Tuck Energy Currents Podcast Transcript

Justin Meier: Welcome to Tuck Energy Currents, the podcast that explores contemporary topics and career paths across the world and energy industry. My name is Justin Meier, and I'm a recent graduate of the Tuck School of Business at Dartmouth College. Tuck Energy Currents is a production of the Revers Center for Energy, Sustainability and Innovation at the Tuck School. It is hosted and produced by Tuck students. My guest on this episode is Lee Taylor, the founder and CEO of REsurety, a leading analytics company which helps empower the clean energy economy through data-driven insights and solutions. Lee founded REsurety in 2012, and it is headquartered in Boston, Massachusetts. In this episode, we discuss Lee's career journey which led him to found REsurety while still at business school, the types of solutions REsurety offers its customers, the impacts of recent legislation on renewable development, and Lee's career advice to young professionals interested in entrepreneurship and careers in energy more broadly. Our discussion was recorded in the spring of 2022. And now on to the show. Lee thanks so much for coming on the show. We appreciate it.

Lee Taylor: Very much appreciate you having me on.

Justin: So the purpose of this podcast is really to help young professionals and students understand more about the power industry, and some of the different sub-industries within that. And so we were wondering if maybe you could just give us a little bit about your path and your career journey that led you to found REsurety.

Lee: Yeah, happy to. And so - Well a starting point, I went to Tuck as a career switcher. So I had been - undergraduate I had studied economics and biology with a focus on environmental economics. So my thesis was on renewable energy technologies in undergrad. So it was an interest from early on. But then I ended up working in economic consulting, and then venture capital, asset management, and sort of got away from where I wanted to be. And business school was a way for me to try to get back to the clean energy industry, or I guess into it in the first place. And interest in undergrad is not the same thing as being in the industry. So I went to business school to make that switch. I definitely didn't go to business school to start a company, my application to Tuck said I wanted to work either for GE or PG&E in their renewable rotational programs, which is about as far from starting a company as you can get. But through my first year project at Tuck first fell in love with this idea that there was a problem to solve in risk management for energy. And that was where REsurety came from. Just ran with that idea and that was close to a decade ago.

Justin: Great, thanks for that background. And for some of us who don't have a background in risk management, can you maybe just give us a sense of the competitive landscape? And maybe one or two examples of the types of projects that REsurety is trying to solve?

Lee: Yeah, so at a high level, the risk management industry all revolves around - you have people who actually hold risk in their core business. And then you have folks who are speculatively trading on risk or trying to manage risk for a fee for those parties who hold the risk.

And so, risk holders are almost always the generator of power, or the buyer of power. And so the thing that was really interesting about renewables is that, historically, if you were a generator of power, a lot of your risk was driven, if not almost all of it, was this concept of the 'spark spread'. So the spark spread is "What is the value of electricity relative to the cost of your fuel, assuming some conversion rate?" So basically like if electricity prices stay constant, and the price of natural gas goes up, you lose money with every megawatt hour you generate by burning that natural gas to produce that megawatt hour. So the energy industry spent 100 plus years building up information tools and risk management tools, including most of the major trading desks - BP, Goldman Sachs, Morgan Stanley, Citi - they all traded natural gas, electricity. These are all ways for folks to manage the risk related to that fuel cost risk - what is the cost of your fuel relative to the value of the power you're generating from that fuel? Renewables sort of turn that on its head, because putting the environmental benefits of renewable energy aside, it's got a pretty terrific economic benefit, which is that your fuel is free. So there's just never this risk that your asset is going to be stranded because the cost of wind speed or the cost of solar radiance has gone up relative to the value of power. That's a great advantage. The downside, however, is that whereas you do control, for the most part, how much natural gas you choose to buy at that price, you don't control when cloud cover comes over your project, whether you have an abnormally windy or high wind or low wind year, and so the volume of your fuel is uncontrollable, and previously had been really un-underwritable and untradable, unhedgeable. So this is intermittency risk, right. "You don't control your fuel volume" is another way of saying 'intermittency'. And that had very real financial exposures for buyers and sellers of renewable energy. As an example, if you're a large tech company, and you're running a data center that's consuming 100 megawatts every hour in Texas, and you try to manage the cost of serving that consumption by buying electricity from a wind farm. That's great. You buy all the power from a 200 megawatt wind farm, that let's say for simplicity has a 50% capacity factor. So on average, that wind farm is going to produce 100 megawatts every hour, on average. Some hours is gonna be 200 megawatts, some hours is going to be 0, depending on whether it's really windy or not windy. So if you're consuming 100 megawatts every hour at your location, and then to manage that cost, you're buying whatever electricity comes off the wind farm, which varies from 0 to 200, it means that on average, you've bought the right amount of power. But in every hour, you're constantly buying more or less power than you actually needed. So if you buy more power than you need, you have to turn around and sell that on the open market. So you have wholesale exposure there. If you didn't buy enough power to serve your load, because the wind dies, and you're still, you know, consuming electricity at your site, you have to then go buy power on the open market, again you have risk. And so that's the sort of intermittency risk. Those are the types of problems that our original products, as REsurety, solved. Ensurers came in in the same way that they hedged the weather driven risk of agriculture, of ski resorts, of golf tournaments - there's all sorts of businesses that are affected by weather that had risk management tools associated with them, but not renewable energy. And so we started REsurety to basically bring insurance and hedging tools into the intermittency problem for renewables.

Justin: Right, thanks for that background. And so maybe just to try to kind of recap what you just said and confirm my understanding - so basically, the issue is if you're on either side of the contract between a user, say, Microsoft, and a producer, a wind farm, of renewable electricity,

there's a risk that because of intermittency, you could be left with the need to buy energy on the open market at a period of time where energy prices have really spiked, right. So in ERCOT, I assume, is the primary example where electricity prices can go as high as $9,000 per megawatt hour, I believe. And so the risk from the wind developer standpoint is that you didn't produce as much electricity as you said you were going to, and then you need to go out and become a buyer of that electricity at an extremely high price, just in order to meet your obligation in that contract. And on the flip side, if you're Microsoft, or the user of the electricity, if the wind farm didn't produce enough electricity, then you could also get hit with that spike and you could go out and buy electricity on the open market at one of those high prices, as well. Is that sort of fair to say? You're helping them manage, assess and manage that risk, for both parties?

Lee: That's correct. On the one hand, there's the information side of that, like, "How much risk do I hold?" "What is the likelihood that power prices go to $9,000 during an hour that the solar project I have a contract with, it's cloudy there?" Like 2019, several solar projects in West Texas - it was a heatwave in August - power prices were $9,000. And some solar projects, it was the middle of the day, we're not producing much power at all, because there were thunderstorms in that part of Texas. And so you had cloud cover, reducing your generation during the most valuable period. On the flip side, you have wind farms along the coast of Texas that tend to overproduce their average during heat waves. So during those hours, you had solar projects, if they had sold their power ahead at a fixed quantity, that were out there having to buy $9,000 power to make up for the fact that they had underproduced the amount of power that they already sold. At the same hour you had wind farms on the coast of Texas, outproducing their commitments and making a mint, because it happened to be windy during those specific hours. And so basically, when and how much of the fuel shows up - and that can be quarterly, monthly, annually, hourly - each one of those time frames has a different level of volatility of what is a high production or low production period. That all has financial risk for someone. Our tools find who holds that risk and offers solutions to it if you don't want to hold that risk yourself.

Justin: Right, thank you. This might be a good time to maybe take a little bit of a step back and, for those of us who don't have much experience in renewables, just talk a little bit about the way these contracts work. The concept of PPAs, or power purchase agreements, is often discussed, I know it's a big part of what you're doing. Can you maybe just give us a little bit of a primer on why these contracts are in place? For example, I know Calpine, or some of these other independent power producers, they're producing and selling electricity in the wholesale market. So if they're in a situation, kind of like you described, where the price of fuel, natural gas, is too high where it doesn't make sense to sell electricity into the grid, they can just not produce, right, and they're not really on the hook, assuming they're not, entered into a power purchase agreement, and they just don't need to produce in that given hour. And they're sort of off the hook it seems like. Whereas if you're a wind farm or a solar array, and you're locked into a power purchase agreement for 20 years to produce a specific quantity per hour, that seems to be what causes this risk that we're talking about. So maybe just a little bit of a primer on that and the types of hedges, I'm thinking about bank hedges specifically, that most of these developers enter into.

Lee: Yeah, if you're looking at renewable energy contracts, you're primarily talking about one of three flavors of contracts, each of which has different risks for different parties. The first flavor, which was the original, is the physical sale of power at your interconnection point, with a utility. So basically, you've built a wind farm, you intertie with the grid at a location called the interconnection point, also called the electrical node, or the bus bar, comes by a bunch of names, but it's where you actually tie into the grid to inject your electrons. And the utility who serves consumers in that area says, "I will buy, physically, every electron that you inject into the grid at a price of X." I will sign a physical power purchase agreement with you for 20 years, settling at your interconnection point. And so every time you produce a megawatt hour, and it hits the revenue grade meter, at your interconnection point, I will give you $20 per megawatt hour for that. That was the first contract that came into existence for renewables. That was how most states and utilities met renewable portfolio standards. That was sort of the origin of the industry. The next version that came into play was the corporate or virtual power purchase agreement. And so this is what Google, Microsoft, Amazon, Dow Chemicals, Lululemon, like all these groups that have signed PPAs, they're almost always, and some of those are physical too, but in most cases, these are what they call vPPAs, virtual PPAs. And what that means is it's a financial contract for difference on the power generated by that project, using the regional average price. And so what that means is that rather than saying, "I'll just buy every single one of your electrons," you're saying every time you inject an electron into the grid and it's one megawatt hours produced, we're going to look at the regional average - so ERCOT West Hub is the western part of Texas, and it's basically like it is the average of all of the electrical nodes in that location. So it's a regional average of all the local prices. And so let's say you sign a virtual power purchase agreement at $20 a megawatt hour, and the average of those nodes in that hour is $30. During that hour, the power price is $10 above your PPA price. So you take that $10 difference and you multiply by the number of megawatts that hit the grid during that hour, and that is the settlement amount. So prices go up, the project pays the buyer of power. Prices go down, the corporate buyer pays the project. So you have this contract for difference that basically recreates a fixed price by - everybody's buying their own power and selling your own power. And then they have this separate financial contract between them, that is set up to hedge the value of their merchant generation or the actual physical generation. One of the biggest differences in risk there between that and the first contract is that it settles on the regional average price, as opposed to the local price. And so if your project is in a part of the grid that is congested, meaning you don't have enough transmission to get it to the rest of the market, your price is going to be lower than the regional average, because you have a local congestion problem. And so you basically collapse supply. Like supply and demand is not working for you as the seller at your specific location. That brings in this concept called price basis risk. So yes, you've hedged your power at $20 per megawatt hour, but that hedge doesn't solve all of your problems. It only solved your regional price average as opposed to your local price. And if you want to work in power markets, read up on price basis risk, because it's a very big deal. The third bucket, which is what you talked about, which is a fixed quantity hedge, also called a bank hedge, also called a P99 hedge, where you basically say, if I'm a solar project in southern Texas, and in the middle of the day, in January, I normally produce 50 megawatt hours per hour, 50 megawatts per hour. And so I'm just gonna go ahead and presell 45 megawatts every hour. So on average, I'm going to be long, I'm gonna be over producing the amount that I

had already sold. That works fine, so long as you're producing your average. But if, as in the example I talked about in 2019, you get a thunderstorm during a heatwave in Texas, which is not an uncommon event, and you have clouds over your project, and so your generation goes from 50, which is, on average, 10. During that hour, you've already sold 45 megawatts at $20. But you've only generated 10. So you have to go buy 35 megawatts. And if it was during a price spike that could be $9,000. So you have to go buy 35 megawatts at $9,000 a pop in order to turn around and give them to your hedge counterparty for 20 bucks, which was your price. That's a very expensive proposition. So those were the three structures. The third structure has the same basis risk as the second one, right, because almost always those hedges settle at the regional average, also called a hub. But they also have the second risk of what they call shape risk, which is that you don't produce your average in the right hour. And so you might produce your average over time. But if you happen to have a shortfall in the wrong hour or an excess in the wrong hour, that can be either very beneficial or very punitive, depending on where power prices were during those hours that you were long or short power during that hour. It's worth noting that in February of 2021, there was a big winter storm in Texas, winter storm Uri, that if you're in power markets, you've been talking about basically ever since that day, or that week, the extremity of that event on power prices really made that third contract structure, the fixed volume swap, really difficult to finance, because the amount of risk that it showed those projects as having that have that kind of contract. So today the vast majority of contracts we see in the market are the first two.

Justin: That's really, really helpful. Thank you.

Lee: Sorry, if that was long winded.

Justin: No, that's great. I think everybody will appreciate that background. And so, I guess, maybe shifting gears a little bit now just to talk about - because obviously, power markets are heavily regulated, and regulations vary significantly between regions - I'm just wondering, can you talk a little bit about how important the regulatory landscape is to the success of your business. And I would assume that Biden's infrastructure bill passing was a huge win for you guys, but maybe just talk a little bit about how important that is for you guys going forward.

Lee: So the regulatory landscape is enormously important to our business and basically anybody else who works in energy, renewables or otherwise. And you're right. You would think by its name that the infrastructure bill would have been significantly impactful, but it actually wasn't, for our business, wasn't that impactful. The two regulatory events that have happened or are happening that have huge implications on us and the rest of the industry are one, the Build Back Better bill or the components of it that come or don't come back, after Build Back Better died. And the second is a tariff on solar panels. So I can get into each of those. So those are the two that are sort of most actively being watched today. So on the Build Back Better bill, there were some components of that related to climate that were really important to the renewables industry. First was they extended and increased the tax credits for wind and solar. And so every time you build a project, or produce an electron from renewable sources, there was a tax credit associated with that. The investment tax credit was one version and the production tax credit

was another, usually the ITC was used for solar and, primarily the PTC was used for wind Those were both basically workarounds to the fact that a carbon tax doesn't exist. So in an ideal world, and this is some of my personal politics, we would have a carbon tax, that would charge for the cost of the externalities of burning fossil fuel that doesn't get charged for today. A carbon tax doesn't pass politically. And so we're making up for that to level the playing field by basically giving an incentive to cleaner technologies. Those carbon credits for wind and solar have been stepping down over time, this bill would have increased them back up and extended them. So more value for the projects. It also created some provisions that are more bespoke around how Tax Equity gets funded. Very few wind and solar projects actually have enough profit to consume all of the tax credits they generate. So you have to basically bring in a third party to buy your tax credits from you, the group called Tax Equity. This would change that, so that you could basically just convert your tax credits into cash, and that makes it easier and more cost effective to monetize your tax credits. So that was a significant portion of the Build Back Better bill for climate, it extended some of those credits to standalone energy storage, which is a very big deal for the industry as a whole and the ability to grow renewables in areas where you already have high penetration. So that died along with the Build Back Better bill. The rumor this week is that Manchin is coming back to the table. And some of those climate components, if not all of those climate components, will reemerge in a slimmed down bill that will pass. But whether or not that passes in this congressional cycle will have a huge impact on the rate of growth in our industry. The second policy I mentioned was the solar tariffs. There's a tariff against panels made in China. There was a claim made by a single company in the U.S. that basically China was circumventing those rules by producing their panels in other countries. And so the, I think it's the Commerce Department, has basically said we might put tariffs on panels from these other countries. Those other countries represent something like 80% of U.S. panel supplies. And so basically, if you have a solar project today in the United States, you have just stopped work on it. Because if you don't already have the panels, there's this risk that you basically have no idea what your panels are going to cost. And so that makes it very difficult to build and finance the project, sell the power at any sort of known price. So right now, the solar industry as a whole is sort of in a standstill moment and may stay there for close to a year, while Commerce works out whether or not they're slapping a tariff on these non-Chinese manufactured panels.

Justin: That's really interesting. Thanks. And I guess sort of staying on that topic of batteries, I was just curious if you could talk a little bit about how the rise of battery storage is affecting your business and your strategy going forward. Is that sort of a natural hedge for most of these development companies? Or does this just represent an opportunity for different types of service for you guys?

Lee: Yeah, so storage for us is both a new customer and a modeling challenge, but in a good way. And I'll describe that in a second. So you're right. Storage is a natural hedge on volatility to a degree, right? So basically as renewables - so the combination of more volatile weather through climate change and increased weather-linked supply of electricity by the rise of wind and solar power, means that the grid is increasingly volatile and weather driven. So as an example that you gave, you mentioned that ERCOT, which is the grid in Texas, has a cap of $9,000. They've since dropped the cap, because of that winter storm. But in 2021, West Texas,

along with most of the rest of Texas, spent close to three days where every hour was at $9,000. And so anybody who produced electricity, that wasn't already sold to somebody in that location at that time, made just an enormous amount of money. So, three days at $9,000. This year, in February, we had much more mild weather from a demand perspective. We also had a fair amount of wind and sun. And so you had an oversupply during that period. And we ended up having, I think, close to two full days, where the entire ERCOT West region was actually negatively priced. So the grid is basically paying people to consume electricity - the wholesale market price of power was less than 0 for two days. So when you think about the impact of extreme weather on driving huge volatility of demand for electricity, and then the volatility of weather driving volatility of supply, you just have a much more volatile market. The transmission and storage are the solutions to that. And you can build storage much faster than you can build transmission. And so storage coming in really unlocks additional capacity for any grid to just absorb evermore renewable energy. So on the one hand, we view it as critical to the growth of renewables. And also, I mentioned it's a modeling challenge because depending on what you assume is the growth rate of wind and solar and storage, will drive whether you think you are underwriting into an increasingly volatile or decreasingly volatile market. Because if you take the book ends, there are people in the industry who just say the economics for storage still aren't there at a big enough of a scale. And so nowhere near the amount of storage that people say is going to be built is actually going to get built, but people are gonna keep building wind and solar. And so volatility is just going to keep going up. You also have the other side of the extreme, where people say storage is just getting cheaper and cheaper and cheaper, it dominates the interconnection queues, so we're just going to be flooded with storage and we're just going to have baseload power all the time. We just aren't going to have any volatility because anytime power prices fluctuate, storage is going to gobble that volatility up. Neither of those two extremes are true, in my opinion, but where in the middle is a very big question that drives how you model the future value of wind, solar and storage. And so I mentioned that they're a customer because for the same way that a wind farm that has made commitments to sell electricity, volatility is generally bad for them. Like prices spiking when the wind dies, very bad. For a storage project, the worst case scenario is a calm market. So like no high volatility of weather, no high volatility of weather driven supply. A boring power market is very bad for storage because you make your money on solving volatility. And so they have, effectively the offsetting risk to the risk that we've been supporting the analysis and hedging of for some time, which creates a really good opportunity to help match those two parties up because in all cases, the most effective risk management out there is when you can find the physically offsetting exposures - anybody who is naturally short, anybody who is naturally long, if you put them together that is always going to be your most cost effective way to manage risk. And so it's got a huge impact on the industry as a whole and our business as well.

Justin: So I think one of the things I'm taking away from this so far is just how much uncertainty there still is in renewables. And so I think it's great that companies like you guys are out there helping to measure and therefore manage that risk. Sounds like a great time to be in the space.

Lee: Yeah. And I think it's not going away, right. I think that for folks that are interested in this industry, it's the trifecta of technology, policy and business, right. And so things like the change

in the tax credit code that's coming or could come, right. The fact that you can now monetize your own tax credits versus having to sell them to a tax equity investor has very significant impact on the financial modeling and how you construct your balance sheet for these projects. So very much into the finance side of it. The fact that it can get entirely turned on its head by one complaint that got picked up by the Commerce Department on panels means that you have to stay on top of the policy component. And then the technology component - like as capacity factors are changing, why do hub heights on wind turbines that capture more stable wind speeds, why do those pay for themselves or not based off of their impact on the capacity factor during specific hours? And I think that that need to stay on top of all those means that you're constantly behind in the industry. There's always something to learn. But nobody gets bored in this industry, as far as I can tell.

Justin: No doubt. And for those listeners who are really interested in this kind of stuff, this risk management stuff, and want to get involved and are looking to learn more and really dive in, what are some resources that you would give them? I know that you guys have a couple white papers on your website but any other resources you would recommend to dive in on these topics would be appreciated.

Lee: So we obviously have resources on our website how we look at things. There are a number of media outlets that do a really good job of covering this industry. I think Canary Media, in particular, does a great job of scrutinizing views of the industry's highs and lows and opportunities and risks. Bloomberg New Energy Finance has both paid and free versions and I think Tuck students have access to the Bloomberg Terminal so you get access to the good stuff. There's a number of energy focused podcasts that are quite good. And so I think that across the board of finding those white papers, getting on the daily newsletters of something like a BNEF or a Wind Energy SmartBrief. I think Google searching on those you can find those feeds, and that's the best way to get on top of it.

Justin: Awesome. As we kind of move towards the closing of this episode, we have a couple questions that we always ask our guests. First off, is there any advice, if you could go back and talk to yourself, Spring semester of your second year at Tuck, what advice would you give yourself?

Lee: Spring semester I was getting ready to start REsurety. I guess maybe, "Be prepared for everything being harder and taking longer than you might expect in that moment." I was sort of force-fed humble pie, first from investors, and then from customers, because when you're in business school still thinking about starting a business, there's a sort of elegant, academic view of "I'll make a beautiful slide deck covering what I'm going to do and how valuable it's going to be in the future and within a few months someone will write me a big check and fundraising will be over and I'll move on to the next challenge." Nothing works that cleanly, and so I think just being prepared for that - and particularly if you're starting a business. I've talked to some folks who've said "I've decided to launch a company and I'm going to give it 6 months and if it isn't where I want it to be I'm going to throw in the towel and go get a real job." If you've got 6 months, don't do it. You've got to have at least 2 years that you're willing to work through it

before you're going to be able to make a call on whether that's going to work or not. And I think 2 years in, we hadn't sold a single product. I think that would be my biggest advice, just be prepared for that, because it can come as a bit of a surprise.

Justin: Yeah, definitely appreciate that. And our last question that we always ask is what advice do you have for students or other young professionals who are listening who are interested in entering a career in energy more broadly?

Lee: Yeah, you asked earlier what the resources are to educate yourself. I think that that is really just the requirement - I don't think you can come into energy and say "I'm extremely good at financial modeling and Excel and someone else will tell me the technical and the policy side of things." I think you really do have to embrace that it's an interdisciplinary industry and that you really do have to educate yourself across that spectrum of business policy and technology. When we interview someone for a commercial role, we dig on all of those. Educate yourself, dig into the weeds. When you talk about what is a fixed volume swap or a P99 hedge or how does a contract for difference work, build a model in Excel and work through it and understand why one bad hour can blow up your year at a fixed volume swap. You should understand that at the core component of it. I think that'd just be my biggest advice for prepping for a role in the industry.

Justin: Great, certainly appreciate that as well. Well, Lee Taylor, just wanted to say thank you so much for joining Tuck Energy Currents. Congratulations on all your success. What you guys are doing is awesome over there at REsurety. And we hope to speak to you again soon.

Lee: Thanks Justin, really appreciate it.