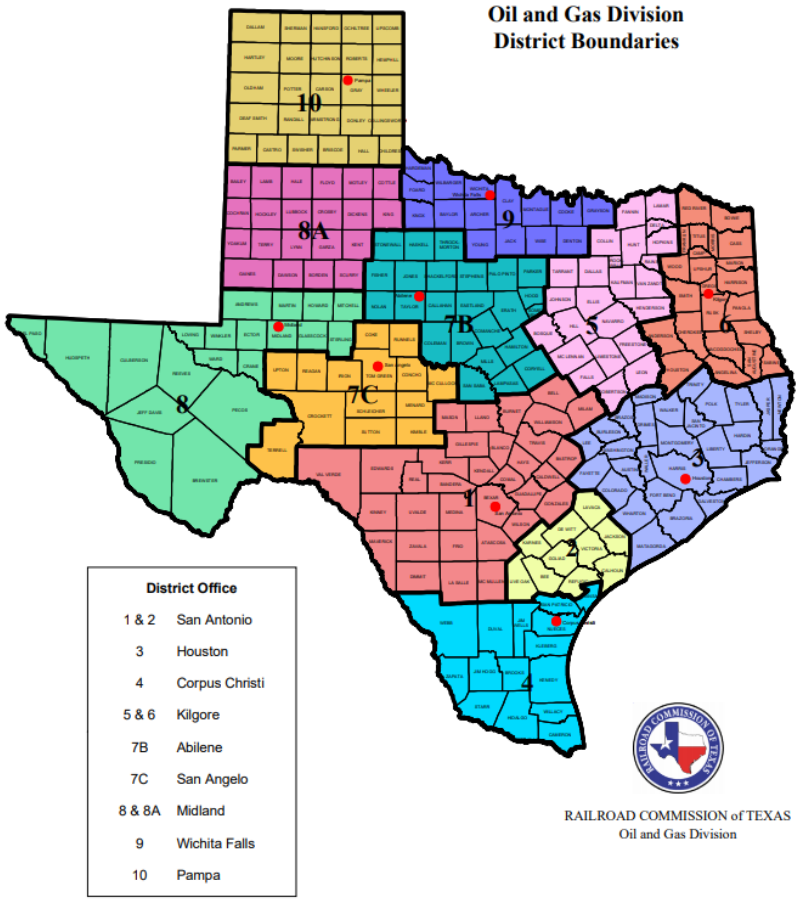
** rrc.texas.gov

[21] https://www.seetee.io/

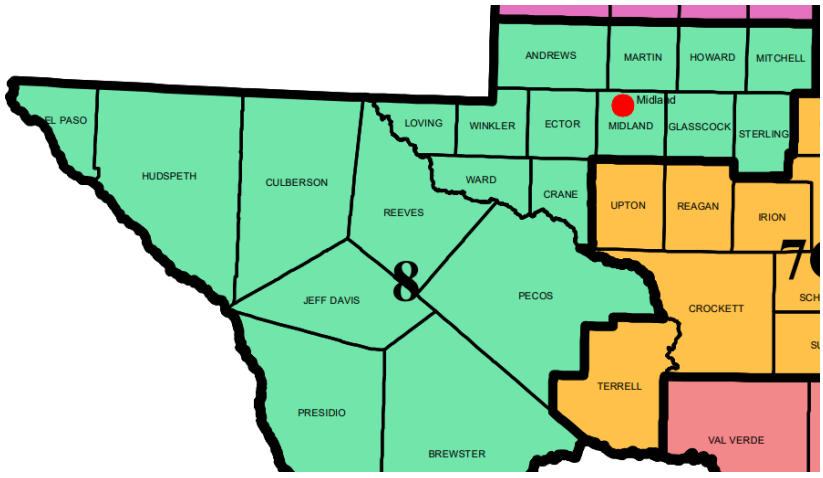
Interesting for two reasons.

District 8 is just a small part of Texas – the green-colored counties in the accompanying map. Yet, without the increased production this year from District 8 (much less the entire state), total U.S. oil production would be down since year-end 2020.

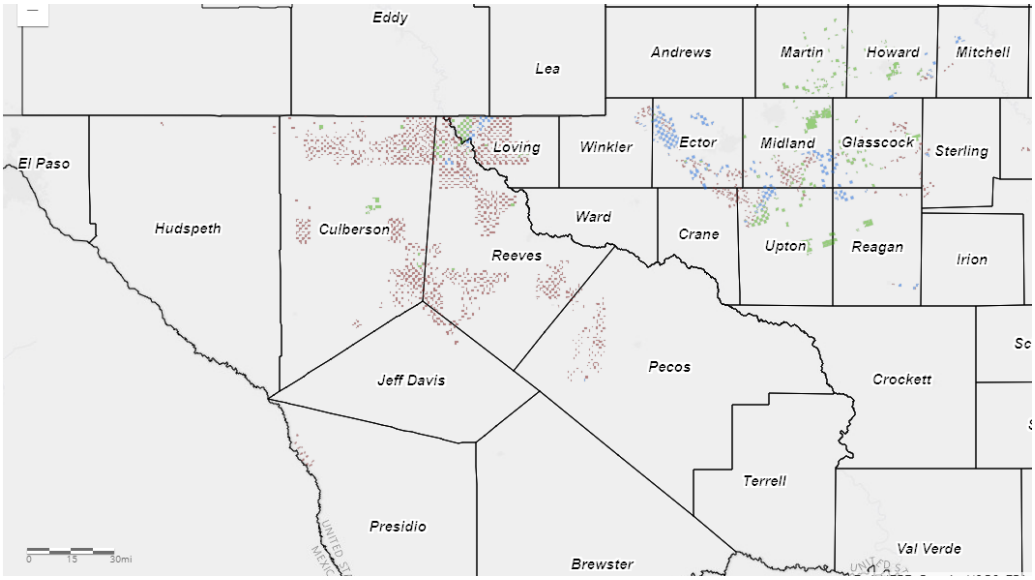
Also, most of the TPL royalty acreage and surface land acreage is in District 8.



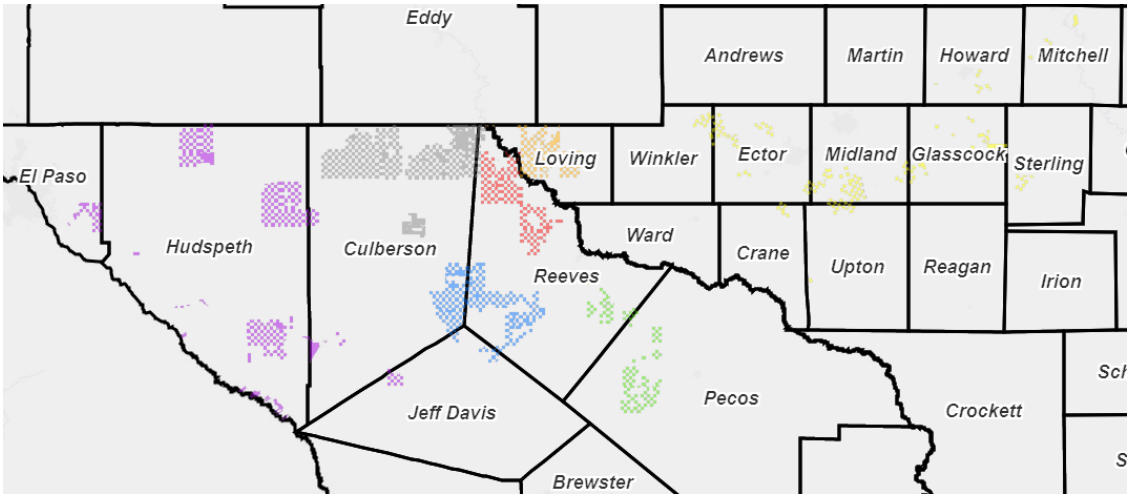
District 8



TPL Royalty Acreage



TPL Surface Acreage



TPL – Addendum

And a final question, which I put in the 'you can't win' category, was about the recent news that Texas Pacific Land Corp. is now included in over 30 indexes and ETFs. The question posed: isn't that a risk to the stock, since if it's in an index, then can't it also be kicked out of the index?

Yes, in the narrow technical sense, it is true that TPL's share price could be negatively impacted in the short term, if it were to be removed from any of the ETFs that currently claim the company as a constituent. If one defines risk as short-term price volatility, then it would be fair to consider this a possible risk. To be frank, though, how would this be any different than the TPL share price experience you've already had? TPL has been 'risky' on a price volatility basis for a very long time, as this five-year chart of the share price, alongside the S&P 500 index, needs no more than a moment's distracted glance to make plain:

However, if one defines risk as the potential for capital impairment, and that this potential is a function of a company's operating and financial performance, then no, that would not be a likely risk. One can look backward at the same chart and observe TPL's cumulative share price performance over the past decade while it was excluded from indexes. Likewise, one can look forward.

One important aspect of the TPL investment thesis is that the operators on its acreage, many of which are the largest, highest quality producers in the world, have been transparent and reliable when communicating and meeting their production goals in the Permian. For example, Chevron, which always met or exceeded its guidance for this region prior to 2020, still forecasts that its production in the Midland and Delaware Basin will roughly double over the next four to five years after a brief hiccup this past year. TPL should benefit commensurately, thus providing further support to the thesis that the company still has many years of growth ahead of it.

It is also worth noting that TPL's market cap is currently greater than approximately 10% of the S&P 500 constituents and that the company meets the index's requirements for liquidity and free float. Nothing is assured, but these statistics, combined with the company's growth trajectory, bode favorably for TPL's eventual inclusion in the S&P 500. If this happens, there would likely be a dramatic increase in the number of ETFs naming TPL as a constituent.

Based on data sourced from ETFdb.com, the companies in the bottom 10% of the S&P 500 are currently included in an average of 140 ETFs, with the fewest being in 87 ETFs. This compares to 32 ETFs for TPL. If this is a guide, it would appear that TPL is still more likely to benefit from the technical aspects of passive investing than suffer from them. Adding some game theory scenario analysis to this, ETF organizers are competing for dollars, as they must, since their fee rates have compressed to near zero. Unfortunately, there is an insufficient supply (there's the magic formula, again) of companies with the required qualifications: market value and trading liquidity, above all; above-market growth rate; increasingly, above average ESG rating; anything in the energy sector, since this is now an underweight but also a risk, since an underweight carries the risk of relative underperformance. With a shortage of inventory, I'd say that there's little doubt that the current momentum for TPL (speaking of which, it is already in the $1.8 billion Invesco DWA Momentum ETF) is in the direction of *more* index inclusion, not less.

Two final notes. One is an additional article, copied below, highlighting how *foreign* electric utilities are now establishing solar power projects in the U.S., in Texas, and even leasing land directly from TPL.

Also, lest I misrepresent myself as knowing more than I really do, I have deep resources backing me in endeavors such as this, including our team of research analysts. Ryan Casey is responsible for the heavy lifting of this TPL index-good/index-bad commentary and nitty-gritty, and Fredrik Tjernstrom for the Bitcoin energy consumption analysis.

https://www.nsenergybusiness.com/news/rwe/

RWE begins commercial operations of 100MW solar project in US

POWERSOLARPLANT
By NS Energy Staff Writer 07 Jan 2020

The West of the Pecos solar project, located in Reeves County, Texas, is spread across more than 700 acres of land

RWE's West of the Pecos solar project in Reeves County, Texas. (Credit: RWE Renewables).

RWE has begun commercial operations on its 100MW West of the Pecos solar project, located in Reeves County, Texas.

Located 75miles (120.7km) southwest of Midland-Odessa, the solar plant is spread across more than 700 acres of land leased from **Texas Pacific Land Trust** and Texas General Land Office within the county and is powered by nearly 350,000 solar modules.

RWE Renewables CEO Anja-Isabel Dotzenrath said: "The completion of our largest solar project in the U.S. is another good example of RWE's continued success in the U.S. market and our effort to diversify our portfolio across technologies. With a development pipeline of more than 10 GW our strategy for renewables in the U.S. is geared for growth.

"A very big thank you to all involved employees and partners, who made an excellent job in the smooth execution of this project. West of the Pecos underscores our commitment to being the partner of choice for the transition to a lower-carbon future."

West of the Pecos solar project is first for RWE in Texas

It is the first project for RWE in the state and is a latest expansion of its growing footprint in the US. In May 2018, the project secured a long-term power purchase agreement (PPA) for 50MW with SK E&S LNG, a SK E&S Co, a South Korean energy company.

As per the company, bringing the solar project online is part of its strong growth ambition in renewables business. The company provides an annual net capital expenditure for renewables of €1.5bn ($1.68bn).

Last November, RWE Renewables had entered into a 30-year PPA with Georgia Power, under which RWE's 195.5MW Broken Spoke Solar, a project coupled with 40 MW 2-hour battery energy storage device, will start supplying power in 2021.

The solar project, spread over an area of more than 1,575 acres, will be located in Mitchell County, Georgia.

https://www.currentargus.com/story/news/local/2020/11/12/operators-eye-renewables-oil-and-gas-operations-permian-basin/6254919002/

Carlsbad Current Argus.

Energy companies eye renewables for oil and gas operations in the Permian Basin

Adrian Hedden

Carlsbad Current-Argus

While the Permian Basin remained one of the U.S.' most active oil and gas fields, it could soon become a hotbed of renewable energy sources such as wind and solar.

The region which stretches across southeast New Mexico and West Texas was known for decades to have vast oil and natural gas reserves beneath the surface. But the desert regions also featured abundant sun light and wind and energy companies are looking to cash in.

Major oil and gas pipeline company Energy Transfer announced on Nov. 3 that it had purchased power from a solar farm being built in West Texas in Pecos County.

The deal specified that Recurrent Energy's Maplewood 2 Solar Project would provide power to Energy Transfer under a 15-year contract, Energy Transfer's first solar-dedicated contract.

The solar farm was expected to be in service by early 2021, per a news release from Energy Transfer.

https://www.greentechmedia.com/articles/read/texas-is-the-center-of-the-global-corporate-renewable-energy-market

Texas Is the Center of the Global Corporate Renewable Energy Market

The U.S. drove growth in global corporate renewables deals last year, with even oil producers now picking up the wind and solar habit.

KARL-ERIK STROMSTA JANUARY 28, 2020

A single U.S. state accounted for more than a quarter of all corporate renewable energy deals signed around the world last year. No prizes for guessing which one.

The global market for corporate renewable energy deals surged again in 2019, reaching 19.5 gigawatts of new contracts, up 40 percent over the previous record year of 2018, according to new figures from Bloomberg New Energy Finance.

Corporate deals were signed in 23 countries last year, but the U.S. accounted for virtually all of the market's growth. Contracted capacity rose only modestly in Europe; it shrank a bit in the Asian market. **Within the U.S., Texas continued its reign, accounting for 5.5 gigawatts of last year's deals**, said Kyle Harrison, sustainability analyst at BNEF and the report's lead author. That's more than Europe and Asia combined.

In some ways this is unsurprising; there are few places in the world where it's cheaper to build a new wind farm than West Texas. More surprising is the fact that roughly 80 percent of the corporate deals signed last year in Texas were for solar energy, a dramatic shift for a market long dominated by wind.

Another interesting wrinkle in Texas' white-hot corporate renewables market is growing demand from oil and gas producers. **ExxonMobil kick-started the trend in late 2018, Harrison said, signing up for 500 megawatts of wind and solar power in West Texas' Permian Basin..**

Last month, Baker Hughes announced deals with developers Apex Clean Energy and 7X Energy to source 100 percent of its electricity in Texas from wind and solar.

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