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Interview with David McCall and Robert Piconi
Green Gravity Podcast
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David McCall:

Hey, it's David McCall with QTS Experience Podcast. And if you've listened to this show, you've heard academics from Berkeley and MIT insist that in order to have renewable energy, you have to have grid level energy storage. To put that in a perspective, you would need a battery at least 200,000 times bigger than your typical Tesla battery and the storage needs to be as green as the energy it's collecting. Join me as Rob Piconi, CEO of Energy Vault, explains how gravity is the ultimate green storage on the next QTS Experience. The most valuable commodity on earth today is data, how we make it, use it, move it and protect it. My name's David McCall. Join me today for the QTS Experience. 3, 2, 1, Robert Piconi, Thank you for joining me on the QTS Experience. How are you today?

Robert Piconi:

I'm well, David, thank you. And thanks for having me.

David McCall:

Man, I'm so excited you're on here. A theme that we've talked about over the last year on this show is sustainable energy, but in particular, what's kind of starting, I want to say March or April of last year, that's kind of risen to the forefront as much as we like talking about how we source green energy, how we buy green energy, what is green energy? What are the viable sources et cetera renewable globally, slowly what's come on into the discussion is this idea behind energy storage. We've had academics on the show. We've had people of industry on the show and I came across your organization just doing research on energy storage and I was absolutely fascinated by how you guys are tackling the problem and I'm sure we'll get to that in the talk.

Before we go there, you blew my mind when you and I met before we came live and you started telling me a little bit about your background. So, could you share with our audience a little bit about how you went from world class athlete to teasing that's me joking, but you know, Robert Piconi goes to school to change the world and somewhere along the way becomes an energy storage guru. What was your journey like?

Robert Piconi:

Sure. Well, look, interestingly I started my career in diversified energy in a large oil company. So, you might remember a company called Amoco. It was one of the top five oil companies back in the day, and they merged with British Petroleum in 1998 at the time, the largest industrial merger. So, I started my career there and which was very interesting. And back then, they used to say, there's no problem that $20 a barrel couldn't solve back in the day. But just amazing to see the reliance on something that's controlled by a few people in OPEC, et cetera. So, just fascinating in the journey I went through the late '90s and as the internet took off and started to transform business models and how we not only communicate, but how we do business, I shifted and went into telecommunications and the labs.

And that was very interesting because I was fascinated with technology and it's impact on everything we do today and how it can really fundamentally change and help us become more efficient, productive, but also present all risks with that, right? To business models. So, that was really interesting along the way, and that's something that I've always had a passion about and something that has stayed with me as we get into now data and the impact and the use and how data is helping us understand the ways we do business today and the way we interact. So, that in terms of the journey what's interesting is through that piece and running companies and businesses also into healthcare, I ran some companies in healthcare and got into that sector using technology and applying it to healthcare business models, which was very interesting to help improve the quality of patient care.

So, that was another phase where I got into running my own companies, running private equity companies and applying technology to really important things. You can't think of anything more important in life. And along the way, by the way, I should say I have eight children. So, part of that, I got married in my 20s with someone that I-

David McCall:

Pause, I got to break the flow, pause. Did you adopt any of these children?

Robert Piconi:

No.

David McCall:

Is this a blended family?

Robert Piconi:

It is not a blended family.

David McCall:

Robert, I don't know that we're going to talk about anything else for the next five minutes. I have three daughters, 18, 20 and 22. My wife and I didn't start having children until we had been married 12 years. And it has been a journey I could not imagine having them cubed to have eight to nine kids. What are the ages that they run?

Robert Piconi:

So, my oldest is 28 and my youngest is 12. And a lot in between there, and this is another, you'll love this. And we may spend a lot of time on this, in the discussion, but after our first child, we were expecting our second child, Dave, and we got natural quadruplets. So, when I was 27 years old, I went from one child to five. And of course, I-

David McCall:

Four of them under the age of one or two at the same time?

Robert Piconi:

Yeah. So, the art of multi-tasking and living and functioning without sleep, these are things in my later 20s, I really honed that skillset. And obviously it starts with a great partner and my wife, and that could not have done obviously without her. So, but anyway, that's part of that story and getting into healthcare and helping people. And you want that. When you have children, of course, you tend to see the world a little bit differently and you think about preserving not only for your children, but as now coming full circle to renewables, which it was like coming home back to the transition from diversified energy, big oil company to now looking at solving one of the biggest problems around getting renewables deployed and that's of course, energy storage.

David McCall:

Mm-hmm (affirmative). One, that's a remarkable story, it's a really cool story. I'm not sure which one's cooler, the eight kids. I mean, like you're your own Oregon Trail right there. You could load up two or three wagons and go conquer part of the West. When we have children in all seriousness, most human beings, it has a profound experience on them. They sometimes if they weren't people of faith, it renews or brings them to faith. If they had very scientific sort of sterile ideas about human life and what that means, it affects it. It may not necessarily completely change things, but it certainly adds color and depth and whatever. It just, what's quality of life mean? What do you want to spend your time on? How do you develop relationships?

It's such a, I did not want to have kids at all. My wife had to convince me. I'm the oldest of five, she's one of eight. Her family is, her mom is Japanese, her dad is Irish.

Robert Piconi:

Oh, wow.

David McCall:

I was like, "Look, we're good." We had finally started making a little bit of money that we had a little bit left over. We lived in a cool little house off a Galveston Island. Why do we want to mess this up? And then you at least in my case, you hold your daughter for the first time and it just, I have to sometimes channel that because she's driving me to distraction on occasion now in the world today. But it's interesting on how in so many ways it can, most of them positive how they can just affect our lives.

Robert Piconi:

Yeah, it is. And I'm of course the outlier, I mean, even having one child today is a huge impact and responsibility. So, I'm sort of, of course, on that extreme and it does, that's also a journey. I mean, starting from your first and when you have many, it is just amazing. Uniquely, I think what you learn is every child is so unique and you can't really put a peanut butter or spread and treat them all the same as a core, but every one of them really needs something different. And you see that, I mean, here we have four all the same day, same parents, right?

David McCall:

Mm-hmm (affirmative).

Robert Piconi:

And each one of them very unique. So, it is special. And it does hone in around this concept of purpose in life. And that's what, as you have children and watch them grow and go through challenges and you're there for them, it sort of really hones in that mission. And that's what was very interesting about now, what I'm going to do for the rest of my life, which is about really focused on the planet and helping have us return and preserve a world for our children and grandchildren beyond.

David McCall:

Well, this conversation's either going to go really, really well, because you're a really cool dude or it's going to go really, really bad because you're crazy. Because it just occurred to me that after you had the quintuplets you still had three more kids. You're like, "This is not enough to feel the team we've only got the infield. What are we going to do? We need more."

Robert Piconi:

Yeah. By the way, the smart people go right there. And by the way, it's not quintuplets, it's quadruplets.

David McCall:

Oh, it's quadruplets, yes.

Robert Piconi:

Yeah. Don't give me more than four. I don't know how it would be.

David McCall:

Well, I mean what's one more but still.

Robert Piconi:

Yeah, exactly. What's one more? But that was something and this is part of you and your partner, your wife and she really enjoys children obviously and loves being at home. And so, that's just... But we figured out what was causing that multiple and had been three children in a standard way. And that's where we finished, but yeah. And we're done. Eight is enough, that's it.

David McCall:

Yeah. I dig it. I think it's really cool. They'll also, it will quickly tell you who loves you when they invite your crew over. They know it's not like, "Go to Costco, get two more stacks of burger because we're going to be feeding people."

Robert Piconi:

Yeah.

David McCall:

So, let's talk about energy storage. So, what's interesting is in the decade up to these conversations in my life anyway, where green energy became in my world in the data center business, something that wasn't just a casual conversation that happens sometimes. It wasn't a particular passion of mine. It just, it didn't come into my work life very much. I didn't have much connection with it. Other things were capturing my imagination. As we began having a conversation about 10 years ago in my line of work regularly, our customers, many of my customers are some of the largest buyers in the world.

And probably Robert [inaudible 00:11:48] 2005, 2006, having a green energy path was part of the conversation, but it wasn't really a requirement. It would be a tie breaker. By I don't know, 2012, it was if you don't have, if you're not already engaged in procuring green energy in some way from the grid and not just buying credits, but how are you doing this? What's your plan? You are excluded from the conversation. And certainly by 2019, if you didn't have a real robust ESG report executives in leadership positions around sustainability, not just with energy, with water, with the efficiency, with all of these resources, social programs, but we still want to have a, we're not going to have a conversation with you. And these are the largest buyers of, and consumers of data on earth, whether they're cloud computing or social media or e-commerce, or whatever.

And so, the cool thing about that is most of these organizations, this isn't lip service. This is some degree part of their culture. In some it's deeply entrenched their CEO, it's part of their founding core philosophy. I mean, they've got to be responsible to their shareholders and their customers and their employees, but this is interwoven into their DNA. And so, it affects, it sure is affecting regulatory control. Regulated markets are being affected because these people are choosing who they're going into and not. But I never heard anybody in all of that time and through that whole journey, talking a lot about storage because to do storage at the grid is hard. To do storage in a home is easier. I mean we would do energy storage for your laptops got energy storage, I've got UPS's and stuff for my home computers.

But for my whole home a little bit. Probably the closest would be some kind of kinetic energy through a generator with a propane tank or something would be probably the closest to that. But real energy storage, so those were the things, but at the grid level, megawatts of capacity wasn't a regular conversation and now it is. Now it's becoming part of a regular conversation. So, as you imagine or as you evaluated rather the renewable energy space and how do you help facilitate whatever that timeframe is, a very short timeframe, a long timeframe from traditional fossil fuel methodology to a renewable world that has to have storage, how did you evaluate whether you wanted to get into the energy procurement or you wanted to or generation around other or the storage, what was that path like?

Robert Piconi:

Sure. By the way, it's a great question and let me start with where we were founded, because that'll go back to the beginning.

David McCall:

Okay.

Robert Piconi:

How did you really decide how we were going to solve this problem? And we were founded at IdeaLab and founded by a guy named Bill Gross. Uniquely, he just yesterday, so timing, Bill just announced his public merger now for IPO, with a company called Heliogen, which focuses on solar based industrial energy. So, taking the sun basically and leveraging that to drive industrial processes instead of fossil fuel and also even to make things like green hydrogen.

David McCall:

Could you imagine that conversation just in a rough for a second, you're sitting down with prospects, so what's your big idea? I'm going to leverage the sun. I want to hear more.

Robert Piconi:

Well, and this sounds great, right? Because it is the single largest resource really that we have. Unfortunately it's not uniformly existing in every part of the globe in the right way. So, and that gets into a lot of other things in transporting electricity. However, what Bill was doing and he had worked for about 15 years, David, in renewables and in heliostat technology. So, these are the mirrors that concentrate the sun and will focus it on a receiver for example, and what's called concentrated solar power or even just straight PV panels. And he saw this issue of storage coming. And as we, I had known Bill for about 12 years before that. He had reached out to me to run one of his earlier renewable companies, a company called eSolar. So, we didn't stay in touch over the years and he called me and he said, "Rob, I have this great new idea for energy storage.

I want you to come help me found it and lead it." And the biggest issue, which is why hasn't energy storage or renewables been more predominant up until now. And it really comes down to, and you've rightfully talked about the smaller applications where we have technologies that can fit that economically. But the problem with renewables as we know is intermittency. So, it produces energy at the wrong time of day when you need it, right? Sun in the middle of the day, but the consumption's really the early morning or the evening and wind typically at night. So, that energy storage, if you need energy storage to make renewables replace other forms of fuel, the fundamental issue is economics. So, this isn't very well known, but the cost to make electrons is very cheap today.

So, even let me start with fossil. Five to 6 cents we can have, and you can burn coal anything and make things very cheaply. The cost to store those same electrons is a multiple of three to four times minimum. So, if you think about that equation, Dave, why haven't we been deploying renewables earlier? It's to solve this economically, and then we'll get into environmental aspects as well, it's a massive challenge. And today, 90% of all electrons are stored with pumped hydro, pumped hydroelectric dams. So these massive pumped hydro dam. So, back to your question on how did we think about solving it, we looked at the world and said, and back in 2017 and said, "Look, this is a big problem and it's getting worse."

So one this urgency, what was fundamental for us and you mentioned this, you remembered this from our first discussion that, "Hey, Dave. The time is now." So, that for us precluded certain technologies. We didn't want to invest in a ten-year roadmap in chemistry, for example, in battery chemistries. And there's plenty of money, I think that's looking at that and will help and improve. And lithium-ions getting deployed now as a proven tech now to try to get the group scale. The other thing that was important to us was we weren't going to do anything to harm the environment. So, it didn't make sense to us to solve in a green way, this issues with renewables and have something that presented environmental liabilities. So, and this was fundamental for us. And that's going to be something that, as we just announced this morning with Enel Green Power, not only energy storage, but using decommissioned wind blade.

So, real circular economy, taking things that otherwise would've gone into to landfills or has to be burned, that we can utilize that in our energy storage. So, the environmental aspect was important. We'll talk more about Enel later. And the other aspect, and this was the hardest one to solve was the cost and the economics. So, this is what hadn't been solved and where we spend most of the time before formalizing the company and the concept we wanted to get those economics solved and get to something that would approach a cost where when you have a low cost wind and solar, it's today, one to two cents. So much lower, 75% lower than existing fossil fuel plants, they're fully amortized, okay? But how could you get storage down to three, four, 5 cents so that when you combine them, you could economically replace fossil fuels for the first time?

So, that's what, for us what that meant and where we focused was we looked at pumped hydro gravity energy storage then, and said that's great. Pumped hydro uses gravity. It's long duration. It's one of the most economical, still too expensive, but let's solve for the bad things about pumped hydro. You can't build them everywhere. They disrupt wildlife ecosystems, because you have to build dams. They're still not as efficient as we would like. So, you lose about 30% of the power in the process of storing it because you're

pumping water back up to the top of the dam. So, that's called round trip efficiency. So, you want to have something that's ideally up above 80% close to where lithium-ion batteries are and cost, and solve for that cost equation and not hurt the environment. And that's what we did essentially in coming up with a crane, a specialized crane to mirror the height that you need for gravity.

And instead of water, which doesn't exist everywhere and in some places like in California, where I am, it's very expensive. Doesn't exist naturally in the desert in a lot of places. So, could we come up with a composite way that wasn't concrete because again, concrete's not good for the environment, seven to 8% of greenhouse gases, come up with a way to make these composites environment-

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Robert Piconi:

... seven to 8% greenhouse gases, come up with a way to make these composites environmentally and hit that cost point. So that's where we focus to solve all those things in an equation, including ultra low cost, high round trip efficiency, and environmentally, something that, whether it be for the main components or transportation and materials, we can make everything locally. It's really fascinating, that combination of innovation. So that's how we did it.

David McCall:

So a bunch of questions have come to my mind, but it occurs to me that I want to talk about your solution. You've touched on a number of elements of pumped hydro, but probably a lot of my audience doesn't know exactly what they mean. So water, they heard dam, they heard round trip efficiency. Can you just take 60 seconds and explain in super simple form this is what pumped hydro is and this is the geographic locations it can be deployed. Obviously it can't be deployed in the desert if it needs abundance of water, but where does this work?

Robert Piconi:

Yeah, so typically, pumped hydro exists where you have water, and that can be rivers or existing reservoirs, and you need height, so you need the ability to have the water sitting and maintain a certain height so that when it, essentially, is allowed to fall down from that height, it's turning a generator to make electricity. Then you have a water turbine that's going to pump that back above to the upper reservoir. So it's essentially using gravity and height because that's the standard equation for energy. That mass times the gravity factor times that height will give you the energy that you're going to produce.

That's, as I said, 90% of all energy storage are these dams. The issue is all of the good locations have already been built. For environmental factors and other cost factors, it's very difficult to get them built anymore.

David McCall:

So as I'm thinking about this, it's obviously generating more energy coming down than it takes to pump it back up. Is there a certain amount of evaporation? What happens? If a water molecule comes down, that same molecule doesn't go up. It's got to be a fraction of that. Is that correct?

Robert Piconi:

Correct. That's the term of round trip efficiency, meaning for every unit of energy you store in that water before it starts, it starts its descent down, it turns the motor to make electricity. How much loss is there in that energy storage capability, because you are, through the fluid losses, exactly your point, you're pumping that back up. That loss is about 30%. So that it's what we call 70%, therefore, round trip efficiency. That's at the high end.

David McCall:

Yeah. In the data center world, we're measuring... if I have a watt of energy come in at the outside of the data center from the substation, I'm measuring by the time it actually does the work at a rack to power that cat video that everybody's watching or whatever I'm measuring, if it was a watt out in the substation, how much do I lose from there through the various systems until it gets to the rack? Because I'm not going to have a watt at the rack. I'm going to have some efficiency or some loss there. The more efficient we can make it to get it closer to that watt... I think it's not the same idea, but it's the same idea in terms of loss. I start off with a unit of one. By the time it actually is done doing its work, it's going to be less than one, and I'm trying to make that as efficient as possible.

Robert Piconi:

Yep. That's it. It's the same concept in energy where we start with one, and at the end of the day, it's, in pumped hydro's case, it's delivering 0.7, again, at the top end. That's one of the things we wanted to solve for is how could we create a gravity energy storage system that's doing that same thing, leveraging gravity to have something essentially that's lowering or falling, that's turning a generator and creating electricity, and then as it would be returned to its state, in our case a composite brick that is returned to its state, what's that loss? For us, we start in the 80s, which is great. That's one of the things we had to solve for.

David McCall:

So we've touched on it. You've said you've built an infrastructure that uses composite materials. Its inspiration was the pumped hydro model. What is this? We'll have links with this conversation to your website and if you want to give us some videos for them to go look at and they see... I've seen a video on it, but can you describe to people how does this impracticality, when you go to build this, where would these locations live? What does it look like if they were trying to build it in their mind palace right now? By the way, that's my phrase of this month. I love that phrase, mind palace. Mine's more like a mind shack, but we're sticking with mind palace for the moment.

How would you, if you're sitting around, you're having a soda water while your eight children are dominating the soccer field and you're trying to explain to the person sitting next to you, who's just stopped watching Stranger Things on their phone, how would you explain the tower, the mechanism, and where you deploy it?

Robert Piconi:

Sure, and very simply. So we're going to take that excess solar and wind that's generating that energy at times when we can't consume it all. Okay? So we're going to take that excess energy and typically co-located to a solar plant or co-located to a wind plant, but can be next to any grid connection. we're going to take that excess energy, and that excess energy is going to turn motors that are going to lift these massive brick composites.

I say massive because they're each about 35 metric tons. They're about four meters tall and two meters deep. They're especially made with this brick machine. So that excess energy is going to turn a motor, and in a standard motor from the likes of GE, Siemens, Nidec, APV, so companies that have been around forever building these, that's going to turn that motor and raise that composite brick to a certain height. Sitting at that height, David, is an object that's all potential energy.

So this goes back to what you might remember in your high school physics class of the concept of potential energy. In this case, it's a composite brick sitting at that height. Of course, today with the technology of AI machine vision software, we can be very precise with how we lift these objects, how we stack them, how we sequence them based on signals from the grid, for example. Then essentially when the energy is needed from the grid or the customer or a data center, for example, wants to tune and set up say, "Hey, I want three megawatts of power over the next eight hours," for example. Maybe that's overnight.

Essentially, we will lower. So through this software, we will then lower that composite brick at a speed based on the amount of power output that's required. In lowering that brick, that potential energy becomes kinetic energy because it's turning now a motor generator. It's going to create electricity. So a lot of people says, "Hey, you create energy." Well, not really. We store it, and then it's potential. Then yes, it gets regenerated, let's say, in that lowering of that object, and that's then we'll generate that electricity, all tuned with software, all fully automated, which we couldn't do 20 years ago. That's how the system works.

David McCall:

I love technology. It just blows my mind. When you were sitting there talking about potential energy, I do understand the concept of potential energy, but I didn't really think about it in terms of a reservoir. Where I live near Atlanta, I don't think it's a hydro plant, but we do have a big dam. We've got a big reservoir above it. We release it on occasion. It waters parts of Georgia, Florida, and Alabama. But you could calculate that lake, in particular, if you have artificial intelligence to help the humans, the energy stored in that body of water. Now you're talking about, "Yeah, but we've got this idea now where we can, as we have excess power that nobody would be able to use anyway, the sun's just doing sun stuff, you have this..." Or whatever. Whatever energy source. The sun. You can connect it to the grid and have any excess.

I don't know that we try to run a lot of fossil fuel. Sustainable energy is more just as the blades are turning or the solar cells are capturing it, but whatever. We're looking for energy storage, period, for all sources of the grid. So it captures it, it stacks it up. The bricks, are they layered? They certainly can't all be suspended. So if you have bricks at a lower level, they have a lower potential energy quotient as opposed to the ones higher. Is that how that works?

Robert Piconi:

Exactly. That's the concept of stacking, which is, by the way, one of the first patents that's already granted, by the way. There's some gravity energy storage companies that have relied on one single massive object. None of them have proceeded past seed funding because it's hard to get the economics to work with one massive object up and down because you have to spend the money on existing infrastructure for that with each massive object. So it's tough to get the economics to work.

But it is like that where we stack these objects in a very precise way. Then they get lowered. With gravity, we would love to go 200 meters, 600 feet in the air. However, we've limited our height to something that really could be built anywhere you can build, like a 20 or 30 story building, you can build our system. In fact, the configuration now is a very simple building that's cladded and you wouldn't know what's inside, unless you knew what was... you went in and looked inside. It's actually that there's these composite bricks that are moving up and down, sequenced with software, and all generated from that excess renewable.

But also to your point, and you were going there, it's any energy source. So very uniquely, we're working with some utilities and companies that want to run their existing fossil fuel infrastructure in a more efficient way. To do that, they want to use storage to help optimize that performance. Why? Because it reduces the greenhouse gas emission. So the equation we're all trying to solve for is that how can we, more broadly, whether fossil generation, more renewables there, we need to be reducing every day the amount of heat that's going up into that atmosphere that's creating those issues.

David McCall:

Yeah. I feel like that's one of the coolest things. We've talked to professors from MIT, we've talked to professors from other places, we've talked to technologists like yourself. The ones that I enjoy the conversation the most is it's not that they're not demonizing any particular group. It doesn't mean that they don't believe there's a better way, that there isn't a sense of urgency. In some cases, some people believe a great sense of urgency. But regardless, we're not turning off fossil fuel tomorrow, and we need energy storage across the grid, period, everywhere, in my opinion. More sustainable.

We just had somebody on the other day who's talking about electrification around so that we can have more electric infrastructure for vehicles, for all these other things, and so the grid needs to continue to build out, be more robust, and we need any more storage. I don't want to just tie storage to renewables. I don't want to create a problem by having environmentally toxic storage solutions. That's not going to work.

I was talking to somebody in the early part of this discussion last year. I'm not going to mention their name. I didn't do a podcast with them. I was just at an event, had this conversation, and they said, "We want to talk to you about this kind of storage." I was like, "To do 200 megawatts at one of my data centers, to do that would be banking a bomb." I don't know that that helps me in being responsible to the citizens around me to solve the problem.

So it's always got to be economical. It's got to be simple. It's got to be environmentally friendly, otherwise we're defeating the purpose of what we're trying to do.

Robert Piconi:

Yeah. David, you bring up some extremely important points that I think it's good that your listenership, if I can call them that, understanding that is we're absolutely going to need fossil fuel for this transition for many, many years to come. You don't just turn it off. The example is right here in California in the rolling blackouts we have. We have them every summer. You can force shutdowns of existing coal generation or fossil generation plants and you can go to renewables, but if you haven't solved the energy storage problem, you're going to be left with times without power.

So there's a transition. We can do this over time, I think, in a way that's going to have us get to that solution. That doesn't mean we shouldn't be aggressive, but also we should use innovation in different ways. You made another great point on the environmental aspects and technologies that have those risks with energy storage, because we shouldn't do this, obviously, at all costs and put risk in. Lithium-ion has its own set of circumstances, whether it be safety or the scarce materials and how they're mined that we have to pay attention to. It's fundamental.

To me, the responsibility we have, if we're going to be solving renewable energy storage, you need to make sure you're not creating other problems. I'll use the example of what we announced this morning, just coincidentally, the agreement with Enel Green Power. So part of where we drove our innovation to solve the cost problem, but also to make sure we were sustainable, and this is where I really encourage people to innovate is we used material science, not for electrochemistry and things, but we used it to think about different materials to replace ones that hurt the environment, like concrete production, with the soil.

So fundamentally, we can use the soil from the ground that we excavate to make all of these composite bricks that are our storage medium. What does that mean? We aren't bringing trucks in to transport. So the largest GAT emissions come from the transport sector. But we also used it to get to that cost point. So soil is cheap, right? It's free at the site, David. So we were also solving the problem of economics by thinking differently about the use of our materials up to and including waste materials. So materials like coal ash, like these glass-reinforced fibers otherwise destined for landfills that have not only a high environmental cost. It's a financial cost for companies.

What if we could take that, cut that cost in half? You have to process it, but if we could reuse it so you don't have to landfill it or burn it and put that into renewable energy storage, and that's what was the basis of what we announced this morning with Enel Green Power. Enel's the largest global renewable player in the world. They have 50 gigawatts of wind and solar under their management. They are very innovative in their thinking of what they call innovability. So innovation, renewables, and the circular economy.

I really encourage and push all the so and innovators there to think about innovation in the sense of reuse of what we have in this world to solve these problems. To me, that is innovation that needs to be fundamental as we think about the clean energy transition.

David McCall:

I have to caution myself not to go off on a tangent of... I got in a debate, I don't know, two weeks ago. It wasn't on the show, or at least it won't appear on the show, with somebody about consumerism. I said, "Yeah, I know, especially in the West. The Japanese and others are pretty good at this, but even..." Well, I'm not going to make an example, but I've seen so many things where the appliances in my home. I wanted to repair something and no, really the solution is you just toss that one and you get another one from the manufacturer. It just drives me crazy.

I remember my folks. My dad was a manager on the shuttle and he worked on the space station and whatever. So he's a pretty handy smart, old-school dude. We would repair stuff. Why would we get rid of that just because it's not the latest and greatest? I'm not making a comment on upgrading your infrastructure. I'm saying that they're designed to fail and really just toss it.

So anyway, this person and I had this discussion, but I wrote last year an article about eWaste. I just hosted somebody whose organization is in the eWaste world and resolving that. Are you familiar with eWaste? Do you know what eWaste is?

Robert Piconi:

I am, yes.

David McCall:

Okay. One of the things that I love that they start with is... You mentioned lithium-ion. I'm not anti lithium-ion. I think all of these technologies have their place. I know that you're saying as well, but they don't all fit every application. At some point, you scale. Some things don't work unless you get to scale. Other things fail if you start exceeding a particular scale. They become too dangerous or not economical or whatever the circumstance is.

But anyway, with the idea of eWaste, companies that really capture my imagination are those that say, "Our number one thing should be how do we reuse and repurpose? How do we do that?" Well, in order to do that, we have to do it with gear. I'm in the IT space. That isn't just designed to just be tossed. That can be recertified. That can be rewarrantied, that can be repurposed, and I'm hoping that more and more of that philosophy gets adopted, but that should be our first thing. So I love to hear what you're talking about.

We didn't set this up. There's going to be cynics in my audience. They'll be like, "Nah, you guys." Nope. I just saw your cool thing and said, "Robert, would you come on my show?" I didn't know if we'd have a Love Fest or that there'd be eight children or that we'd get in an argument. I don't know. It could all happen here, but I just thought your solution was really cool. I wanted to learn more.

But I love that idea of how do we do no harm? I'm not naive. I'm in the world of I've got to satisfy shareholders, and so we have to... I think one of the greatest benefits to the world is economics and freedom or capitalism, but it has to be ethical. It has to have this philosophy of do no harm. So as I'm looking at these solutions, or as I'm understanding them, especially as it comes to eWaste, if we don't have a philosophy of repurposing, there's got to be, like you're doing with the blades, "Okay, they've served their life. That's awesome. How do we, instead of sticking them over there for however much time it's going to take them to decompose or we're going to have to consume them and emit whatever chemicals we're going to emit, I can just...? Maybe there's some environmental impact, but it's a fraction of what it was before... I could put it in this block and now it's serving a greater good."

It's like when we sink ships to build reefs for fish or whatever, we create systems that we can repurpose, we don't just junk it and cause greater harm.

Robert Piconi:

Yeah. Yeah. We obviously share that. That was fundamental, not only for us to stick to the parameters around the environmental side, but what's amazing about that is what it does for the economics, because-

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Robert Piconi:

What's amazing about that is what it does to the economics because, and your father is very similar to mine. He made a comment to me a few years ago that, when we had something break in our house, we had to fix it. We didn't run to the Home Depot...

David McCall:

Right.

Robert Piconi:

... to go get another one, right? They didn't have that option. So, they grew up with that, and I love that. That is, as we thought about it and the cost that companies also incur. So, it's not only good for the environment, but the cost of... There's a true financial cost to have to dispose of these things, let alone the environmental costs, so that you can actually get the benefit on the economic side, and that's another aspect that is very important.

Look, there's applications for a lot of tech that it's very important, fundamental to this transition. Lithium-ion has such an important role to play, the electric vehicles and all the assets that we use every day that we wouldn't be using and storing, laptops, cell phones without it. So, it is about that and that journey and that optimization of those technologies now to grid scale, and we need everything we can get.

David McCall:

What's the typical capacity of one of the towers, would you imagine?

Robert Piconi:

Well, our average initial storage size, and we talk about that in megawatt hours. That's hours. We're already in megawatts, so we're already moving from kilowatt hours to megawatt hours. You know, our solution specifically is really designed for large grid scale so,

while we could do four or 10 megawatt hours of storage, ideally for us, we're going to start at 40 megawatt hours and above, and even up to, by the way, multi-gigawatt hours of storage.

So, think about what happened in Texas and having enough storage capacity to deal with events, but as well as to replace fossil fuels, you know, these large power plants are doing multi-gigawatts of generation. So, how do you replace that? So that's where, for us, we started somewhere around 40 or 50 megawatt hours, and we'll scale up to multi-gig watt hours of storage.

David McCall:

Now, do you imagine the towers are primarily going to be at the energy generation sources or are they going to be deeper in the grid in urban areas, metropolitan areas, or how close are they going to be to generation?

Robert Piconi:

I would say three main areas. The first is exactly what you've just articulated, which is co-located around where there's these large solar sort of PV facilities or large wind turbine farms, so we can be co-located there. Secondly, you mentioned near urban areas so, because we're a structure and essentially now, instead of a single crane tower or the product that we're building called EVx, which was announced with Saudi Aramco two months ago and their transition.

So, we developed that in parallel to the power that's operating in Switzerland connected to the grid. Now, it's a simplified structure, essentially like a building. Think about it like a chess board, if you're looking down on a chess board, it's the thing about vertical freight elevators, all orchestrated with software. So, it's a structure like anywhere you could build a 20 or 30 story building.

So, the second location is outside large metropolitan areas where it may be paired with renewables. It may just be connected to the grid. It may be near an industrial site or existing fossil fuel facility that's going to make the transition. Why? All that grid infrastructure is there. So, David, coming back to this point about reuse, reuse what's there. The grid infrastructure is there at a full plant, etc. Why wouldn't we build it there and then build out solar or wind or generation around it. So that's the second area.

The third one, and this is very unique to us because of our duration, how we can do longer duration without degradation and storage. So, our technology doesn't degrade over time, unlike your batteries. So, because of that, think about industrial plants that need 24/7 power. Let me talk about one, and this is one that Rob is working on and working with one of the largest customers in the world in this space, desalination plants.

So, what a critical function producing millions of gallons of drinking water in a lot of arid regions of the world, where they have to convert and desalinate water. It's so critical, but they're having to use a fossil or diesel generation to power 12 hours of the night because they need between four to six megawatt base load power for the night. There's really no way to store that economically today except, of course, with a solution like ours.

I'll say I don't know a lot of others that are similar that can do it economically over long periods. So, we can co-locate next to, or in the vicinity of, these desalination plants or other industrial facilities where they are already building out solar because a lot of them are built in places where there's a lot of sun.

They have plenty of generation during the day, but they have to power eight to 12 hours through the evening periods when the sun's not shining, so that's the third area of location where we can co-locate. Think about farming in the desert and in other applications, and that gets into other things that we haven't shared publicly before. I'm going to share one of them with you...

David McCall:

All right!

Robert Piconi:

... because I'm so excited to be here, but imagine a world where you have a structure where the center of that structure is free, meaning there's physical structure, meaning there's pillars, but it's empty. Think about what we're doing in these days, in sustainable farming, in vertical farming. If you think about vertical farming, what are the three biggest costs for these innovators now that are doing Ag Tech and sustainable farming in hyperponic ways, so without using so much water.

Their three biggest costs are real estate, electricity, but a lot of them use the light to the power of the growth and then people. So, what if we could take these facilities that are used for renewable energy storage around renewable and also have another reuse concept to do different things with that space. I might suggest that data centers are probably not far behind.

Anyway, so there's a lot of forward-looking things that, as we are innovating always, and that's why it's fundamental to stay ahead with competition and to keep that as a part of your culture every day. I think with this mentality of reuse and things, I think a lot of innovation can come and integrate a lot of things that will be the future of this planet. How do you feed it? How do we power it, etc.?

David McCall:

Right. Actually, Robert, you're hitting on my... I knew I was going to like you. I wrote an article last year about Ag Tech, just because I ended up on this journey. Not only one of the biggest costs, one of the biggest challenges they have is the people because nobody's signing up to be a farmer these days, the technology that they need to have, the connectivity that they need to have. They're trying to deploy robotics, drones, artificial intelligence, LiDAR, like all of these different technologies, and nobody wants to go be a farmer.

They want to go into the city and be a material scientist or whatever, but we still have to feed the same number, in fact, more, growing more and more and more. We're learning now. We're applying technology and science, and how do I don't destroy this soil? How do I not over fertilize, etc., so I love to hear that in a way that I hadn't even considered something like energy storage can come to that environment to help them with the cost of people and the availability of people, for that matter, and the cost of electricity.

It's just amazing that I'm also surprised so many times when I hear people kind of moan about the opportunities of the future. I'm like, "Have you lost your mind? Why? What are you talking about?? There's so many opportunities. We just don't... There's not enough talent. There's just not a show up with work ethic and a curiosity and go explore materials or go explore energy, or go explore Ag Tech or whatever. There's a hundred other categories. There's opportunity if you're willing to work for it.

Robert Piconi:

Yeah, and it's so true, and one of the messages that's fundamental, you hear a lot about the risk with the planet, and there's a section of what we hear is a lot of gloom and doom, and a lot of it's based on projections of what could happen. I am so optimistic and encouraged, and maybe it's because I see the technology that we're developing and that others around us are developing, how it can be used in ways that haven't even been thought of to solve these problems and, in some cases, multiple problems at one time.

This is one of the benefits of working with an incubator like Idealab, which is probably one of the most prominent ones in the U.S. It's, I think, the longest running incubator, and there's so many interesting ways that we can remove CO2 from the atmosphere. A lot of it comes down to then economics, is how can you get it economically? That's one of the ways you have to use innovation is to solve that so it actually becomes a viable product.

I'm encouraged, and the last thing I'll mention, and you mentioned this about people wanting to be farmers. You think about this coal plant transition we have to do, and I'm talking about this because it's happening, and it's so cool. You think about having to eventually shut down a coal plant. It's got all that grid infrastructure. Typically, coal plants buy as much land as they can around them.

Obviously, they've been buying over the years because of potential liabilities from the coal ash and also just the visible piece, the aesthetic piece of looking at a coal plant. So, think about transforming that asset where you can decommission it, reuse even the concrete debris, all the debris, reuse it in something like these composite bricks, as an example. Reuse the coal ash. You build out solar. You dismantle the plant. You have energy storage built there, which in our case, it is a structure.

Then take those jobs for people that get displaced from working there and have them be a part of maintaining a new energy infrastructure, for one, but also potentially other applications within a structure like that, for example, including Ag Tech and sustainable farming. So it's really, from my perspective, I'm very optimistic about how we're going to be able to use technology here to solve some of these big problems.

David McCall:

Well, you know, one of the things you said so casually a few minutes ago that made me chuckle. I'm also an optimist when it comes to these things so, I mean, we're realists. We could see how data can be twisted to harm human beings instead of cause human beings to flourish in technology. Well, I just hosted somebody on a few weeks ago who helped pick the protocols for GPS and then later chose TCP/IP for the military to be the backbone as we move from Artnet to founding the internet.

His name's Heidi Haydn, one of the most amazing conversations I've ever had in my life. At the same time, there's no greater amount of human trafficking in history. We can twist tools to harm but, most of the time, we use them for the good.

Where I started chuckling was, you just casually said, "We're essentially taking a water reservoir in an environmentally friendly, vertical way. We're taking it to the desert, and we're helping the desert bloom as it desalinates and deploys it, like Biblical size miracles, two or three or four, and we're just casually mentioning it with technology as we cruise on by.

I mean, do we get surprised by anything anymore? You know, that's, we should be optimists because, when we invented the airplane, we also invented the airplane crash. We also solve so many of these other problems, and it's our nature as human beings to just constantly innovate.

Robert Piconi:

Yeah. Sometimes, it does take the crisis or that burning platform. So, to be clear, we got to a point, and we started to see it, right? We started to see much more extreme weather anomalies happening. Unfortunately, we got to a point, and for the reasons you talked about this from the beginning, I've loved it, 2006. You went to 2012 where the companies were evolving and shifting to renewables and, by the way, that was very early.

I mean, the companies you were talking about were really, I would say, innovators in using it, but it did take, unfortunately, it took us to get to a point where we started to see the impact and lives were lost, right?Lives were lost, unfortunately, because of it, so it sometimes takes that burning platform to get and harness the power of innovation, and that's one thing I will never short-sell about our humankind and its ability to innovate.

You know, if anything, I think that the pandemic taught us something about and forced us as a world to... It forced us to collaborate because there was this phenomenon happening that was killing our people, and that was difficult. So, renewable energy and the climate crisis, that's beginning to force coordination again to avoid something that could get worse, but I remain that optimist like you, David, because of what I see is taking place in using technology differently.

People are really pushing, and companies are making this happen by choosing who they do business with and having those requirements, so it's happening. I mean, you're seeing it and even, my gosh, in the last year, we've added the last six to eight months companies and countries, countries in particular, that never made public commitments on sustainability and achieving, for example, net carbon neutral by a certain date.

I mean, China stating that they have this 30/30 program. I don't know if you have heard that commitment but, by 2030, they're going to peak. By 2060, in the next 30 years, they're going to beat at a net zero, so to have China saying that, that's pretty massive.

David McCall:

That is massive for Microsoft to make these commitments, and they're serious about them. These are organizations. Every now and then, I'll hear somebody say, "Yeah, but maybe they won't get..." Oh, so they get 70% of the way there. Here's the other cool thing, though. If you don't make it a political thing, the innovation that's coming along with this, whether it's the innovation that comes because president Kennedy says, "We're going to win this race, and here's how we're going to do it.

It's going to be about exceptionalism. It's going to be about this thing." Whatever the reason that we got behind it... You talked about Bell Labs before and all the other, Skunk Works and great innovation and whatever, and they came together before that and since, and we have unbelievable evolution and materials. Well, in the same way, one of the things we've talked about the most is the economics related to storage and to energy.

Everybody would have laughed at you 15 years ago. There is a, "Sure, I'll give you a megawatt of solar power, but it's going to cost you." You know, this is the impact. So, the finances weren't there. Well, the finances are there. The economics are there and people

are constantly innovating.

Hmm. How do I get that? How do I get frictionless transmission so that I can stand my tower up out here in these areas, but I can deliver it with almost no loss halfway around the country or maybe even at some point the world.

We just haven't invented it yet. We will. We absolutely will, and we're going to be the recipients and the beneficiaries of all of these different innovations that we're working on now, regardless of whether it's, I'm somebody who is convinced that science says in a very short term, if we don't make these green changes, this is the consequence to our environment on earth, and I'm not arguing with those people, but that's their motivation.

My neighbor across the street who could, I don't want to put words in their mouth, but that's not their motivation, but the idea to have energy independence, to have their own source of solar and their own energy storage and only fail over to the grid if something fails within their system.

We're still moving towards this. How do I improve the aquifer? How do I reduce carbon? How do I reduce emissions from chemicals that I don't want? How do I harness the natural resources around me and have independence? Man, I'm all in on all of it.

Robert Piconi:

Well, you'll appreciate this. If you ever get out to Southern California, it'd be great to have you stop by the lab, which is in Pasadena, and we're located just north of that, about an hour, just in the Thousand Oaks Village area.

David McCall:

I know it well. I went to school out there.

Robert Piconi:

Oh, did you? Okay.

David McCall:

Yeah.

Robert Piconi:

Well, on the wall in Idealab and outside my office on the wall, there are some words and a picture of a philosopher from the 19th century. He was actually Austrian. He's German. His name was Arthur Schopenhauer, and he said the following, that "all truth passes through three phases. First, it is ridiculed.

Secondly, it is violently opposed and, third, it is accepted as universal. Hearing you talk through what you just talked through about where we get to, and I think about even Energy Vault, we went through all of those spaces, and maybe it takes an announcement from the largest energy company in the world like Saudi Aramco or maybe Enel Green Power, like this morning, to get to that, okay, now maybe this crazy idea, these towers you've been building...

You're aren't going to move around 35 minutes on bricks. You can't build them economically. You can't build them without concrete. So, all that stuff and, believe me, we've got all the naysayers out there along the way, right? So, it's just fascinating and encouraging at the same time, which is why it's outside, also in this office because it's always good to remember that as you evolve.

David McCall:

It is. It reminds me, I remember when I was a kid, I was a terrible student my junior and senior year. They hadn't invented ATD yet, so I don't know what I had, but I wasn't a good student. I was always angry with my dad and so, for both of our sakes, when I was 18 years old, I decided to escape authority and join the Airborne Infantry, which he still thinks it's the funniest thing I ever did to escape authority.

My drill sergeants believed in wall-to-wall counseling. That was quite the experience. Anyway, I didn't go to college into my forties and went and got my degree just because I felt like I needed to check a box. Anyway, I wish I had that time and money back now.

One of the things I learned when I was in school was this guy, I cannot remember his name, but he tried to teach that the continents can shift. They're not lily pads, but they shift, starting with the scientific community that Darwin was part of. They all absolutely ridiculed them. Then, to your point, they began to violently oppose him, and now our satellites...

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David McCall:

... point, they began to violently oppose him. And now our satellites show us how continents shift and adjust and they do these things. And of course that makes sense. Unfortunately, for him, it's 60 to 70 years after his death. But it's... we just see this over and over and over. You're a heretic if you think we orbit the sun, instead of the sun orbiting around us. I love it though. The humans that, look, I got an idea. It may prove out that it's not entirely right, or it's not right at all, but we should at least embrace... in a fail small kind of micro, let's just experiment. And if it bears fruit, it could improve the situation for all of us. I know that's Pollyanna and few people get that, but we don't like our truce challenge, do we?

Robert Piconi:

Well, and I think the best companies have solved that, right? The best ones that innovate have not made an environment where you're penalized for failing, right? That you only get there through failing. And some people, very famous people that I won't name here, dropped out of college to go fail and try to do something that college wasn't helping them doing. And so, I mean, it's pretty... I think the people that have really had the best results, let's say, in driving innovation have been able to put in place that business model to encourage it.

David McCall:

I've been very fortunate in the last few weeks, I've had a couple of different folks from MIT come on. And one of the things I love that they talk about is we're really trying to get back to... I shouldn't say get back. They're really trying to encourage and emphasize a particular spirit of innovation. And we've got Georgia Tech right down the street. I'm sure that's going on in a lot of these things. But how do we have a healthy curiosity where we don't just declare everything that's current bad and throw it out, but we're constantly scratching our head in the best way and saying, can I improve upon that? And maybe the answer is, no. That's based upon what we've got today. That's as good as we can do that thing. But maybe it's, yeah. I can improve upon that.

And thank goodness, because we're not still going down to Lake Erie and cutting ice blocks and loading them up in the wagon and storing them in the warehouse up the street. That we actually can have refrigeration in our house. So yay, yes. Before we wrap up, I know we're getting close to our time here, but two quick things. The first is I'm a huge fan of what can we do with data. It seems like to me the two most valuable things that people are commoditizing these days, organizations, is our attention and data. What's the relationship, when you guys are building these things and you're working with this, do you... in data centers, we mine data, we use data in a variety of ways. How does data come into play in your world?

Robert Piconi:

It's a great question. And what's amazing is the continuum, the energy is on and I think energy infrastructure. It's following a network topology and infrastructure. And I'm going to share what that means. But let me start with, I guess, just for energy storage, for example, and generation and data and the software that we use to control and manage it. It's fundamental to understand the fundamentals of supply and demand in terms of supply of electrons that's required to power our world versus that demand. And at the end of the day, that's all data that needs to be utilized so we can optimize meeting the demand, which is very volatile, the supply. And if I were to say that without us talking about energy, that sounds just like something else as I worked for Bell Labs and Lucent Technologies. And what we're resolving for are network infrastructure, how to deal with the demand of data, because it's absolutely volatile.

You can't predict it at times. It's more concentrated in some areas than others. And in some areas you don't have network infrastructure in place. So if you think about that, what's happening in energy now and what we... I went through to telecom transition when telecoms like Telefónica in Spain, or Verizon, et cetera, were moving from data to video and the demands on the network that that created network infrastructure. And so what's interesting is you look at that evolution of the network, the concept of the network, where we now have, with wireless speeds, where they are, et cetera, we have storage. So think about energy storage as the cloud, right? The cloud is where we... are the data centers where our data resides and how that data gets analyzed so we can optimize a lot of things that I won't get into here. But in a very similar way, if you think about energy, so you've got electrons.

So instead of data the [inaudible 01:08:27] is electrons. It's the same. You've got electrons in a sense, and how they move and how they're created and where they're stored and where they're utilized and where they need to be utilized. It's in that same fashion. You have a network that's got to be able to optimize that supply, meaning generation, and the demand of the people that are using it. So it's fundamentally, I see the energy infrastructure progressing in this way, where we're going to have all types of generation. By the way, that's fossil, that's solar, that's wind, that's pumped hydro electric dams that are going to continue to be there by the way, forever. Let me just be clear. And you have nuclear power, so you have all these power sources. We're now moving into the storage era for energy. Storage has been there in the network, right? For a bit where energy storage now at scale is where we're going to store this utilizing software then to optimize that supply and demand. And you may have heard the term virtual power plant. So what is that?

David McCall:

What is that?

Robert Piconi:

Well, just as the concept is essentially where you're utilizing software to help manage and balance that supply and demand of energy and virtual in the sense of it doesn't have to be physically co-located. I mean, there's a grid network in place. You can store in different parts of the network, generating different parts of the network. So I think this evolution of just like you optimize a network of data and how it gets distributed, how does it get stored and how you analyze it so we can provide value. I see the energy landscape, the energy architect is moving in that very same way.

And I think you're going to get... and I don't want to get into the layers of the network. Layer one is the transport layer. Moving up the stack where the value is. But I think it's going to be the same. I mean, you're going to move up that stack from just what is in a network transport, but we're going to have generation, which is what we have today, different types. You're going to have storage, which moves further up the stack. Data centers. I mean, in a sense. And then you have a way to optimize and deliver that and have it add value. And that's, I guess, where I see things evolving. And I think from an energy perspective where there's going to be a lot of value created to help optimize this network, meaning the energy network.

David McCall:

I love that idea. I hadn't even considered it, but I think you're absolutely... it's obvious you've thought about this a lot. One of the things that they're dealing with in the data world is this idea called data gravity that was coined a decade or so ago. I think it was somebody from a GE that coined it. And it was that data sets grow to a certain size where you don't push sets of data over networks anymore. They're just too big. You have to pull the applications to them, or you move things closer to them so that they're moving shorter distance. It's cheap to create data, it's expensive to move data. Kind of like you were talking about earlier, it is cheap to create energy. It is expensive to store energy, right? Same idea.

And so, which kind of brings me to this, when do you think solutions like yours are going to move closer to the airport, that are going to move closer to data centers, that are going to move closer to big infrastructures like ours? Now, there are different types of data centers. There's edge data centers, there's enterprise data centers. My data centers and most of the folks that... all of our peers are big REITs. And so back to repurpose. While we do some Greenfield builds, and we're doing more of those now, which just being ground up builds. The only reason for that is we've bought every old chip manufacturing plant there is. We've bought every repurpose, big, heavy infrastructure and repurposed them. And that is core philosophy of ours. We want those systems because they've got access to heavy power, they've got access to utility, they've got access to connectivity.

The fiber networks are running through there. And the further you get out from that infrastructure, the harder it is and more expensive far and away it is to build those things. We have energy storage, usually in the form of kinetic, whether it's active power or fly wheel or other things, or we have UPS, battery UPS systems. A variety of sizes and big, massive farms that we have to manage. And so I'm curious, when do you think towers like yours, especially when you talk about putting them... I imagined initially that it would be a crane type infrastructure, which it is. But what would citizens think about? But if it's just an attractive building, and a lot like this and we're already in heavy industrial places.

And the second thing is one of the things that COVID has accelerated is retail and some commercial office assets just collapsing. And people are trying to find out or figure out how do we not have urban blight? How do we repurpose this in a smart way? And so whether it's 15 minutes cities or whatever, they don't want to turn them into... first, they thought they'd turn them into warehouses, but they don't want that kind of traffic coming and go. And so it seems... I'm curious, when do you think your towers or solutions like that will get closer to the data centers or maybe take advantage of some of these depressed asset locations where they can come in and an old abandoned parking lot or whatever, and build up to get storage further from maybe the generation, but still have a role to play in the middle of these areas?

Robert Piconi:

By the way it's a great question. And you're highlighting another area of innovation around transport of electricity and what happens over long distances with loss. And very interestingly, there's, in this sort of another thing to get your thinking around this concept, there's group right now that, for example, if I were to tell you that in Australia, in Northwestern, Australia, there's groups looking at building out massive solar farms, massive, many, many, many gigawatts of solar that are building a underwater DC line. So a submarine line, that's a gigawatt. So it's 1000 megawatt line to Singapore, for example. Or groups in the North of Africa that are looking at building out renewable generation and powering, for example, up into the UK. So those things may sound like an idea for the future, but those things are actually taking place.

So what's amazing is transport. So this aspect and that's what's... again, it's a concept of the network right in. And while we have solutions... where I'm going to go with this question a bit is the nice thing about the grid is, I mean, it exists in a lot of places or some places it doesn't exist. But as you can transport electricity and fairly efficiently that there is loss, but there's technologies that are going to solve that. Where we're going on renewables as well is off grid. So where you can combine with the right storage at the right cost and storage that doesn't degrade. So it has an economic life that makes it affordable, let's say, for the initial capex. And you look at levelized cost over time and the cost to operate it as well. So you really need to get something really cheap.

But if you can get it cheap enough, you can build off grid and power small cities and a lot of emerging areas of the world that need power or to power these industrial plans, as I mentioned, where you build out renewable with a long duration storage and you don't need an existing, typical utility grid. So I think the... to come back on this aspect of moving closer up, for example, our storage moving closer to an urban environment where it's consumed, there's pretty good infrastructure in urban environments. I think as you think about... for us, as we think about structures, we fully realize, and that's one of the things... I mean, we use gravity. So you have the height, you need a structure.

And we got a lot of feedback, David, as we developed and built our first unit that's connected to the grid, five megawatt in Switzerland. Why did we actually been announced and what we're building is actually different than that? And this is part of the innovation curve and the product life cycle, where our customers told us, they said, look, we love gravity. We get pumped hydro, because a lot of the utilities they've got that's what they manage. They love it. They run infrastructure, right? This is in there in your mentality. But they said, and we love the fact you don't degrade, you're environmentally friendly, great. But guess what? You need to be shorter. You need to have something that can fit in structure. And you're managing a lot with that rotating crane, could that be simplified? Which we did.

And now it's basically a vertical freight elevator. And then the final thing is they didn't want an addition long duration, they wanted shorter duration and high power at times, but when it's needed over four hours in the night. And we call that decoupling of energy and power. So I think that feedback helped us. And you have to listen to your customers. It drove us to innovate and to rethink how we thought about packaging this proven gravity storage now with the rotating cranes operating and to simplify it and to have something you can repackage and deliver on what customers need. So that enables us, back to your question of location and coming closer to where that demand is, right? Where's that demand and around cities is a simplified building, basically.

And if we can handle a building and it's clotted and structures clotted, you can paint it, you can reuse the inside. So this all comes back, circular coincidentally, to how do you reuse, to your point on the warehouses as get bought up. How could we think about also... we use a term called belly of the beast for that inside of our structure. Uniquely, it's an internal term of how can we reuse what's there that solves problems that other people have, like in the Agtech and for sustainable farming where their highest costs are electricity and in real estate, like in your business. And then the other one's labor. But how could we reuse that? So again, to me, this is where innovation should be driven and result in something that's good for the world.

David McCall:

Well, I love our time. What haven't we talked about that we should've talked about? I think we covered...

Robert Piconi:

I think we covered all the topics that I was expecting with this and even some that I wasn't. And it's great to especially get some of the anecdotes also a little bit about your life and how you've thought about things in different industries and the corollaries here. So that's what I love about this discussion is it pulls in so many pieces outside of a core domain, let's say, of energy storage. It's amazing how the world is becoming smaller and the use of technology can help us transform the insult problems. And I think that's really cool.

David McCall:

Well, now I got to go back and tell my wife, "Look, we can't complain as much anymore. I just got trumped by Superman." But, look, I know it sounds Pollyanna, but I think we should be about human flourishing. I think we should be about, at least my world, kindness and love and how do we... when we're thinking about what we're doing and what we're doing next, how are we taking care of our own business, how are we taking care of our neighbors. And regardless of, in this particular case, the technology that we're pursuing in the area of storage, I think it's time we unite now. Let's think about, for the listeners of this show, then we're going to share with a lot of people, we're going to have links to what you guys are doing and just go out and start getting involved in this conversation.

It's a conversation that needs to happen regularly, more often if we're talking about sustainability. And it just makes sense to me. So the clock's... But by the clock is ticking to me. What that means is not necessarily doom and gloom, it just means the longer we delay in getting smart solutions out there, the longer it takes for us to bring just good decisions to our grid and to what we're doing. I mean, one of the first, if not the main symbol of modernity is electricity. You look at a globe and where you don't see lights on the globe, it's probably not a very modern area. When you talk about the ability to bring energy storage to parts of the world where even some of the structures aren't built out yet, you're bringing modernity. And when you bring modernity you reduce disease, you increase... you can't have water wells without electricity. You cannot have modern medicine and health care and agriculture and whatever without these tools. And so when they're lost, you're essentially turning off modernity. So anyway, I'm going on... that's my only rambling for today. I really appreciate you coming on the show.

Robert Piconi:

Thank you. It's been a pleasure. And if you ever get out here to Southern California, love to introduce you to the team a bit and take you to lunch. So we'll do that.

David McCall:

It'll be great fun. I really appreciate it. If you've enjoyed the show, please like subscribe, share and combat. Combat. Comment. No combating. Thank you for joining me today everybody. Have a great day.

Robert Piconi:

Thank you.

PART 4 OF 4 ENDS [01:23:25]

Forward-Looking Statements

This communication includes certain statements that are not historical facts but are forward-looking statements for purposes of the safe harbor provisions under the United States Private Securities Litigation Reform Act of 1995. Forward-looking statements generally are accompanied by words such as “believe,” “may,” “will,” “estimate,” “continue,” “anticipate,” “intend,” “expect,” “should,” “would,” “plan,” “predict,” “potential,” “seem,” “seek,” “future,” “outlook,” and similar expressions that predict or indicate future events or trends or that are not statements of historical matters. These forward-looking statements include, but are not limited to, statements regarding estimates and forecasts of financial and performance metrics, projections of market opportunity, expectations and timing related to the rollout of the business of Energy Vault, Inc. (“Energy Vault”) and timing of deployments, customer growth and other business milestones, potential benefits of the proposed business combination and PIPE investment (the “Proposed Transactions”), and expectations related to the timing of the Proposed Transactions.

These statements are based on various assumptions, whether or not identified in this communication, and on the current expectations of Energy Vault’s management and the management of Novus Capital Corporation II (“Novus”) and are not predictions of actual performance. These forward-looking statements are provided for illustrative purposes only and are not intended to serve as, and must not be relied on by an investor as, a guarantee, an assurance, a prediction, or a definitive statement of fact or probability. Actual events and circumstances are difficult or impossible to predict and will differ from assumptions. Many actual events and circumstances are beyond the control of Energy Vault and Novus.

These forward-looking statements are subject to a number of risks and uncertainties, including changes in domestic and foreign business, market, financial, political, and legal conditions; the inability of the parties to successfully or timely consummate the Proposed Transactions, including the risk that any regulatory approvals are not obtained, are delayed or are subject to unanticipated conditions that could adversely affect the combined company or the expected benefits of the Proposed Transactions or that the approval of the stockholders of Novus or Energy Vault is not obtained; failure to realize the anticipated benefits of the Proposed Transactions; risks relating to the uncertainty of the projected financial information with respect to Energy Vault; risks related to the rollout of Energy Vault’s business and the timing of expected business milestones; demand for renewable energy; ability to commercialize and sell its solution; ability to negotiate definitive contractual arrangements with potential customers; the impact of competitive technologies; ability to obtain sufficient supply of materials; the impact of Covid-19; global economic conditions; ability to meet installation schedules; the effects of competition on Energy Vault’s future business; the amount of redemption requests made by Novus’ public shareholders; and those factors discussed in Novus’ Annual Report on Form 10-K for the fiscal year ended December 31, 2020 under the heading “Risk Factors,” and other documents of Novus filed, or to be filed, with the SEC. If the risks materialize or assumptions prove incorrect, actual results could differ materially from the results implied by these forward-looking statements. There may be additional risks that neither Novus nor the Company presently know or that Novus and the Company currently believe are immaterial that could also cause actual results to differ from those contained in the forward-looking statements. In addition, forward-looking statements reflect Novus’s and the Company’s expectations, plans or forecasts of future events and views as of the date of this communication. Novus and the Company anticipate that subsequent events and developments will cause their assessments to change. However, while Novus and the Company may elect to update these forward-looking statements at some point in the future, Novus and the Company specifically disclaim any obligation to do so. These forward-looking statements should not be relied upon as representing Novus’s or the Company’s assessments as of any date subsequent to the date of this communication. Accordingly, undue reliance should not be placed upon the forward-looking statements.

Important Information and Where to Find It

This communication is being made in respect of the proposed merger transaction involving Novus and Energy Vault. Novus intends to file a registration statement on Form S-4 with the SEC, which will include a proxy statement/prospectus of Novus, and certain related documents, to be used at the meeting of stockholders to approve the proposed business combination and related matters. Investors and security holders of Novus are urged to read the proxy statement/prospectus, and any amendments thereto and other relevant documents that will be filed with the SEC, carefully and in their entirety when they become available because they will contain important information about Energy Vault, Novus and the business combination. The definitive proxy statement will be mailed to stockholders of Novus as of a record date to be established for voting on the proposed business combination. Investors and security holders will also be able to obtain copies of the registration statement and other documents containing important information about each of the companies once such documents are filed with the SEC, without charge, at the SEC’s web site at www.sec.gov. The information contained on, or that may be accessed through, the websites referenced in this communication is not incorporated by reference into, and is not a part of, this communication.

Participants in the Solicitation

Novus and its directors and executive officers may be considered participants in the solicitation of proxies with respect to the Proposed Transactions. Energy Vault and its executive officers and directors may also be deemed participants in such solicitation. Information about the directors and executive officers of Novus is set forth in its annual Report on Form 10-K for the fiscal year ended December 31, 2020. Additional information regarding the participants in the proxy solicitation and a description of their direct and indirect interests, by security holdings or otherwise, will be included in the Proxy Statement and other relevant materials to be filed with the SEC regarding the Proposed Transactions when they become available. Novus stockholders and other interested persons should read the Proxy Statement carefully when it becomes available before making any voting decisions. When available, these documents can be obtained free of charge from the sources indicated above.