Justin Huhn: Update On All Things Nuclear

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Erik: Joining me now is Uranium Insider Newsletter founder and publisher Justin Huhn. Justin prepared a slide deck for this week's interview; you'll find the download link in your research roundup email. If you don't have a research roundup email, just go to our homepage, MacroVoices.com, click the red button above Justin's picture that says "Looking for the downloads." Justin, it's so exciting for me to get you back on the show. The last time I interviewed you, I was just beginning my own journey of education around all things nuclear. I didn't frankly know what the hell I was talking about, as some of our listeners politely and others not so politely let me know now I think I know enough to be dangerous. So hopefully, I won't embarrass myself too much at this interview, but I'm super excited.

I've been following your newsletter quite closely for many months now, starting to build my positions in uranium and other nuclear technologies, and very excited about this future. So I want to get an update. Last time I talked to you, I was kind of talking long-term nuclear renaissance stuff, what I see on the horizon long-term, and you were saying, "Look, it doesn't even matter whether that comes true or not. There's this specific setup that was bullish in the uranium market, regardless of whether there's a policy change or a nuclear renaissance, or any of that. It just has to do with fuel cycles and so forth." So as I see on your first slide here, on page one of your deck, you're talking about the Renaissance. Has anything changed in terms of there being a setup that is independent of that? And if so, or if not, how does the Renaissance angle come into it? And when are we going to start to see the market discount that? Because, boy, I don't think we've really realized what's coming in.

Justin: Sure. Yeah, you bring up good points, Erik. And thanks for having me back. I'm looking forward to talking with you again. And you're right, our last chat, we kind of did a 30,000-foot view of the broader picture, the broader thesis, longer-term vision, etc. And you're absolutely right, some of the exciting developments for nuclear in the future of nuclear in terms of new countries pledging to build new nuclear, countries expanding on nuclear, carbon neutrality goals, net zero goals, etc., etc. The advancement of SMR (small modular reactors), advanced nuclear reactors, these are all very exciting for me. They're most exciting for just the abundance for humanity in the future kind of level, not necessarily from an investing standpoint, because none of these new major build-out plans going out into the 2030s, nor the potential snowballing adoption of small modular reactors have any effect whatsoever on the short to near kind of midterm investing thesis. So Erik, if you actually just model out existing nuclear reactors, nuclear reactors under construction that will be grid-connected in the next five years or so, and

you look at demand based on that alone, with no other demand from future builds, we're going to see a significant supply shortfall and therefore pressure on rising prices. And that's really kind of the fundamental basis for this as a commodity investment: looking at the supply and demand picture. What does that look like for the next 5-6-7 years? And I can tell you, it looks extremely bullish for the commodity.

Erik: Justin, tell me more about the two green charts that I see on page one, what are these indicating and what are they telling me?

Justin: So these two charts are actually from something called the lift-off report that was put out by the United States Department of Energy. I believe it was back in March, a couple of months after we spoke originally. And this is a report that the DoE put out: three different reports, one of them based on the hydrogen economy, one based on renewable energy, and one based on the expansion of nuclear. And it's essentially an acknowledgment of the pretty significant expansion of nuclear in the United States that will be necessary to reach these 2050 carbon neutrality goals for the country. These two charts essentially are representing the two options of deployment, whether or not we get this started now and actually have new nuclear builds, construction starts before 2030. And if it waits until 2035, and how much more difficult and how much faster we will have to get things done if we wait another 10 years to get this going. The important point of this slide is really to recognize that the United States Department of Energy, under Democratic presidential leadership, is actually promoting the doubling and possibly even tripling, eventually, of nuclear power. So this is showing 200 gigawatts of nuclear, and these are new builds, nuclear, not total capacity. We currently have something like 93-94 gigawatts in the United States. So this is literally a tripling of nuclear that is being suggested by the Department of Energy. So this is very, very new sentiment around this technology, where we've been in multiple decades of negative sentiment around nuclear. Now this is actually a bipartisan, supportive sector for United States governmental leadership. And this is very new. It's very exciting. You know, new nuclear United States is not on anybody's bingo card, and definitely not in anybody's supply and demand modeling. And I'm not holding my breath for this to happen. But this is just a shining example of how significantly the sentiment for the sector has shifted in the last couple of years.

Erik: I really want to drill down on this point and understand it a little better. Because I am at a handicap here, what I'm experiencing Justin is, every time I turn around, I see signs of the world finally waking up and getting the nuclear message, literally down to the level of Miss America using her title to essentially become a pro-nuclear activist and use the attention that she gets from being Miss America to help promote awareness of the merits of nuclear energy. Okay, that was not happening. You know, I never noticed anything like that. I'm feeling like all of a sudden, there's a tide shift here, and it's big. But then I stop. And I say, wait a minute, I just got interested in this, like less than a year ago, and I started following Twitter accounts that promote information like yours about all things nuclear. You've been in this for several years, are you seeing something that's not just interesting signs of progress, but rather interesting signs of progress that are suddenly really seeming to accelerate in the last six months, or am I just

perceiving that because I started paying attention to a new subject that I wasn't paying attention to?

Justin: I would say that it started to shift a little bit earlier than just a six-month timeframe. But it's really accelerated. And part of that acceleration has to do with Russia's invasion of Ukraine, that really put a highlight on nations' energy security. So for example, Europe is highly dependent on Russian natural gas, coal, and oil. And when those supplies were interrupted because of this conflict, the EU actually had a very fine point put on national energy security. And nuclear just achieves that pretty much better than anything. If you have a nuclear reactor constructed and up and operating in your country, you can store decades' worth of nuclear fuel in a small warehouse. And that's huge for energy security, but also national security. But that, of course, is just kind of on the heels of a very strong movement towards lower carbon emissions, net neutrality, net zero carbon goals for most countries on the planet. And whether or not you're on board for that type of narrative, that is what is happening. And finally, nuclear is getting some recognition for being a clear and obvious answer for consistent baseload clean power.

So the narrative has been shifting for a few years, but it just continues to accelerate. I'll give you a couple of examples. On slide number four, I list a number of countries that have recently announced reactor life extensions. What I didn't include on this slide was new reactor builds, countries that are building new nuclear. There are dozens of countries building new nuclear. In fact, just in the last week, Uganda, that only has 1.3 gigawatts of currently installed electricity capacity, is looking at making a deal with the South Koreans and with the Russians to build out over 15 gigawatts of new nuclear. I mean, this just is coming out of left field. But all of these countries here are announcing life extensions on this slide on slide number four, and life extensions, very differently from new builds in nuclear, have immediate effects on uranium demand. So that's I'm definitely more upbeat about life extensions and reactor restarts than new nuclear. But yes, I mean, long answer short, Erik, the narrative has been shifting for, you know, probably about two to three years. And it's been slow-moving, and it just seems to be kind of going on this hockey stick type move in terms of nuclear adoption and support of nuclear. When I first was familiar with this investing thesis back in 2016, you know, the original bet was, this is a sector that everybody is ignoring. Most people hate it, the commodity is completely bombed out and is trading at, you know, a third of the price it needs to be in order to incentivize new projects, supply and demand is all skewed. But there was a lot of abundant supply in the market. So it took some time to work through that. But, you know, really, the point was, that was a bet on the sector going from absolutely terrible to just bad. We're looking at 1% growth for the sector, maybe now we're looking at a four or five 6% annual growth rate for nuclear going out as far as we can look in the future.

Erik: Wow, lots of really good stuff to unpack. I want to go back to the beginning of your answer first, and then I'll come back to some of your last points talking about the geopolitical stuff on page two. Tell me a little bit more about that. Because it seems to me like there's just there's been an ecosystem of uranium that's been actually, I would say, surprisingly open on a global basis for the last couple of decades where you had the, for example, the Megatons to Megawatts program, where there's actually a partnership between the United States and Russia

to take Russian nuclear warheads down, blend the plutonium in them in order to make, you know, non weapons-grade fissile material that could then be used in American reactors, we had this partnership will obviously geopolitics have changed. Okay, what exactly is that going to mean? I could imagine that means there's a whole bunch of supply coming from a part of the world that we might lose access to, that's going to completely change things. But I gotta believe there are also some curveballs, where this could work the other way. So what things do people need to think about in terms of what could happen in the world and what that's going to do to your investment thesis around uranium?

Justin: The really short answer to that Erik would be that supply is fragile. Currently, so and the biggest driver of that statement has to do with almost half of the annual supply of uranium coming from a single country, and that's Kazakhstan. So really, what what your listeners should understand is that the uranium market is and has been a global market. To your point, the megatons to megawatts program, which ran from 1993 to 2013, was somewhat of an off balance sheet asset. For nuclear utilities, it was 20 million pounds per year of secondary supply that didn't come out of the ground from a mine. That definitely aided in the suppressing of the price of uranium for a very long period of time. And that's not there any longer. But coming back to kind of geopolitics, Kazakhstan is in a very, very interesting and precarious geopolitical position. So they have been a reliable supplier of uranium to the west and to the east for a very long time. In fact, they were ramping supply ramping production. So significantly, from the mid 2000s, into about the mid 2000. Teens, they went from just producing a few million pounds a year to being the largest supplier of uranium in the world at roughly around 60 million pounds of uranium produced on an annual basis, which is absolutely insane. And if you look at this slide number two here, this is actually coming from their fiscal year 2022 investor handout because Adam problem, which is the uranium producer in Kazakhstan, they are majority owned by the state of Kazakhstan, but they are 25% public listed on the LSE. But you can see that even for 2022, their Asian market is almost half of their of their sales. And in 2022, for example, the United States bought a lot of uranium from Kazakhstan, and that is going to change. And the reason that is going to change is there's multiple reasons.

So one is that transportation has become a problem during this particular conflict in the Ukraine. So instead of shipping material to the west, starting by heading north via rail, to the port of St. Petersburg, and then out to sea, there shipping the material straight west through the Caspian Sea through the Black Sea, through a number of countries with their own geopolitical conflicts happening currently. And the cost of transportation heading west rather than going through that port is something to the tune of 20x the price. This has caused a lot of problems and deliveries over the past 18 months for Western customers of kazatomprom. The other point I want to make is that ties between this country and both Russia and China continue to deepen a couple of big examples of that that have happened since our last conversation, Erik one is that the company confirmed at the back in December, this large new mine in Kazakhstan called the Budan opscode this six and seven blocks of the butanol fsco deposit, a lot of uranium held in this deposit that mine 49% ownership of that mine was pushed through to Rosatom. So the Russians now have engaged in a new joint venture with Kazakhstan since the invasion of Ukraine. And this, of course, has terrible opposite optics to the west. But it also means this big

new supply of uranium, half of that's going to end up in Russia and a bulk a chunk of the other half that's owned by kazatomprom is gonna end up in the east.

Justin: One more example would be that CNN see China National Nuclear Corporation, they signed a very large contract with kazatomprom that we don't yet know the actual numbers on this contract. But we do know that it's chunky. We know that because because Adam prom had to have a special shareholder vote to approve a contract that would push the the total size of contracts from this one entity beyond 50% of the book value of the company. So this is a very large contract. This is yet another sign that China's massive nuclear build out is going to lead towards China securing more pounds of uranium on a global basis. But where is it easiest found for China? It's right there in Kazakhstan. They're building a gigantic warehouse right on the border of the two countries. More pounds from Kazakhstan are going to end up in Russia and China and that's a problem for the West.

Erik: Justin, let's move on to Slide three where you're showing renewable energy and its frailties, and this is something I've been thinking about for a long time which is, Is there a moment where maybe people wake up and they say, wait a minute, we've been doing all this wind and solar stuff because it really does feel like the best, cleanest, greenest way to do clean energy? Maybe it's time to look a little bit more carefully at the engineering data and realize that wind and solar are not completely without fault. And maybe some of that nuclear stuff really is more appealing, even though it doesn't sound like it would be.

Justin: Sure, yeah, there's plenty of evidence that's starting to come out now that we have years and years of pushing extremely hard on expanding both wind and solar in multiple places around the world. I think in our last conversation, we talked pretty substantially about Germany and the failure of their energy transition program and where they've put, you know, more than half a trillion dollars into the expansion of solar and wind in the country while simultaneously shutting down all their nuclear reactors. And they're actually producing more carbon emissions in the country than they did before the energy transition program even started, and they have extremely high energy costs. Look, the cheapness of solar, for example, has a lot to do with not only subsidies in the areas where it's being built, you know, I mean, here in the United States, there are plenty of subsidies for the expansion of solar electricity, both on the on multiple state levels. I'm in California, and on the federal level, and you're also exporting the cost. So most of the solar panels come from China, and in China, there are very few environmental regulations. They produce solar panels with coal energy. You know, you need extremely high temperatures to create polysilicon, and that is done primarily with coal, whether in China or elsewhere.

And you also have, you know, oftentimes, if not extremely cheap labor, slave labor, to put it mildly. And so what you have is a false sense of affordability of these technologies. And that starts to couple with what we're seeing as frailty with these technologies. So solar panels, for example, in the first photo in this slide, are showing a solar field in Texas that recently got hit with a hailstorm. This is a field that had a 30 to 35 year expected lifespan, and it lasted four years. So when you see these levelized cost of energy (LCOE) comparisons of renewables to nuclear and fossil fuels, etc., they're baking in a whole bunch of assumptions. They're baking in

the cost of implementation, which, like I mentioned, is subsidized by various factors. And they're basing it on an expected lifespan. So the levelized cost of energy, essentially, that sort of metric is a lie, to put it lightly. You have to...

Erik: Justin, sorry to interrupt, but I just want to go a little deeper on LCOE, Levelized Cost of Energy, because that's a really important topic that we haven't discussed in much detail. I don't think we've ever brought it up on MacroVoices before. Some of our listeners may not be familiar. The idea here is that the whole world is kind of organized around a lot of energy measurements based on things like barrels of oil. Well, if we're going to consider other forms of energy, we need to start thinking about energy in terms of the energy we produce, not the amount of fossil fuels we consume. So the Levelized Cost of Energy is meant to be a way to look at a whole bunch of different clean energy sources, whether it's wind, solar, and so forth, and essentially have them all competing on a level playing field where we can see through one number which one is truly superior to the other. And it's completely fair, and it doesn't give any unfair bias to one energy source over the other. Is that a true statement, or is it actually not so clean?

Justin: So part of the problem with LCOE is that it's making an attempt at measuring the lifetime costs of implementing any particular source of electricity divided by the expected energy production of that particular source of electricity. And one of the problems is that it has to factor in certain assumptions, right? For example, the LCOE of this particular solar field that I mentioned in Texas that got destroyed by hail was probably very, very low on its initial calculations. However, because it lasted for years and not 35, the numbers that were cited to promote the implementation of this solar field were completely ridiculously low and not accurate. You also have to factor in assumptions when you look at LCA for nuclear, which is also extremely problematic because you have nuclear in China or the UAE built by the South Koreans versus, you know, the Vogel plant that was recently built in Georgia, vastly different cost structures for these plants based on where they're built and how much they cost. You also have LCOE influenced by the expectation of the lifespan of nuclear reactors. So you might actually have the initial license providing that LCA number, which in most cases is a 40-year operating lifespan in the United States right now. We're looking at giving life extensions to reactors that fit safety protocols, extending lifespans up to 80 years or potentially 100 years. These numbers really are just thrown out there and very difficult to rely on. You also have to consider the value for society that cannot be measured in having stable electricity. Going back to Europe, they've had periods of negative electricity prices due to extremely windy days, but when you need electricity, you can't rely on renewables. In places like Southern California, electricity prices have risen despite expanding solar. Intermittency challenges the grid, requiring battery backups or baseload energy sources like gas or coal.

Erik: Something that really concerns me, Justin, is that so many people are being told the answer, and it's a beautiful one: all you need to do is just add batteries to that wind that you're talking about. And you know what, Justin, if we were not competing with electric vehicles, or if electric vehicles were not competing with the need to use batteries, that might make sense. But we've only got, it's basically going to be impossible to mine all of the battery metals needed to make all the electric vehicles that people think are going to be made. We don't have enough

battery metals to make batteries for windmills, when windmills were never really the smartest way to make clean energy to start with.

Justin: Correct! Yep, that's absolutely correct. I think an important point too, is to just kind of, and we covered this a little bit in our first chat as well, Erik, is the energy return on investment, you know, the actual energy you get back from what you invested in establishing that source of energy that has increased over time since the inception of electricity. Throughout history, this is the first time in history where we're actually attempting to go in reverse. So you have an EROI with, you know, natural gas currently, let's say it's somewhere around a 20 or 25 to one return on investment. Solar PV with battery backup, you have basically zero energy return on invested because it's so energy-intensive to mine the battery metals and establish these grids. And then you look at the frailty of those grids. The fact that batteries don't last forever, you have to toss them, rebuild them, recycle them, whatever it might be. It's just an extremely, extremely inefficient way to try to keep society operating as it is now. No, I'm not trying to just completely, you know, pooh-pooh the idea of renewables across the board, I think there's a time and a place for them. But saying that we need to go 100% renewables, we can establish a firm, reliable, clean grid that's 100% run on renewables with a battery backup is basically an unrealistic pipe dream, it's not going to happen, it cannot happen, physics will not allow it to happen. And the reason you see a lot of historically speaking, a lot of the quote-unquote green NGOs be anti-nuclear is because when you have nuclear, you don't need renewables, it's just baseload. And it's clean, and it threatens these industries. And that's one reason, in my personal opinion, why we've seen an anti-nuclear movement over the past decades. Finally, finally, physics is starting to win out.

Erik: Justin, let's move on to Slide five, where we're talking about the future of nuclear, where it's headed, nuclear renaissance, and so forth. I really want to get your perspective on this because frankly, you know, first of all, I absolutely love your newsletter. I've been following a lot of your trade recommendations. I'm enjoying building a position in uranium mining stocks, but you know what, if I think about what I see on the horizon, in terms of a nuclear renaissance that I'm convinced will happen, not because people are smart enough to think it needs to happen. It's because I think we're at the point where there were only a few years from being forced to recognize it's the only sane solution that there is, and that there are no other options. And I think that's where the really, really big nuclear renaissance is going to come from. I feel like I am in 1998. And I know exactly what's going to happen with Google, and I want to invest in it. So what we're doing is I've got Justin's newsletter, and with Justin's advice, I'm buying stock in the catering company that serves lunch to Google because you know that that's going to grow with Google and I'm going to buy some stock in I don't know, the people that make stationery or whatever, the actual industry, there's no good way to invest in it because we don't know who the real players are going to be. And a lot of the people or a lot of the companies that will benefit the most from, you know, if there's going to be a whole bunch more nuclear plants, then there's going to be a whole bunch more demand for turbine steam turbines. And so Siemens is going to do well, but that's not a pure play. There's no good way to invest in what's coming that I can see. And I feel like we're investing in uranium, not because it's the smart thing to do, but

because it's the only thing we can figure out to do in order to bet on what we see coming. Do you see it that way?

Erik: Hang on a second, because I want I want to test that. First of all, I do agree with you. And I do agree in the end that there's a very strong uranium bullish case here. But let's just talk this through for the sake of completeness. Imagine and this is pure fantasy now that governments around the world got their shit together and did the right thing to serve the people who elected them. What they would do very quickly is they would round up all 250,000 tonnes of nuclear waste spent nuclear fuel waste, which is in storage around the world. They would tell a Rando in France and other companies around the world to gear up to reprocess recycle. Yes, it is possible to recycle nuclear waste, France has been doing it for years, other countries don't follow suit, because their governments are not paying attention. If we were to simply recycle all 250,000 tons of spent fuel waste that that's already in storage that would produce 237,000 tons of perfectly good eu 308 uranium that could be used to make more fuel rods with or could be used to fuel more reactors. And furthermore, if we really got our shit together, we'd start using breeder reactors that are 20 times more fuel efficient than once through Pressurized Water Reactors. And we wouldn't need so much uranium. So you could see the market get flooded with recycled uranium because governments around the world finally started being responsible and doing the right thing. And you know, you wouldn't need uranium miners for a little while. Now. I don't have any fantasies about government's doing the right thing. So I'm still buying uranium stocks. But in theory, if we really got our shit together, we wouldn't need so much uranium would we?

Justin: I suppose in theory, you have a decent point there. But I'm going to push back a little bit and say that, despite the fact that there's abundant potential uranium held in nuclear waste, we have yet to see any evidence of of that utilization of that expanding. So for example, the Russians do a bit of reprocessing, the French do a bit of reprocessing. The Japanese are looking at doing a bit of reprocessing. But it's still a very, very small amount relative to their needs. And so the French, for example, and the Russians continue to expand in mining uranium, the French are setting up a joint venture in Mongolia to mine uranium with ISR. They're expanding in Uzbekistan, they're expanding in Kazakhstan. They're expanding in Africa. The Russians are doing largely the same in Africa and Kazakhstan. And so reprocessing is reprocessing is very expensive. It's known as MOX fuel, mixed oxide fuel. And basically you have to have a an extremely complex chemical separation where you're actually pulling the plutonium out of the nuclear waste and mixing that with a bit of recycled uranium and a bit of fresh uranium as well. And it's very expensive to do and the cost really is probably the primary reason why this hasn't been more widely adopted? So this is, in theory, could this expand? And will we see more reprocessing fuel? If we see a continuation of expansion of nuclear demand on a global basis? Probably? Will this happen in the next three to five years? No. So it has absolutely no threat whatsoever to this particular investing thesis. But you also have to look at general, you know, general sentiment around fuel amongst folks who are not necessarily all that familiar with nuclear versus the industry's reality. And the sentiment around fuel is like, Oh, what about the waste? What about the waste? That's a big problem and industries reality is, nuclear

produces such a tiny amount of waste relative to the amount of electricity it produces. It's has a perfect safety track record, it's easy to store, it really isn't a problem.

So despite the fact that, you know, every single nuclear utility has some waste sitting at their facility, the motivation, especially with price to reprocess that material is just not there. And if we see sustained prices, north of you know, $150 a pound for a long period of time, will we see an expansion of reprocessing? Possibly, but there's just no evidence of that yet. And as far as different types of reactors, I completely agree with you, I think all these various advanced reactor types that are far more efficient, in some cases might run on on thorium with the Molten Salt Reactors, we're still seeing a vast expansion of large lightwater and boiling water reactors that's primarily with all of these countries are building. So while there is great hope for these advanced designs, and I cross my fingers that these will be built, and we will move in that direction. There isn't any evidence yet that that's happening. So what is happening now, there's 5556, large lightwater reactors, boiling water reactors, pressurized water reactors under construction globally right now. And the Chinese are building, you know, 10 more a year. So that's, that's what's happening. That's what's going to be happening in the next, you know, few years as far as this investment is concerned. When we're talking about the mid 2030s. And beyond, are we going to see new designs that don't require as much or any uranium at all? It's entirely possible. But that's just that's yet to be seen.

Erik: Let's talk about China's role in the future of uranium and energy, and, frankly, the role of uranium and energy in defining China's role in the world in the coming years. Because it seems to me like if I look at what's going on, you know, I saw Kirk Sorensen's thorium videos back in 2011. When he first put them out, I thought it was really cool. All of my advisors told me, "Don't even think about investing in it because the US government's you know, got it set up. It's acid doesn't know how to regulate those things. There's no potential whatsoever because the government's in the way." And meanwhile, people in China saw those same videos. China built, it's actually constructed and it's been approved to go into operation China built a full-scale, thorium-fueled Molten Salt Reactor. As far as I can tell, in reaction to Kirk Sorensen's videos, where he was trying to wake up the US government, China got the memo. And China has made an announcement that they're going to make a huge commitment to nuclear. I think you and I, Justin, both see something that I think you see that I can see, which is this SMR industry, the industry that builds hundreds of thousands, over the long run, of small modular reactors that completely replace fossil fuels over the next 50 years. That industry is not the kind of industry that's just something interesting to make money in. That's the kind of industry that changes the balance of power in the world, whichever country controls that industry has a huge economic advantage because they have an energy advantage. If you're making all the SMRs and you're the United States, or if you're China, well, then having that control means you've got a huge economic advantage over the rest of the world because you've got a lower cost of energy for your manufacturing. It's a really, really big deal in the course of the world. That's how big SMRs are going to be. And as far as I can tell, China is a country with massive manufacturing infrastructure. And they've already got the lead on thorium-fueled molten salt. Are we screwed? I mean, is it just a matter of time until China wins the control of this market?

Justin: I wouldn't say we're necessarily screwed, but they certainly are way, way ahead of us. When I say us, I'm talking about the United States and I suppose the West generally, although you know, the French are...

Erik: I dont know if any advantage that China has that was not delivered to them on a silver platter by essentially, let's spend a whole bunch of American tax dollars figuring out how to get nuclear right. We'll write it all up in research papers at the Oak Ridge National Laboratory, then fire Alvin Weinberg, the guy who was responsible for all of it because it competes with something in the President's home state of California. And we'll throw it all away and forget about it. And let China our competitor, pick up that research and use it to create an advantage and allow them to use it in a way that allows China to literally replace the United States as the global economic and military, hegemonic power over the world. That's a really big deal. And it's very concerning to me that I think China is very, very much in the lead on advanced nuclear, please tell me why I haven't wrong. I mean, I really, really want to have this wrong.

Justin: Well, gosh, there's a lot I could say about that. But I'm probably not going to go down that road too far. I mean, there's no shortage of evidence of political missteps and squandering of opportunities on behalf of the United States political leadership over the last couple of decades. But to put it simply, China thinks in decades, and they play the patient long game. And when they see an area where they can take advantage, they go for it. And this is one of those areas. You know, interestingly enough, with nuclear, because there's only so many countries that have the historical precedence of building nuclear, the know-how, the skilled labor, the engineering know-how to actually build nuclear, making a deal to build a nuclear power plant in your country typically happens with an export country. So for example, like I mentioned, the United Arab Emirates just built four reactors, the Barakah, the four units at the Barakah power station in the UAE, and the South Koreans built those reactors, and they did an absolutely phenomenal job on time on budget, just brilliant, brilliant pieces of engineering. And it's going to set up this oil-rich country very, very, very well for the future, and they're building two more, and they're looking at potentially building a total of eight reactors, which would be 25% of their electricity needs coming from nuclear.

But, you know, oftentimes what happens is these nuclear contracts are actually kind of geopolitical alignments as much as they are seeking energy security for your country. For example, Poland has recently announced they're going kind of all in on nuclear with large reactors and small modular reactors. And they had bids from the South Koreans from Westinghouse, and from the French, and they chose to go with Westinghouse, not because it was the cheapest, not because they have a better track record of building than the South Koreans do. But because they wanted to plant a flag with geopolitical alignment with the United States. I mean, that's just kind of the reality of it. So to the extent that China is eating everybody's lunch, and as far as nuclear builds go with domestic builds, they are, but there are other significant established players in the export business. And this is primarily the Russians, the Russians have the largest export book, even now after this invasion. And some of those contracts have reenact like with the Finnish. But they still have the largest export book, but the South Koreans are deeply established in the United States and with Westinghouse continues to

be a major player on the global stage. So it's kind of like an all-out sort of, quote-unquote, arms race in terms of who can build nuclear plants the best and the fastest, and how can we get it done and the geopolitical alignments along those lines are significant. China, of course, is looking at drastically expanding their electricity infrastructure. Like I mentioned, there's they're aiming to build 10 reactors per year for the next decade or so just to put that into perspective. They currently have 53 gigawatts of nuclear in China right now. They're trying to hit 150 gigawatts by 2030. So that's another 90 Something reactors in the next six and a half years, will they hit that, I don't know, they just announced approved six construction starts for new nuclear two weeks ago, in a single week, six new construction starts for new nuclear. So China is moving in that direction very, very quickly, and they're going to need a hell of a lot of uranium for this buildout.

Erik: Justin, I want to go back to something very important that you just said, which is China really is kind of late at the moment in the race to build the most nuclear plants. I agree with you that that's what almost everybody is focused on: how many and how many new nuclear plants like the old kind are gonna get built. I'm gonna make the argument that that is very, very important to the history of the world, but not nearly as important as the next really big thing to come next, which is SMRs. Because I think that once you achieve assembly line efficiencies of scale, you completely changed the game. And the way we're going to solve this energy transition is by mass-producing small modular reactors on assembly lines. So unfortunately, I think that's an even stronger case in China's favor. But you also said Russia really is who's got the export book. Do you see China setting up to get into the business, competing with Russia for exporting reactors, or do you think they're not going to pursue that for some reason?

Justin: Well, they're definitely already in that business when it comes to large reactors. When it comes to SMRs, yes, well, for SMRs, I think that they're going to be one of the many players, but they're not necessarily, quote unquote, in the lead of this particular race with SMRs. The South Koreans are definitely up there. GE Hitachi is, in my opinion, what seems to be gaining the most market share in these very, very early days of this next big wave that's coming, which I completely agree with you, I think this is the future. If you look at slide number five, Erik, this is coming from the Breakthrough Institute. This chart is basically showing how the expected, and again here using levelized cost of electricity, but that's, you know, just looking at the initial capital to establish these technologies. You know, the first of a kind is always more expensive. Once you get to end of a kind and you're building multiple reactors with that supply chain efficiency, we should see the cost dramatically fall for small modular reactors once we start to get these going. Right now, what's happening is there's a race to see which designs can garner the most market attention. So right now, we've got NuScale's Voyager, which is a lightwater small modular reactor, X-energy's X-100, TerraPower's Natrium, GE Hitachi BW RX-300. These are really the big names, there's a handful of others. And there are more than 80 different SMR designs currently being developed right now. So China's not necessarily in the lead when it comes to global market share for initial orders of small modular reactors. So far, that seems to be GE Hitachi with BW RX-300. But you know, who knows, I don't think it's going to be one design that's going to be the clear winner, there's probably going to be multiples because there are multiple different use cases.

The advantage of the Small Modular lightwater reactors is the design is very familiar for any countries that already have nuclear established. So it's a familiar thing as far as regulations go. Some of these reactors like X-energy's Xc-100, which is a gas-cooled, high-temperature reactor that produces very, very high temperatures. And you can actually utilize it not just for electricity, but for industrial steam and industrial heat. In fact, they have a number of letters of intent with Dow Chemical operating in Texas, to build a number of these small Xc-100 reactors. So it's a very exciting period of time for this space because it's yet to really hit, but the orders are coming in by the hundreds. And it looks like it's moving in that direction. And there's multiple use cases for small modular reactors. It's not just Industrial Heat, it's not just the fact that they're small, which will allow them to be implemented into smaller electricity grids. But also, in theory, if they can be built faster, that has a major advantage, especially in Western countries that have to deal with a lot of red tape and bureaucracies that can slow down projects with expensive capital currently, with interest rates, the faster you can build something, the more attractive that project is going to be. So among let's say, the nuclear utilities in the United States that are looking at new nuclear, most of them are looking at small modular reactors, rather than building new large reactors.

Erik: I should correct my statement about China earlier, because you're exactly right, Justin, China's not even in the SMR business at all right now. So to say that they're a leader or had that they're in the lead, this doesn't seem to make sense, what I meant is, in my opinion, China is very much in the lead with respect to advanced nuclear. And by that I mean molten salt and thorium fuel, I get I allow myself to kind of get ahead of myself, I ought to remind myself that the first many years of the SMR industry are going to be entirely about Pressurized Water Reactors that burn uranium and nothing else. I can't help the fact as a futurist, I just think about the thorium fueled molten salt future that I envisioned for the world. And boy, I think China has caught the lead with the work that SINAP is doing the Shanghai Institute of Applied Physics and their thorium fueled reactor that they've already built. I think they've got the lead in terms of being able to step up and say, Oh, if what is going to change the course of the world is whichever nation is in charge of the SMR industry that fully embraces all of the advanced nuclear technology, it when China figures out that that's going to be the important thing. They're in the position to do it. And I don't think anybody else is Am I missing anything?

Justin: No, I don't think so. I mean, I wouldn't say that there isn't anybody else in that position. But I think that they're clear.

Erik: They're ahead, then they've got money, and they figured it out, and their government is behind them. And if I look at all of the molten salt companies whose governments are not behind them, there's a big difference there. Definitely.

Justin: Definitely. Yeah, they're ahead. And then part of the reason they're ahead is because, again, they're not dealing with as significant red tape and bureaucracy challenges that you would face, for example, in the United States. But yeah, they're certainly ahead in terms of actually letting the rubber meet the road and building some of these different technologies. Your

point with thorium, I think, is really interesting. So, about 10% of the world's reactors are what are known as heavy water reactors or CANDU reactors, Canadian deuterium reactors, and all of Canada's fleet are CANDU reactors. And I don't know why there's not more attention or more CANDU reactors being built because these things are pretty fantastic. They run on natural uranium, it doesn't have to be enriched, but they theoretically can run on thorium with a little bit of plutonium that has yet to actually happen. Why reactor operators are hesitant to utilize different fuels in their reactors is because what is working is working and why fix it if it isn't broken. But theoretically speaking, heavy water reactors can run on thorium with a little bit of plutonium, which I find fascinating. But still, again, a lot of these advanced reactor designs are very exciting and have huge future potential. But as far as the investing case is concerned, you can really keep it pretty simple. And looking at what's the existing fleet, what reactors are going to hit the grid in the next five to seven years, how much demand is that going to create and what's the supply side look like? And then again, just looking at the evidence of what is actually being built, you know, we see large gigawatt-scale, pressurized water reactors being announced almost on a weekly basis now in various countries. So despite the fact that we have exciting advanced technologies at the forefront that look like they're coming, we still see countries choosing to build more of what is already familiar. And there's really nothing wrong with the existing nuclear designs. But these advanced designs, I agree with you, I'm very excited about them for the future.

Erik: Well, and I should apologize for getting ahead of myself, because I can't stop talking about them. And I could spend hours on it. Let's follow your lead and come back to what more of our listeners are probably interested in, which is making money on this stuff. Right now, the strategy is basically to invest in uranium mining companies, because that's the closest thing we can get to a pure play. You've got companies like NuScale going public, which are finally starting to provide a pure-play SMR investment, but that's the first one, you know, it's brand new. The trade is either uranium itself, which you hold through the Sprott Physical Uranium Trust, or it's uranium mining shares. My strategy for that is to follow your newsletter to get the advice on which uranium mining shares to invest in, in terms of market timing and so forth. Is this a good time? Is it a bad time? We went through a route that you guys didn't really see coming, but it seems like we've really rallied nicely out of that. So does this rally have legs? Are we gonna go back down and retest that? What do you think?

Justin: Well, I think it has legs. But I think that we potentially have some broad market headwinds. I mean, the day that we're recording this, we're dealing with a kind of a gap down in the broad indices, and the uranium stocks are selling off a bit. But I think the timing right now currently is pretty exciting for a number of reasons. And one is, you know, we're kind of in the first recovery phase of a very long-term, year and a half-long consolidation following the previous peak of the first leg up for this market. So we've had a big reset in terms of valuations for the uranium miners, which gets me excited, because my conviction for being long here is extremely high for obvious reasons. We're also coming into what is typically a stronger season for the commodity, usually Q3 or Q4. Q1 is when we typically see moves up in the price of uranium. The reason is, we have utilities coming back from the slow summer season of summer vacations, we have the big WNA, World Nuclear Association conference in London the first

week of September. And there are a number of nuclear fuel conferences in the fall. And that's typically when utilities come back to the table to secure more pounds in the long-term market and in some cases in the spot market. So I don't really like to bet on the short term. But all things considered, considering the fact that we've seen a big correction, considering the fact that the technical charts of most of the stocks in the space and the commodity itself look absolutely gorgeous. Here, we're finally seeing some long-term moving averages tick up and the short-term moving averages above those long-term moving averages, with the stocks trading above all of that. You know, not exclusively, but most of them have a pretty nice-looking technical setup here.

And the case for the uranium for the price of uranium going higher is a very, very easy case to make. So the Sprott Physical Uranium Trust, Yellowcake PLC on the LSE. These are ways you can own, quote unquote, own uranium, and just own the commodity. Probably the best risk-reward, you're not going to see leverage like you see with miners by owning the physical, but the downside here in my personal opinion is very, very limited for the physical commodity. So it's basically a bet on the commodity going higher. And these equities are extremely volatile. They never go perfectly in the direction you think they will, but over the long term, the trend is intact and will continue to move higher in my opinion. So I'm excited about speculating at this particular point. Looking at the valuations of the miners compared to the metal, we're actually literally back at valuations at the very, very inception of this bull market, because we've seen such a big reset in valuations, yet the uranium price continues to move in a very clear and obvious bull market fashion.

Erik: Well, Justin, I can't thank you enough for a terrific interview. I intentionally let it run long because it's such a fascinating topic. Before I let you go, I do want to give you a shot to plug the uranium insider newsletter that I subscribe to. I very much recommend it. It's basically your guide from you and your partner, Rick. Maybe you can tell people what's on offer, how much it costs, and what they get?

Justin: Sure yeah, so we've been operating this newsletter since August of 2019. I'm doing this with my partner, Rick Sacks. He's a retired hedge fund manager with 30 plus years in the precious metals and resources space. He's been a great partner on this venture with me, and we've built up quite the community here. We provide a 30 to 40-page monthly newsletter, members-only webinars where we speak with industry professionals in the nuclear industry, and almost daily video updates that I do on an almost daily basis where I cover news flow that day, or look at market technicals, etc. The cost is $597 for the year, $197 for the quarter. We have a very high renewal rate, which I'm very proud of. It tells me that we're doing something right here. We go deep into the macro.

Most importantly, we cover the fuel cycle extensively. It's important to understand all of this in order to have conviction because the volatility is so high, but you're not going to have outsized gains without outsized volatility. That's a market rule. So what we try to do is we take as much of the complex information around the nuclear fuel cycle and the uranium industry and distill it down into what that means for investors, so that our members have a clearer understanding of

this market and a clear understanding of where we expect the market to go. It's been a fantastic experience. It's very encompassing venture every single day, all day. This is all that we do. And surprisingly, there is always something to read and think about and discuss in the nuclear energy world and in the uranium mining world. We're excited for the next few years and potentially beyond for this investment.

Erik: Well Justin, I look forward to getting you back for another update in a few months. Patrick Ceresna, Nick Galarnyk, and I will be back as MacroVoices continues right here on macrovoices.com