Transcript of Interview with Gregor Macdonald

Interview by Aaron Edelheit

February 8, 2021

*Lightly Edited for Readability

Aaron: Hi, Gregor, thank you so much for just agreeing to this discussion and conversation. I'm excited to learn from you! Diving right in.

Aaron: You have been very bullish on renewable energy. But from your writing, even you have been surprised at how fast it's growing. Can you explain what is going on for people that aren't studying the growth in alternative energy and how this lines up with industry projections and I guess the common narrative around or the commonly understood narrative around alternative energy?

Gregor: Sure. I mean, part of the explanation has to do with the unique properties of wind and solar, but the broader explanation has to do with growth and really the theory of growth or growth laws. And these theories of growth or growth laws are repeated across domains, across time. And if you're a venture capitalist, you're not only familiar with these growth laws, but they're the thing that's most important to you because they govern how quickly a small thing can become a big thing. And so, wind and solar are also stories of how a small thing becomes a big thing. What people perhaps aren't as aware of is wind and solar, like many other new technologies, actually had to spend a long time in the trenches being ignored and simply stuck in being small things. That was true in the nineteen nineties. It was also true between the year 2000 and 2010, even though investment capital got very excited about green energy between say 2005 and 2008. And that was partly driven by the pressure that was coming into commodities and the oil market. What was happening with wind and solar is that from a technological standpoint, they were still just almost immeasurable portions of the global energy system, really tiny, and they hadn't crossed yet those key economic thresholds to make them competitive economically. And so, the big upsweep that we started to see this decade, because this really gets going around 2010, that happens because of all the time in the wilderness. Right? To use a phrase that Winston Churchill used, that they just spent they logged many years in the wilderness.

And then, of course, and we'll get into this more. What began to happen was the manufacturing rate or the learning rate began to kick in. And when I explain the manufacturing rate or the

learning rate, I often use the example of a lawnmower. The first gas powered lawnmower is the most expensive lawnmower that's ever been built on the planet. It requires an enormous amount of human capital, investment money, trying to figure out how to make a prototype that safe so that your dad can use it at his house. It's the most expensive lawnmower ever produced. The millionth lawnmower is unbelievably cheap to produce. The profit is flowing on that lawn mower, to we'll call it the Toro company. And it's probably a better lawn mower than the first lawn mower. That's what's happened with wind and solar. And just to put a little sticky note on our conversation here, we should probably talk about offshore wind because there the learning rate has really done something revolutionary. So, to wrap this up and answer your question, the reason that people often feel like, wow, I missed this, wow, what happened? Where did wind and solar come from? They came from a long distance away. They were coming towards us for a long time and they finally broke over those key cost thresholds. And then end of story. They're just absolutely ferocious monsters of growth. And that's where we are today.

Aaron: So, I want to explore more of where we're going now because we're on this growth curve and you just said something that's like red meat for me to hear is about revolutionary things still happening. Can you explore what revolutionary things are happening and what should we be paying attention to, for example, in wind and where does that take us going forward?

Gregor: Ok. Before I get to wind, let me tell you a little story

Aaron: I love stories, so this is good!

Gregor: As a journalist and a reporter, I just try to soak up as much information as possible. And so, about a year ago, I sat in on a corporate presentation by a utility company called PacifiCorp. PacifiCorp is actually a subsidiary of a of Warren Buffett's Berkshire Hathaway. And like many American utilities, it has a legacy bag of assets that were built up essentially in the post-war period. A lot of the coal, some natural gas, and in recent years it started to add some wind and some solar. Now, utilities run sophisticated computational analytical models to try to figure out what every business tries to figure out, what's the optimal mix of its assets, where's the best place to invest next? What might be some future costs that are coming down the line that could really hurt profitability? And where should the company go in the future so that it is so that in the year 2030, it's in a good place. And so, to do this, they run something called a Monte Carlo simulation. And a Monte Carlo simulation, which I cannot explain to you on a mathematical level but what's wonderful about it is it spits out just myriad possibilities, like it will say, hey,

PacifiCorp, this is what you this is what would happen to you if you not only stuck with your coal, but actually built all your, built even more coal. And went one hundred percent coal to the year 2030. Here's what would happen if you went all wind. Here's what would happen if you went all solar. So, in the presentation, even the executives at PacifiCorp were surprised that every time they ran the model, putting in the new prices for wind and solar and the new future liabilities for coal, the model kept spitting out: close your call by 2028 oh, wait, close your coal by 2026 oh wait, close your coal by 2022 and then the next one you should shut all your coal down now and build wind and solar. Ok. So that's one example of how exciting this moment is, because we've completely departed the world of policy when it comes to figuring out should you build wind or solar.

And I haven't forgotten your question about..

Aaron: Wait, could you just explain what that means? I think that's a very important point. I think what you mean is that you no longer need government incentives to build renewable energy, which is good for all of us. Is that what you mean?

Gregor: That's correct. That is absolutely correct. You still need some government incentives in other areas, probably EV still, because that sticker price hasn't come down. We'll probably we'll probably get into that. But we've now fully departed from the from the world of needing incentives. There will always be some incentives. I mean, economies are complex. And one report I did a piece of journalism I did it was fascinating last year was I reported on how East Coast ports, right, which have been fallow for like 40 years, these are this been my part of the world where I grew up in New England, New Bedford, Massachusetts, New London, Connecticut, places like this that have been forgotten since World War Two, since they were fishing ports. They're now being revived as launch pads for what will be a new American offshore wind industry. And so probably someone five years from now will say, hey, that offshore wind industry got some subsidies through the state of Connecticut because the state of Connecticut threw some money into the port. And you know, the Norwegian company that set up the wind farm got a little help from that. But, you know, it's brushing all that aside, the offshore wind industry doesn't need subsidies anymore. It knows how to get the job done, deliver a product at a great price, make some profit for everybody, you know, along the way. So, yeah, that's where we are.

Aaron: And so, going back to the revolutionary part. What is exactly going on in wind that gets you so excited?

Gregor: Yeah, this also gets back to your original question, how even the experts were wrong. I guess I'll reluctantly call myself an expert, an expert in understanding our current position and where we're likely to go next. That's about as far as I'll claim my expertise. I'm not a material scientist or a wind power technician or engineer. OK, here's the thing that's just, Aaron, I've got to tell you, this is the thing that has really surprised me. So, the rate at which the cost to build new utility scale solar, I knew it was coming down. Right, like. What Warren Buffett actually went in and completed a big old project in California called Topaz, which at the time was the biggest solar array in the world. I've actually flown over it. In fact, here's a funny story. This is true. I was flying once from Portland to San Diego to attend Howard Lindzon's StockTwits conference. And a key part of my presentation was Topaz. Right? I wanted to explain to the audience that it needed to think about solar and wind, it needed to be cautious about oil and gas investments. And this was like 2016 that I think I went down to give this presentation. So, I'm sitting there on the airplane and I've chosen my window seat carefully to look over my slide deck. I look down and what do I see Topaz right there underneath me looks like a big black microchip on a circuit board of the desert.

So, I knew that solar was going in that direction. In other words, back to the learning rate, when you start manufacturing five hundred thousand lawnmowers, now you're learning a lot about how to make a lawnmower better and how to make it and have your input cost be cheaper and you get to the millionth. This is what was starting to happen in global solar last decade. China was really beginning to manufacture those panels and what was happening is a kind of deflationary boom was beginning. And this is another subject we might get into, but it was kind of hard to be a panel maker like a First Solar, because you're offering so much value in the technology and making better panels and get the price of your panels a little bit like microchips, it's hard to get pricing power. So, I knew that that was happening. But around 2016, I said to myself, you know, the one place where we're probably not going to see further cost declines and gains is offshore wind. It's like offshore wind is just a really hard thing to do. You need these massive ships and you're deploying these just improbably large pieces of infrastructure, and especially in the North Sea. I mean, like the North Sea is famous from the oil and gas industry for poor killing people and sinking boats. And so, I thought, you know, that's probably not going to happen. And then it happened, and it just sort of rips my face off a little bit. But it's another example of the learning rate. You know, it's another part of the energy sector that went through

the learning rate? Fracking! I mean, in 2007, 2008, I would have told you tight oil. Sure, it's there. And sure, you can get it out, but good luck making a profit, right? And so then fracking went through this amazing learning rate in which the techniques improve, the cost drops, the knowledge base increased, the tools to discover the oil and extract it got better. And so that's what's happened in wind power. And we've now got just crazy, crazy wind offshore wind power plans all around the U.K. and now, as I said, it's coming to the East Coast. But I mean, all those states on the on the eastern seaboard, from Virginia to my original home state of Massachusetts, have all signed on to deploying pretty big quantities of wind offshore. And they'll just run those cables right into those dense populations. So, yeah, the thing the thing that someone should write a book about cost drops and offshore wind, I think that would be, that book would go straight to the shelf at Harvard Business School. You'd want to study that and learn from that.

Aaron: And that's really interesting to try to absorb. Can you share just in numbers what kind of growth we're talking about in the US so that people can really understand? I don't know if you want to start in 2010 or in 2000? 2005? In solar and wind, what kind of growth have we experienced? And from reading your newsletter, you've been one of the most bullish on these and it's even exceeded your forecast. I'm curious of where you think it's going.

Gregor: Ok, well, you've asked the right person to explain the growth of wind and solar to an audience of people who are interested but don't necessarily understand these things because that's kind of like my game, is translating these somewhat semi scientific and data points to sort of a story that people can understand. I also have, I'm going to start out, though, with a helpful hint. We measure the growth of wind and solar power in two ways. We can measure the capacity, which is the actual hardware, right? So, like I mentioned, Topaz is a half gigawatt solar plant. You now have one gigawatt solar plants and Australia wants to build a 10-gigawatt solar plant. That would definitely be the biggest that the world has ever seen and just crazy, crazy, large. So, you can measure the capacity of these plants and gigawatts and by the way, that's exactly how you measure a coal plant and a natural gas plant. So, if you go to Wikipedia, if you live in the state of Ohio and you say, hey, I wonder what the size of these existing coal plants are here in the state of Ohio, you just Wikipedia “Ohio coal plants” and they'll tell you one is four tenths of a gigawatt. Another one is one point two gigawatts. OK, so that's a measure of capacity. But here's the helpful hint. When it comes to wind and solar, which do not run 24/7/365 like a nuclear power plant or a coal plant. What you really care about is the generation, the output. What you really care about is the volume of electricity that these plants produce. So, yes, when you look across the world, various countries will report how much solar they built in gigawatts, but what

you really care about is how much new solar generation was produced last year in China. Sure, tell me the gigawatts. But what I really care about are the terawatt hours. That's TWh. And in this world that we are moving into, which is going to be more of an electrified world, I'd say every person you know who is an investor in finance, you should get familiar with those three letters. Capital T, capital W, lowercase h. TWh. Terawatt hours. That measures the actual usable amount of electricity that's available to people and industry, to society. OK, so I'm going to describe the growth of American wind and solar, not in gigawatt terms, because that won't really help you fully understand how it's going. To describe it and what really matters, which is terawatt hours. So, I'm also going to just describe the share count first. OK, so like in 2011, combined wind and solar only provided 2.98% of American electricity. At that point, coal was still providing a very large amount of US electricity, and then there was natural gas, creating US electricity and also hydro. By 2014 combined wind and solar, we're providing 5.13% of US electricity. Wow, now that's not quite a doubling from 2011, but look at that, just in three years. Wind and solar goes from 3% to 5%. Now, we come five years forward from 2014 to 2019, 9.65%. Ok, there's a doubling! That's five to basically 10 percent in five years.

OK, now, let me just pause here. If you're an investor in a startup, if you're an investor in a new technology and you see that technology cross the 5% share level like wind and solar did in 2014, that's your go signal that things are about to get pretty exciting because as we know from, again, growth studies and growth laws, uptake of new technology, it's called in a business book “The Diffusion of Innovation”. Some people think of it as an S curve, right? Long, slow, plodding, no growth at the bottom. And then all of a sudden, boom, it sweeps upward majestically and then the growth tapers off. We're in that fat part of the curve. We come up off the bottom.

Aaron: I'm curious, in terms of that body curve, what was it in, in like 2000 or 2005? Do you have those figures?

Gregor: I do. I'd have to load up my Excel spreadsheet, but I can tell you it was either at 1% or below 1%.

Aaron: Ok, OK, no that's helpful. Just in terms of thinking about like that, it was at 1% slowly increasing to 3%. And so, I look out to 2030, where do you now think that market share is going to be?

Gregor: Ok, that's a good question. Now, so the barrier that… Let me put it this way, not barriers, the hiccups to getting to much higher shares has nothing to do with the capability of wind and solar. It'll have to do with how much intermittent, intermittency from wind and solar, can our power grids handle and so from this year, 2021 to 2030, wind and solar will be standing right there available to grow as much as we want them to grow at an affordable price. But we're going to need to start pairing them with what I call big box storage/grid level storage so that when the wind blows at night in Texas, Texas combined wind and solar in Texas provides more than 20 percent of the electricity that Texas needs. But it's very weighted towards wind, which blows at night. Texas is going to need some batteries. It needs to bank that surplus wind power at night so that it can get fed back into the grid during the day from a battery. You know how Texas is handling its great volumes of wind power already? The local utilities basically have these great offers, if you're a Texas resident, charge up your car at night run your dishwasher at night, charge up your home battery at night, do anything you possibly can after 9:00 p.m., because that's when all this surplus electricity is available on the grid. So, when you ask me generally where we're heading towards the year 2030, we're probably heading past 30 percent share. OK, that's generally where we're heading because we're at 12 percent now.

Aaron: Wait, we just went from nine 9.65% in 2020 and we're at 12 percent?

Gregor: Yeah. We made that big leap in one year. Now there's a little baseline adjustment there.

Aaron: I saw on your newsletter because of the decline. Yeah. So here's an interesting question. If we had the storage, the battery storage technology and the infrastructure in place. Where do you think the market share could be?

Gregor: Yes, so I'm glad you asked this, because I'm not an absolutist and I recommend that people not measure the success of wind and solar by whether or not it can provide 100% of the world's electricity. You show me a world where wind and solar provide like 65 or 70% of global electricity and I just plant my flag and say we won the war at that point.

Aaron: For sure, that's what I mean. I'm not assuming that you're going to get 100% and it's probably not wise from a diversification. Yeah exactly. Yeah, but once you get to, once you get past 50, the amount of traditional energy that you need has to be so much lower, right?

Gregor: That's correct. And there's also another adjustment. Now here's a very upper-level concept, which I see it arising in our conversation. I'm just going to throw it out there. This is you know; this is for the advanced class and for further study. But I'll just explain it this way. And it's a weird one. It's counterintuitive. We can run the same world economy using renewables but using less energy with renewables because renewables are so much more efficient compared to fossil fuels. Fossil fuels lose at least 40 percent of the energy that we burn goes into the atmosphere, right? So, like the amount of energy that it takes to move an electric vehicle one mile down the road is at least 40, is at least 60 percent less and really more like 70 percent less than the amount of fossil fuel energy it takes to move a vehicle one mile down the road. Don't get me wrong, oil, petroleum, jet fuel are very powerful, energy dense miracle sources. So was coal, coal transform the world. Let's let's be clear about that. Coal powered the industrial revolution. No coal, no industrial revolution. You might have had an intellectual revolution. You might have had a revolution, a social revolution. You might have had a market revolution, but no industrial revolution without coal. OK, so they're amazing fuels, but they waste an enormous amount of their heat. It just it just escapes into the atmosphere. I mean feel the hood of your engine. After you've driven up from San Diego to Los Angeles. It's hot for sure. So that's that up in my little E-book, Oil Fall, I get into those issues. This concept was difficult for me to accept really when I first encountered it. But it is simply a thermodynamic energy physics fact that if you start running your system on wind and solar, you just have less waste loss. And that's happening in California right now. When you plug in an EV just to extend this comment, and we don't necessarily have to keep going with this, I just want to make clear when you plug an EV into the grid in Los Angeles, you're actually getting double efficiency because that grid has almost 25% of its electricity coming from wind and solar, whereas if you plug in that EV into the outlet in Ohio, you're not getting that double effect because you're basically plugging into a system that doesn't have much wind and solar and it's still coal and natural gas. Remember, the EVs are still just the EV in Ohio is just as efficient, going one mile down the road as the EV L.A. after you've unplugged. But what's coming out of the plug matters. So, this is a this systemic transformation that we're going through, it's top to bottom. It's from the left of the car and it's the level of the power grid. It's complete and it's going exciting.

Aaron: Yeah, very exciting. Going back to my question, if we had that the battery, big box storage set up, do you think that we could get to possibly 50 percent in 2030 if we had that? Not saying that we're going to get that, or is that will be too aggressive?

Gregor: I think that's too aggressive. But I do want you to know that we have the technology, we have the big box storage already. And its learning curve, right, the rate at which it's cost to manufacture and its affordability, its learning curve is behind wind and solar, it hasn't come into that juicy part of the curve where it's getting super cheap, but it is occurring. And if you actually look at the projects, the live real actual projects that are being deployed for, I'll give you an example. There is a there's a farmer owned community utility in the Great Plains states of Nebraska, Oklahoma, Kansas. And it's the utility itself is corporate headquartered in one of those states. They just did a big project last year. And by project, I mean planned a project of big wind and some solar. And they decided to pair a big box with it because big box storage has become affordable enough to start making that choice. Plus, put this another way Aaron, think of it as a whole system. Your big box is expensive, but your wind is cheap. You take the cheapness of the wind and you put the expensiveness of the big box together, your whole system starts to get a lot more affordable. Plus, that big box gives you options. It gives you arbitrage opportunities. It makes you a potential market maker in the market for electricity, right? You could come into the market when prices are high and offer electricity from your big box and grab those higher prices. OK? We're going to move into a world where electricity is traded algorithmically, right? With owners of assets like big box storage, being market makers. Right? They're going to take they're going to suck up their own surplus electricity when it's cheap and sell it back to the open market when prices are dear. Again, another sort of mind-blowing thing. It's already happening. Its already people have already, it's like I didn't figure this out. I'm just telling. I'm just reporting. We're already there. But just to cap off this answer, storage needs to become cheaper. And no, I don't think 50 percent wind and solar in the US electricity system, even in the best-case scenario, is quite realistic for 2030. I suppose I could be wrong about that. But I think that share from 12 percent last year to 50, I think that's probably too much. But I mean we're heading towards 30 that's the general grand sweep. I think we'll probably get above 30 and we'll see how the economy goes.

Aaron: And if I expand out the time horizon to 2040?

Gregor: Ok, well yeah.

Aaron: So, you’re talking nineteen years.

Gregor: Yeah, that's easy because as you know with exponential growth it's those eventually growth slows down. But in the belly of the S-curve you're just going a lot faster than anyone thought possible. Yeah.

Aaron: Are traditional energy assets, are they stranded assets?

Gregor: You know, this phrase stranded assets has become sort of a phrase of choice in recent years, I've got a couple of thoughts about that. So, there's always stranded assets as the world moves forward. Archaeological ruins are a form of stranded asset. When you go visit them on your travels to Europe. Most cities on the eastern seaboard have subway tunnels that are that are stranded, that aren't being used. And the way in which economies handle stranded assets is they, I would say they naturally amortize the losses over the year. You don't take all the losses in one year of the pipelines and the natural gas plants. You suffer them chronically from year to year. Right. So, yeah, there's going to be stranded. California already has shut down at least one or two natural gas plants that were built fairly recently because they're just not there. They're just not needed.

Aaron: Here's a better, maybe stranded assets is not the right phrase, but I'm talking to you as an investor, so maybe I should think of it more of are these now cigar butts? Are they the potential shopping malls that are being slowly decimated by ecommerce? What's the analog in other industries? Is it like, I'm just making it up, but is it like the CD rom versus digital streaming? You know, how would you have an investor, and I'm a value investor, right? So right now, it looks like energy is on sale and that there's going to be a mean reversion and I can make quite a bit of money. And I think that all of this alternative energy or that the world will have to move on from oil or natural gas is completely overblown. How would you talk to me as a value investor now feeling the pull from energy?

Gregor: Yeah, there's a couple of framings there that I think would be helpful to people when they "feel the pull" to, at the very least, enter oil and gas as a short-term trade. Unfortunately, old coal plants and old natural gas plants and also other fossil fuel infrastructure like, like pipelines and so forth, they're worse than old malls because there's actually a whole little cottage industry around the repurposing of existing malls and malls don't typically sit or create environmental footprint or environmental waste, residual footprints. So you don't have those environmental cost risks as well. But let me let me give you the framing that I think, I'm glad this is coming up, because I always like to answer this question, and I've thought about this fairly deeply. If you're

an investor. And you want to take a look at the energy sector. You need to think first about the difference between fossil fuel dependency and fossil fuel growth.

Let me define fossil fuel dependency. Even as bullish as I am on wind and solar, basically taking over the world, there will be fossil fuel dependency for the rest of this century, and you and I won't be alive and there will be fossil fuel dependency right up to the year, for the next 80 years. There will be a long tail of usage. Why? Because petroleum's a unique product in it. It's very key to agriculture. So just those natural gas to fertilizer, it's very key to the plastics and material science. And by the way, I'm pretty bullish on material science and petroleum-based uses of chemicals and so forth as we go forward into this century. But you must also pay attention to growth, and if there's no growth, you can't fall back on the dependency argument. This is the mistake that people often make. A typical conversation goes, hey, wind and solar are taking over the world and they're going to kill fossil fuels. Yes, but not quite like that. And then the other investor says, look, I don't think we're just getting on wind and solar fast enough, so I'm going to go long fossil fuels. No, that's a problem, too. He says we're not getting off oil so soon. Yeah, that's true. But what about no growth? See, the entire global coal sector went bankrupt. In 2012, 2013, 2014. OK, maybe not the entire, but the listed global coal sector that was tradable on stock exchanges, most of it went bankrupt around that time. Why? Because growth ended. You know where coal dependency is right now? It's not that far below those 2013 levels. Global coal usage is in a dependency phase, but there's no more growth. Who wants to invest in that? I mean, the only investment opportunity you've gotten global coal is to maybe buy some metallurgical coal on the futures exchange during a recession and then riding it back up as industrial activity restarts again and steelmaking fires back up again. That's it. And as far as I'm concerned, that's basically where oil and gas are right now. Of course, oil is a trade right now. We're coming out of a pandemic here. Global oil demand is going to grow at least six percent this year. But it's a baseline effect. It's going to grow six percent from the smackdown lows of last year. But it's not even going to get back up to the 2019 highs of demand. And now oil is just in a world of s.h.i.t. because it just doesn't have growth prospects of oil growth rate. The oil growth rate on an annual basis is already running into trouble in 2019. So, if you feel the pull towards energy and you want to play a refining the refining complex for a couple of months as we go into driving season, I can definitely understand people doing that. But it's no longer an investment. It just isn’t.

Aaron: What you're describing is that oil and gas become a trade, which really is you're hoping to flip it to the greater fool, yeah, because there is no longer growth. So, you're just hoping

someone else pays a higher price, assuming that they have a rosier view of the future and the future is a no growth future. So, it's just a trade.

Gregor: Yeah. And, you know, there will be the typical sophisticated hedge fund strategies where you strangle or collar a basket of dividend paying stocks like Exxon Mobil with other offsetting trades so that you're basically just clipping the dividend, right? Like that would be like a, you know, a dividend carveout, you know, structured trade. So, there'll be a bunch of that going on. There will be vulture strategies for the oil and gas sector that will go on for years and years. I should say, though, you know, chemicals in material science, those are in a world that's going towards batteries and electric cars and wants to create lighter vehicles and the carbon fork on my new, I just got a custom-made bicycle made for me and it has a carbon fork on it. Excited about that. All these materials and things, that's all, that's all going to happen.

As I said, the long tail of petroleum use is there, but there's not going to be any growth for it. But you'll have a rebound year in 2021. You'll see. The data is going to come in and it's going to be like “global demand is off the charts! Americans are back in their cars!” Even the Europeans are driving again. You'll get that stuff like that. And maybe that maybe that story blows right through the traditional shoulder, what's called the shoulder season for energy investors in April and May. And maybe it blows right through to Fourth of July, but that's pretty much where the coal sector trade has been for 2013, just picking up some of those deep, deep lows, especially in the metallurgical coal, and that just getting out, you know.

Aaron: So I'm interested in something you said that that strikes me is that I hadn't considered before, is if you think about a longer tail for natural gas and for oil and in that maybe without some of these price spikes or just a more sustainably lower oil price, then maybe you'll have some opportunities to be an investor on the chemical side or the material sciences side that takes advantage of all this excess oil and natural gas that we will have available since it's not being used as part of the power transportation sector. Is it did I am I understanding that right?

Gregor: Yeah, absolutely. And you know, when oil gets cheap, those industrial users of oil, generally speaking, presumably they will go into the market and hedge their forward exposure for oil and lock in those lower prices. I took a look at the refiners in the last couple of weeks that their share prices are doing well. I'm just going to guess that, like, those companies have long institutional knowledge and talent for buying oil when it's cheap. And of course, that's awesome, because refining is just an arbitrage. You try to buy the cheapest barrel of oil you can and then

you bring the product to market during current retail prices. And that's how you make money. I heard Jeff Curry, who's from Goldman Sachs on a podcast the other day with Jeff Weisenthal and Tracy Alloway, the Oblates podcast on Bloomberg. I really like Jeff. When I back in the days when I was thinking almost every minute only about oil, he really helped explain the world. But I have to disagree. He's got this idea that there's going to be another commodity super cycle. And I've written in my newsletter, I wrote a whole big issue called Material World, and I acknowledged that deploying new energy technology and new EV at a rapid rate this decade will definitely bring a new call on commodities and resources. But the last time we had a commodity super-cycle was when a single enormous country, China, a sovereign, went through an industrial revolution. I just, I don't see that being repeated again. So, I disagree with the idea of a commodity super cycle, but I'm constructive. I'm positive about the outlook for commodities and resources this decade, not in any spectacular inflationary way, but definitely like little things like lithium and copper. Copper is a big, big part of renewable energy buildout, especially windmills, silver, even silver. Silver is a component in solar manufacturing and in fact, the solar sector has filled the hole left by photography for the global for the global silver production industry and back to the learning curve. Solar is getting better at using less silver per panel produced. But with the growth rate, solar industry is going to use a lot of silver, so I'm constructive on all these commodities and oil just did what you'll probably see it do multiple times this decade. It will go back down to $25, $20 dollars a barrel. It will go in lulls. It'll come back up to fifty or fifty-five and go back down again.

Aaron: So, you know what strikes me is what you said and I forget where I heard this before, but when you're really betting on these commodities you're really betting against technology at this point.

Gregor: That's true.

Aaron: And that's the kind of a, that's been a bad bet in a lot of ways, not all the time.

Gregor: If you're making if you're making a 10-year bet on copper, you're betting against technology, but you might not be betting against technology if you make a three-year bet on copper.

Aaron: No, that's a very good point. That's a very good point. And so, beyond the obvious, where are the opportunities that you think investors are not exploring?

Gregor: Well, I just think there are some basic investment themes that an investor who is not an expert in energy or infrastructure, I mean, the solar industry has a whole bunch of publicly listed companies, and you can, you know, you can get a basket of those companies and an ETF and like people should have like I mean, seriously, I just helped a family member set up a basic allocation portfolio for rebalancing every 90 days. And I helped them put in I think it was 15 percent or 20 percent to renewable energy, which was basically wind power, solar power, probably some batteries and things like that. I didn't want it to be much larger for them, but because I think maybe the share prices kind of go crazy or they sort of already have. So, yeah, I mean, I think and also an investment in solar is an investment in the power grid to a certain extent. I mean, there's an ETF that, I'm just like anyone else, I mean, I have retirement accounts, so there's an ETF that I've been in for a long time called Grid, I think it's first trust. It's just an index of electronic equipment makers. Right. It's like ABB and Siemens and Endphase and Solar Reg and Honeywell and things like that. Just to paint a broad stroke because I'm not recommending any individual names. But I mean, you just take a look at agencies like the IEA in Paris and they'll tell you how many trillions are going to be invested in the power grid, just the growth of the power grid, right? Just the actual physical thing and all the switching and the terminals and the batteries and so forth, that's just going to suck up trillions of dollars of investment to the year 2040. That's just like your average investor who's just saving for retirement should have some exposure to that.

Aaron: That's really smart. One of my favorite things is just and this is why I love this conversation is the older I get, the less I want to do trading and the more I just want to invest and have this secular tailwind behind me so I can sleep at night. And I don't really have to worry about any day or quarter because I know what's coming and what I love about what you just said, and it's going to make me go do a whole bunch of work on the main suppliers, you mentioned a few, to the grid is, you know what has to happen to the power grids, not just in the US but around the world. You know, the trillions of dollars that has to there, that are going to be spent and it doesn't take a rocket scientist to figure out, the precision would be very hard, but you don't need to be a rocket scientist to say that ten years from now that's going to be a great business or over the long term is going to grow faster than maybe economic growth.

Gregor: Yeah, and in fact, you know, just to put a little macro phrase on top of this, I've been writing for a couple of years now, as a way to really help people understand what is happening, what's going to happen is that the next unit of global GDP is far more likely to be built on top of

the power grid rather than liquid fossil fuels than it was 10 years ago and five years from now. That equation will basically continue to become truer and truer and truer as we move into this decade, and again, it that framing admits that petroleum will have the long tail. But back in the forties and fifties, economic growth was just super tightly coupled to the growth of oil consumption. I mean, it's just right there in the data in the post-war period and in the developed world, in Europe, Japan and the United States, you want a new unit of GDP? You'd better use a couple of new units of oil. That equation has broken down. And that's another way of thinking about, so if that's true, which I believe it is and it's already true, then that that tells you that the big sort of down the middle of the strike zone trend is electricity and the growth of the electricity system. And the as I said, the algorithmic air traffic controlling of electricity and then all the stuff you build on top of that, it's like the electricity system is going to become to be seen more as a more as a platform. It already is. Interesting little, your average charging company now, Aaron, take a charging company, right? There's a couple of charging companies SPACS at the moment. There are some existing charging companies that are owned by bigger companies. They're already in the power grid with their cool little technological devices that a EV user can use to soak up power when it's cheap and not take power when it's more expensive. See, that's the electricity grid as a almost like a stock market of electricity, basically with, you know, thousands of individual users and the companies as intermediaries getting for themselves what they need when they need it, prices when they want. Just that that's where that's where this is all headed. And that's why I said IEA is its mind-blowing number of trillions that will have to be invested in the power grid. By the way, the US has all power grid infrastructure in the same way it has old coal and old natural gas infrastructure. So, there's going to be a whole infrastructure upgrade cycle that's got to come as well.

Aaron: And what also strikes me is that with all the speculative fervor around, well, a lot of it in electric vehicles, but also in battery and LIDAR and now charging stations. Is all of this money, it's only going to accelerate the future. This is what the Internet bubble showed. You throw all these billions, hundreds of billions if not trillions of dollars at something and people get really excited and there will be companies that don't work out and there will be disappointing investments and people will lose money. But in the end, it's going to accelerate that future. And accelerate the going back to our original point, and it's going to accelerate that renewable future, the technology coming forward, the cost curves coming down and you can see it happening.

Gregor: Bubbles are actually a very effective way to get new technology distributed. And if you're an investor with good risk management, you can catch the bulk of that move without

getting hurt. If you put all your money in a single stock, that is probably a great stock at a great time taking advantage of this growth and just goes absolutely crazy to the upside. That's exciting. But that stock will have a high degree of sensitivity to, it will feel out the tiniest little fluctuations in the growth rate a year or two up ahead. It'll figure that out. And it will correct, many times along the way, and eventually it will go to sleep for a while, even as you're waking up into a brand-new world, that that company was taking advantage of. So, it's bubbles. They get a lot of criticism because when they burst, people get hurt. I've dealt with this in my newsletter, are we in a bubble now for new energy technology and SPACS and EV and stuff? You know, probably I mean, or I mean at least a little bit of a one. Right. But like many bubbles, it has a fundamental underpinning. And you can just sit back and enjoy the benefits to society with cleaner energy and better technology. Or you can also invest responsibly in it and do really well. Right? Like you don't have to, like what you were saying, you know, you don't have to put your skull, your white skull t-shirt on, your black t shirt with a skull on it with like your death or glory. You don't have to be a death or glory trader. Right?

Aaron: No, that's exactly right. Gregor, I really enjoyed this. You've given me so much to think about. If I want to encourage anyone who is an energy investor or any investor at all to subscribe to your newsletter, where can they find you? Where can they find your newsletter?

Gregor: Yeah, you just yeah, so I use my name as might as part of the newsletter, because my name has been out there for, you know, for over ten years in journalism and writing about this stuff. So the name of my newsletter is The Gregor Letter. And that'll just come up immediately as a top search in Google. And I'm at Substack.com with The Gregor Letter. You can also find me on Twitter @GregorMacdonald and that's MACDONALD. Names just spelled out like GREGOR McDonald. So, I'm pretty easy to find on the Internet now. My son said, Dad, are you a famous person? I said, no, but it is easy to find me on the Internet. I guess that's one measure! So!

Aaron: That's great. Thank you so much. I really appreciate this, and you've helped educate me and I'm very appreciative of that. So, thank you.

Gregor: Thank you, Aaron. It was a pleasure.