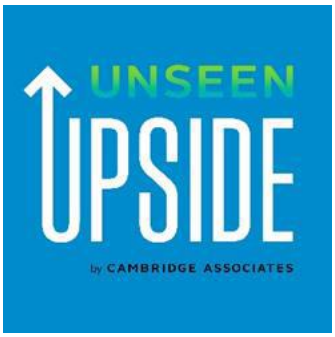

Season Three: Episode Four
Battery Storage, Renewable Energy & Building a Sustainable Grid
Launch Date: May 16th, 2023

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Hillary Ribaudo: All throughout history, the ability to harness and store energy has driven human development and innovation, and although today batteries are ubiquitous, they are still one of our most impressive scientific achievements.

[Mux: KPM_KPMCS_0037_00201_Medieval_Trotto__a__APM.0-02]

Di Tang: Imagine you're sitting down with one of the great inventors, Leonardo da Vinci. This is the fifteen hundreds. Maybe you were the aristocracy, and you could afford this new fangled thing called a beeswax candle that burned brighter, produced less smoke, but probably you didn't have that money.

Hillary: This is my Cambridge Associates colleague Di Tang.

Di: So you were with Leo, sipping your wine, burning your tallow candles. You tell him about the invention of batteries and that can store energy, which then can be used to create light and heat, and that's all magic and science fiction to him.

[Mux: APM_APMC_0166_04501_L_Is_A_Strong_Word_Rhythm_Mix_APM.2-35]

Hillary: I'm Hillary Ribaudo and this is Unseen Upside by Cambridge Associates, where we explore investments beyond their returns. This whole season we are talking to innovators and investors who are helping to bring what once was thought as science fiction into the real world. And in this episode, we are exploring how battery advancements have the power to redefine our lives–and pave the way for a more sustainable future.

[End Mux Theme]

Act I - Hypothesis: Batteries might be the missing link to fully harness renewable energy.

[Mux: SON_SCD_0704_00601_Sports_Zone_C_APM.0-02]

Mateo Jaramillo: It's not as if I dreamed of becoming a battery entrepreneur, that wasn't the goal from the early days. but what I knew I did wanna work on was something that, was meaningful and, that made a difference for people and if you have an impact in the energy world, you sort of by definition have an impact in people's lives.

Hillary: Mateo Jaramillo is the co-founder of Form Energy, one of several companies working in the energy storage space. And, batteries, well they're the best-known energy storage technology we have today.

Mateo: The energy system for electricity is going through a very big transition right now, with renewables becoming, lower and lower cost. And with the, need to decarbonize the electric system overall, that brings new challenges with it.

Hillary: According to the U.S. Energy Information Administration, in 2022 about 31% of carbon emissions in the country came from electricity generation.

[Mux: SON_SCDV_0215_00101_Walk_That_Way_A_APM.0-02]

[Sound Design]

For example, in a glowing metropolis like New York City, the electric grid has to provide power for millions of buildings. And it takes dozens of plants in or around the city to generate the majority of its daily needs. Traditionally, many of those plants have been driven by fossil fuels using fuel oil and natural gas to produce electricity.

Hillary: The electric power grid relies on a balance between supply and demand. Electricity can be stored during times of high production and low demand, and then released during times of low production or high demand to help balance the grid. As climate change progresses, the electric grid will have to be able to store more energy, to prepare for extremes.

Mateo: We look at something like winter storm Uri in Texas a couple years ago, where inconceivable sets of conditions are happening and you have a freeze that leads to an outage for four days in a row in Texas. And, that's just a, kind of event that really gets people to understand just exactly where we are. And you see those patterns everywhere in the world, right? Increasing volatile and frequent weather patterns.

Hillary: Existing renewable energy sources tend to be more intermittent, because it's not sunny at night and it's not windy all the time. So batteries could be a key solution, by storing the energy from those renewable sources.

There are many different ways of storing energy–there's thermal energy storage, and pumped hydroelectric just to name a few, but there is still a gap when it comes to storing clean energy for long periods of time in a way that doesn't break the bank.

Mateo: We need more than just a few hours of energy storage. We need what we call multi-day storage at Form. And, so really that's where we are focused, where we've been focused from the very beginning. Bringing that kind of energy storage, to the market, cost effectively and solving some of those trickier to solve problems on the grid as we go through this energy transition.

Hillary: Form Energy was founded in 2017 by energy storage veterans who came together to reshape the global electric system.

Mateo: And I should say as well, that this energy transition is not one that happens overnight. It's been happening for the last 15 years. It will happen for the next 20 or 30 years. And, what we are doing is hopefully bringing a new tool to that transition.

Hillary: A tool that has many possible applications right now.

Anders Kristoffersen: Here in Denmark, we often face long and dark winters where we don't see too much sun and we don't have too much wind.

Hillary: Anders Kristoffersen works for a Danish nonprofit called the Velux Foundations. There, he leads their impact investing program.

Anders: So we could face extended periods of days, weeks, and perhaps even month, where, the production that we get out of our renewable assets is below the demand and so we would really need to store energy for longer times.

Hillary: Anders was trained as an engineer, then worked for the World Bank and has even advised the Danish government on environmental matters.

Anders: Whenever I fly into a new city, uh, look down at the highways, see all the taillights, see all the activity going on down there. And, I always look down and, and wonder how can that ever be sustainable?Aand so I think we need to do better.

Anders: We need to be able to keep up with the lives that we're living today, but in a much more sustainable way. We face many challenges in the world today, around climate change, high geopolitical instability, inflation, even the risk of recession.

Anders: Many of the solutions can be found in clean technologies, which coupled with the responsible consumption and a changed behavior, can move us away from a very unsustainable use, of resources and energy today into, a more bright future where we don't rely on long and dirty supply chains of fossil fuels being dig out of the ground.

Anders: My personal belief is that we'll need many different means of energy storage, and it makes sense for us to have a quite broad approach to this area.

Mateo: One thing to keep in mind is that there is no perfect battery. I'm somewhat fond of saying that batteries are like humans, and they're all flawed in their own special way. And the trick is to find the application for which the flaws really don't matter so much. And every battery has some flaws and deep ones, frankly. And we need to be able to take those into account.

Act II - Research & Experiment: Batteries 101 & Form's new battery.

[Mux: KPM_KPM_0710_32401_Electric_Circles_APM.0-02]

Hillary: Batteries have been evolving for over 2 centuries. And they work by storing chemical energy and converting it into electricity that we can use later on. But when thinking about batteries there are a few things to consider.

Dipender Saluja: One is energy density, which refers to how much energy you can store in that form of batteries.

Hillary: Dipender Saluja is co-managing partner at Capricorn Investment Group, one of the investors in Form Energy.

Dipender: The second is power density, which refers to the speed with which you can extract that energy and use it. And it also is the speed at which you can recharge that battery.

Hillary: You have to consider cycle life as well, which is the number of times a battery can be charged and discharged before its performance begins to degrade.

Dipender: We all have our version of my phone is now two years old and it has less performance than it did when I got it new. And there's several things going on in that battery that is leading to that degraded performance.

Hillary: There are also safety and cost considerations.

Dipender: In the early days of lithium ion batteries you would hear the story of a laptop battery catching fire on an airplane, cuz that was like, everybody's worst nightmare.

Dipender: Safety is a big deal because, you don't want these batteries burning, when you are trying to use them.

[Mux: MYMA_MYD_0010_00201_Anodize_APM.0-01]

Hillary: Now, there are three components that all batteries have in common: an anode, a cathode, and some kind of electrolyte, which is the medium that acts as a conduit for electricity.

If you take the batteries from your remote control, you'll see they have two ends, one positive -that's the cathode- and one negative -that's the anode. Inside the battery, electrons flow from one to the other through the electrolyte, generating an electric current in a controlled way.

And chances are your remote control batteries are Alkaline.

Mateo: Alkaline batteries generally are not rechargeable. So those are what known as primary batteries, not, secondary batteries. Secondary batteries being rechargeable battery. And so there's a lot of batteries, a lot of electrochemical cells, that use different materials and have different properties.

Hillary: Then, there are the Lithium-ion batteries that most mobile devices use– but this kind of battery still has several drawbacks, in addition to being prone to catching fire, as Dipender mentioned.

Mateo: Lithium is a phenomenally light and dense, uh metal, but it's quite expensive.

Hillary: And research has shown that the extraction of lithium -a non-renewable mineral- can damage land and contaminate the air.

Mateo: And so that's why we went looking for something that was fundamentally different.

Mateo: When we started down the path to say we'd like to have a multi-day energy storage system, something that's cost effective to cover those longer periods of intermittencies, we also had to consider the material sets and consider the options. We can't just pretend like there are materials that solve the problem. They actually have to exist in the real world. and they have to be able to be embodied in a real device. Sparing all the details, we ended up selecting Iron Air precisely because it is able to scale.

Hillary: Iron is that grayish, shiny metal that rusts in damp air, and air, well, that's what we're breathing right now.

Mateo: So iron is phenomenally abundant in the earth of course. And it's very safe for humans

Hillary: So safe that you probably have some in your kitchen! Cutlery, stainless steel appliances? Well, steel is made of different elements, but its major component is iron!

Mateo: We had a whole age where humans worked on iron and so there's a lot of knowledge about iron. Of course Steel is extremely prevalent in our world today.

Mateo: And what we're doing with iron in a battery is essentially reversibly rusting it. So on discharge, we rust iron and on charge, we drive that oxide off and we return it back to the metallic state. And so it's a fairly. Simple process, but it is not easy to do at its sort of highest potential. so it needs to be as efficient as you possibly can make it. It needs to be

as low cost as you possibly can make it, but in the device that we have designed that we are producing today, we think we have done that.

Hillary: Iron-Air batteries as an idea is not exactly new. The Form team is building on a base of deep knowledge. At the heart of the current version of the Iron-Air battery is a module about the size of a washing machine. The chemistry it uses has been studied before in different places like Sweden and the United States.

Mateo: Probably the most fundamental study that was done was actually by Westinghouse under the auspices of uh US Department of Energy Grant.

Hillary: This was after the oil crisis of the 1970s.

Mateo: And they were looking at a lot of different technologies and they were considering Iron air for transportation applications.

Hillary: But this kind of battery is not very suitable for vehicles, and not just because of their current size.

Mateo: Iron air batteries are essentially open, they have to breathe in the oxygen and, transportation applications prefer, much more hermetically sealed approaches.

Hillary: So, the science has been there but only now is a company taking a swing at making it commercially viable, but with a new application.

Mateo: When we started the company, we knew we didn't have to invent the science from scratch. We could look at the proof points, in, in a lot of different studies that look at these reactions and understand that, that we were not trying to break new scientific ground. What we needed to do was to embody that science in an engineered device, at a cost competitive point. And that's been the real challenge for us.

Hillary: Part of the challenge has been figuring out how long a long-duration battery can and should last.

Mateo: So initially, when we were evaluating the landscape uh, it was a very open field and we didn't know if the answer would be 10 hours or a thousand hours or 10,000 hours. Of course there's, just over 8,000 hours in a year to, give you a rough sense for how many hours we're talking about.

Hillary: So Form's team built computer analytic models to help them understand exactly what they needed to create and how it could be applied. Their grid planning models account for the fluctuation of renewable sources, demand, and grid conditions, on an hour-by-hour, day-by-day, and year-by-year basis.

Mateo: If you need a 2000 hour duration battery, that implies something very different about cost than if you need a 200 or 100 hour battery.

Mateo: And you really have to understand that quite precisely. It, it cannot be in the end, a finger in the air exercise.

Hillary: Form Energy's initial battery can store electricity for 100 hours, and the process of getting to that number was the beginning of Formware, an analytical framework tool for future grids and big batteries.

Mateo: Working in, in deep tech, you have to have the software capability to it.

Mateo: You can't just sort of only focus in the lab. you've gotta have the companion. Analytic and software-based understanding for what you're working on.

Hillary: But software alone does not build these things.

Mateo: We also had an empirical process, and we essentially had a bake off in the lab, if you will.

Hillary: To get to Iron-Air battery, the team tested different chemistries until they were confident, they had what they needed for their product.

Mateo: And the reason that we had the confidence to pursue it is because the models told us.

Mateo: And we of course went and talked to a bunch of customers about this too. But the conclusion was if you build a battery that has the specification of this iron-air thing you're considering, it is entitled to be competitive in the market, and there's a massive market for it.

Mateo: And our utility partners, said, yeah, sure. You go build that, we'll buy it.

Hillary: And building them, they did! But don't forget they are intended to help the electrical grid so size matters.

Mateo: These are large batteries. Um, these are meter scale, of very heavy systems. You will never see this battery in a phone or anything that moves really, it, it's very dense. It's very heavy.

[Mux: SON_SCDV_1025_00701_Moments_Of_Uplift_A_APM.0-02]

Hillary: You can compare the height and width of each individual battery module to a side-by-side washer and dryer set, they're just not as deep. These modules are filled with a water-based electrolyte similar to what you can find in AA batteries.

In the liquid, there's about 50 electrochemical cells - they are a meter tall, metallic in color and stacked together. The iron and air electrodes are in these cells, enabling the electrochemical reaction: unrusting - charging, and rusting - discharging.

And these battery modules are grouped together in protected enclosures. Hundreds of these enclosures become what Form calls “modular megawatt-scale power blocks.” And that’s the product they deliver. It’s essentially scalable pieces of infrastructure–which enables flexibility to meet the electricity demand of wherever they’re placed. But these power blocks of multi-day batteries are just the beginning.

Mateo: The first version of the iron air battery that we introduced that will be the worst performing, highest cost battery we ever make. And it'll only get better from there.

Mateo: Form Energy is not so much an iron air battery company as it is an electrochemical solutions company.

[Locations Sounds]

Hillary: We wanted to see this new kind of battery so we headed to Somerville, Massachusetts to visit one of Form’s facilities.

[At the Lab]

At Form Energy – **Jocelyn Newhouse**: Let’s get you lab coats and all…

Hillary: The company has other locations in California and Pennsylvania and is about to open a new one in West Virginia, where they will mass produce their 100-hour batteries.

[At the Lab]

At Form Energy - **Jocelyn:** Um, alright. Let's go back this way; um as we walk, you can see this is a huge warehouse and we have a box in a box here. This is our walled lab area, and that's where we have kind of the more wet chemistry activities.

Hillary: Here, just over the river from Boston, they do R&D work and the team opened their doors so we could learn a little more about their process. Our guide today is Jocelyn Newhouse.

At Form Energy - **Jocelyn:** I'm the Director of Cell Performance here at Form and I have a team of about 20 engineers and scientists that are working on everything from electrolyte discovery and development through full cell, integration of all the different components. And understanding how that, um, functions under different operating conditions.

Hillary: Jocelyn earned a PhD in Materials Science and Engineering and her research focused on liquid metal battery cells.

At Form Energy - **Jocelyn:** I've been, devoted to, combating climate change for now over 15 years. Uh, working on batteries. And so I think it is the missing link between being able to use renewable energy and our society being used to on demand energy.

At Form Energy - **Jocelyn:** So one of the unique things about building out a lab in a former warehouse is we have very tall ceilings. And that means that we needed to have very tall wires.

Hillary: In the area we're visiting, the Form team is running the process on a small scale. This space has a few dozen white boxes that look like large refrigerators, they call them incubators.

At Form Energy - **Jocelyn:** so that's an electrochemical test equipment that allows us to charge and discharge the battery under specific conditions. And all of those wires are the electrical connections. And also, air connections to enable us to test our batteries.

At Form Energy - **Hillary:** so behind those sort of fridge looking incubators there's just a lot of wires coming out the back into these literal Tupperware containers.

Hillary: The Tupperware containers are full of water. They aren't part of the battery, they are just an inexpensive and fast way of testing whether or not air is flowing! And at the moment it is because we can see a lot of bubbles.

At Form Energy - **Jocelyn:** It's kind of an effervescent, uh, battery.

At Form Energy - **Hillary:** I love it.

Hillary: One of the attractive features of Iron-Air as a chemistry is it is extremely safe.

Mateo: We use a aqueous electrolyte. That means it's water based, so there's a lot of salt in it, which makes it basic, but very safe to handle.

Mateo: And the other thing is, although it is very energy dense, it is not very power dense.

Mateo: In other words, you can't get all the energy out very quickly like lithium ion can, for example, and so this is another reason why it can be very low cost because we don't have to have elaborate safety systems in place.

Hillary: At the lab, Jocelyn says that some of their incubators are more specialized than others.

At Form Energy - **Jocelyn:** You can see this one has even more, equipment fixed to it, and that's something that we use for specialized testing to really dig into how our battery is operating and gather a little more information.

Hillary: Information like length of a battery's cycle life. Remember… that's the number of times a battery can be charged and discharged before losing performance. Mateo says that eventually, they'll last two decades.

Mateo: There will be a cycle of replacement that happens for the life of the project, which typically are 20 years or even longer. Over time, our expectation is that we'll make the devices themselves last 20 years.

Mateo: And at the end of life, we will, recycle the bulk of the materials. there's no path these days on new technologies where you don't consider the end of life, and what the implications are and how you deal with it.

Mateo: We're increasingly moving to a circular economy and that's just the reality of, of all new product development, whether it's clothes or it's batteries.

[Lab Sounds]

Hillary: At the lab, Jocelyn takes us into a different, louder space.

At Form Energy - **Jocelyn:** This is where we're doing our full scale cell testing.

At Form Energy - **Hillary:** Okay.

At Form Energy - **Jocelyn:** So these, you can see are in that opaque plastic vessel we call it. And that is our product intent cell. So each of the cells is a hundred hours.

At Form Energy - **Hillary:** Each of these cells?

At Form Energy - **Jocelyn:** Yes.

At Form Energy **Jocelyn:** So a minimum fielded unit will be something like a shipping container size. Okay.

Hillary: And though this is a highly professional research and development facility, a few details I saw revealed a little something about the team working here.

At Form Energy - **Jocelyn:** So the battery testers are all named after, celestial objects. So Earth, Venus, Neptune, things like that. And then our incubators are all Oreo flavors.

Luckily there are a lot of Oreo flavors because we now have a lot of incubators.

Humanity is one of our three values and, and fun is part of that.

[Mux: CEZ_CEZ_4359_01601_Slow_Food_APM.0-02]

Hillary: Scientists, materials, oreo-flavor-named incubators and much more are all here thanks to investment. To date, Form Energy has raised over $800 million in equity financing from an array of investors. And one of the companies that believed in their vision was Capricorn Investment Group.

Dipender: Very early on we got as obsessed with batteries and we started looking at, all the battery technologies that, were out there.

Hillary: Dipender Saluja again.

Dipender: We were very interested in batteries for transportation, but we were also very interested in batteries for the grid and for stationary applications.

Dipender: And then along the way, we also saw some battery ideas for consumer electronics. So as a result of this, we have seen literally hundreds of battery company ideas in the last 20 years.

Dipender: We decided early on that we would invest in companies that could be commercially successful, and have a positive impact on the world. Scale being a very important part of it because, scale would have the effect on commercial success. And therefore turn into good investments.

Hillary: Besides Form Energy, Capricorn has invested in other companies working to make a difference in the energy storage sector--including one focused on recycling batteries.

Dipender: We have invested in Redwood Materials, which has now become the largest recycler of lithium-ion batteries in America.

Dipender: They are, on this very fast growth, scale up curve now, to step up to the challenge of recycling all the battery waste, material, that is starting to, come from the various manufacturers around the world. And also from consumer electronics as they end of life and starting to see batteries from cars coming back.

Hillary: And in the energy storage space the opportunity for returns is enormous because there's a growing market for battery parts and materials.

Dipender: It doesn't take a lot of math, to understand how big that economic opportunity is which is gonna result in, large amounts of employment and wealth creation in the regions that can develop and build these batteries.

Hillary: The clean tech market is increasingly changing but that wasn't always the case.

Di: In those early days, the clean energy revolved a lot around power generation, and you saw investors come in sometimes with more enthusiasm than experience or technical expertise, putting a lot of money into opportunities that were capital intensive and highly technologically complicated.

Hillary: Di Tang is a member of the sustainable and impact investing team at Cambridge Associates.

Di: Because they didn't necessarily have the diligence capabilities. There was a very high failure rate in that Clean Tech 1.0. Today we are seeing this combination of a more robust.

Investment ecosystem investors in the early stages like Capricorn, who are technically experts, who are able to diligence the risks of failure of very early, but promising emerging technologies. And then we have this swath of later stage investors who have the connections, the capital, to support these companies as they scale and commercialize.

Hillary: At Cambridge Associates we work closely with Anders and the Velux Foundations to deploy capital to sustainable real assets and private equity venture funds all across the globe.

Di: These include Capricorn, where top class technologists like Dipender have the expertise, experience, and network to source and assess the viability of emerging climate technologies like Form. Whose Iron air batteries can help shepherd us into the next phase of the energy transition.

Hillary: At the Velux Foundations they have their own strategy. Here is head of impact investment, Anders Kristoffersen, again.

Anders: The idea that all the activities that are today fueled with fossil fuels should, in the future be driven by electrical energy, that is the main driver that you can see across many of our investments. And so, battery storage is definitely at the heart of what we want to help catalyze.

Hillary: The Velux Foundations consists of two philanthropic foundations: VILLUM FONDEN and VELUX FONDEN, started in 1971 and 1981 respectively. Their grant areas cover science, the environment, and social and cultural purposes in Denmark and internationally. And just in 2021 alone, the two foundations granted EUR 244 million euros.

Anders: In particular in the area of sustainability, we really wanted to be able to engage with companies making, uh, the world a more sustainable place. That's what you call Cleantech companies today.

Hillary: And in the environmental space, Anders and his team focus their effort on climate change and resource efficiency.

Anders: We're lucky that we can invest across production of renewable energy, sustainably managed forest, sustainably produced food, and a wide range of clean tech companies. So, it is really, a targeted program, but, a quite wide investible universe that we work with. And we do that by investing in unlisted funds across real sustainable assets and private equity.

Hillary: The Velux Foundations are invested in Capricorn's Technology Impact Fund. And Anders says we need companies to embrace new perspectives, like Form does.

Anders: The notion that this technology is basically about rusting and unrusting iron, that in itself sounds a bit weird, interesting. And it's a totally different avenue, that they take compared to many other players in this space. And so that's the exciting thing.

Anders: And what we need is really for companies to, to take on new views, that we can help to solve this riddle. We will need many different types of storage, in the system in the years to come as, renewable energy becomes, much more, prevalent.

Act III - Pilot, expected results and the future.

[Mux: LQC_LQC_0008_00201_Electrical_APM.0-02]

Hillary: So, let's say these batteries are successful. Who would own them and what would that look like?

Mateo: If you haven't seen a picture of a utility battery project, it essentially just looks like containers sitting in a field, if you will.

Hillary: Form Energy's Mateo Jaramillo again.

Mateo: And you have many of them depending on the size of the system, but, watching batteries operate is, maybe the energy transition version of watching paint dry.

Mateo: It's not terribly exciting. And from the outside you can't really distinguish one chemistry from the other. And that's, that's by design, right? They should be boring. Infrastructure is not meant to be exciting to watch, because it needs to be very low cost and, and long lasting.

Mateo: The key feature of them is that they are reliable, they'll be low cost and they are very scalable. So, in the end they should very unobtrusively be sitting there in, in a field.

Mateo: And we don't require any battery farmers to work the batteries. But, but certainly the point is taken and, and there'll be a, a part of the power infrastructure just sort of sitting there and doing their job.

Hillary: Form is working on their pilot plant under a partnership with Great River Energy or GRE, which is one of the largest electric co-ops in the country and they have a leading position in the industry.

Mateo: Great River Energy was our earliest utility partner, and we're eternally thankful for that. Being in Minnesota, uh, they understood very well, the challenges that go along with these multi-day weather events. For them, it's the polar vortex. Blast of cold air comes down from the Arctic and sits over their service territory for 3, 4 days or so.

Mateo: And that's precisely when they would like to be able to have the renewable power available, but that also coincides with a typically a wind lull. In other words, they don't have the wind turbines moving in they know that for the long-term stability of their system, as they increasingly want to bring on that low-cost renewable, energy, they have to have a complement to it.

Mateo: And so the point of the pilot is to demonstrate that we can, deploy this type of asset on their system and that it operates as designed. So very much fitting into their system, right, as one asset, as one tool that they have at their disposal to ensure the reliability and the robustness of their system.

Hillary: The team at Form thinks of power density in terms of MegaWatts per acre, which is what they are expecting to generate.

Mateo: Initially, as we do the pilot, it'll be a few megawatts per acre and we'll get higher than that just to give you a rough sense though, coal is about one megawatt per acre, natural gas is much higher than that, of course. Wind and solar is much less than that, about one 10th that, or maybe one fifth that. Depending on where you are. And so it, it very much fits in the spectrum there.

Mateo: The way to think about how this benefits the system is in the entire portfolio and when you have low cost, long duration, or multi-day stores like we have, what you can also do is right size, your renewable power build out, so that you don't have to build nearly as much. And when we do all the modeling on this, one thing that very clearly comes out with this low-cost multi-day storage is you can reduce your build of, let's say solar by about half or wind by even more.

Mateo: And that's because, to solve the reliability challenge, you don't need as much overbuild of those renewable assets. You can rightsize them, so that you're not consuming as much land, and going through all the challenges there. That's one of the main benefits.

[Mux: BIB_TBX_0099_02501_Electric_Skies_Instrumental_APM.0-02]

Hillary: In August of 2022, the US Government passed the Inflation Reduction Act or IRA into law. It is the single largest investment in climate and energy in U.S. history. And It offers funding and incentives to accelerate the transition to a clean energy economy-and one of its goals is to help the US become a net-zero economy by 2050.

Hillary: Many energy providers have announced that they want to be able to deliver carbon-free electricity by that same year.

Mateo: I think it's imminently achievable and I think, getting to the net zero, future is, it not only feasible, but I think it's gonna be lower cost in the end, than the, system that we have today. And our type of battery, our multi-day storage, approach is gonna be a piece of the solution. But the scale of this challenge is sort of hard to comprehend.

Mateo: It's a multi-trillion dollar investment is what will be required to do this. And, the grid is old, by the way, in general, in the United States. And so we need to be investing very heavily in the electric system. Anyway, and we might as well invest in the next version of it.

Anders: Energy goes into basically everything that we do. Just look at what happened here in Europe as the Russians invaded Ukraine and gas supplies were cut off in Europe.

Hillary: Anders Kristoffersen from the Velux Foundations again

Anders: Energy prices spiked. And it was something that could be felt at all levels of society and in life here in Europe. And so the whole sector to me is incredibly important and I'm convinced that things are really moving and the technologies are being de developed as we speak, but we need to accelerate that even further, as we not only want to be able to carry our cell phones around, but we also want to electrify vehicles. We also want to be able to sail big ocean going vessels on renewable energy. And we even want one day to fly on renewable energy. In all those applications battery play a key role by being the energy storage vehicle that you need when you need to go off the grid.

Hillary: And Anders believes we have the innovation power needed to solve this.

Anders: I've always sort of been interested in how we as humans interact with surroundings, with the nature that we were born into. And how we become better at treating nature better.

Anders: We have only been working seriously on abiding climate change and developing clean technologies for some decades. And while it'll require tremendous work for us to get through, I see every day new interesting ideas, so I'm deeply optimistic but of course, there's a long way to go.

[Closing Mux]

Hillary: If you want to learn more about batteries, or venture capital, please visit us at Cambridge Associates dot com slash unseen upside or check out the show notes. Stay tuned for more upcoming episodes and if you like what you're hearing, leave us a review and tell your friends and colleagues.

At Cambridge Associates, our podcast team includes Michelle Phan, Luke Charest, and me, Hillary Ribaudo.

From PRX Productions, Sandra Lopez-Monsalve is our producer and Genevieve Sponsler is our editor. Production assistance by Isabel Hibbard. Our location producer for this episode is Nico Rivers.

This episode was mixed by Samantha Gattsek. The executive producer of PRX Productions is Jocelyn Gonzales.

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[Mux theme fades]

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