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AMANDA PETERSON CORIO INTERVIEW

Hi, and welcome to GridTalk. Today we're very, very excited to have with us Amanda Peterson Corio, who is the Head of Global Data Center Energy for Google, a very important job these days as Google is gearing up to deal with the increased energy demands associated with AI.

Q: Hi, Amanda.

A: Absolutely.

Q: How are you?

A: I'm good. Thank you for having me.

Q: So, to start with the raw numbers, you have 17 campuses currently in 13 states and as indication of how you're ramping up, five more are in the works. Talk about that rapid increase alongside the fact that you are heavily committed to being a good environmental steward and utilize non-carbon emitting sources of energies. Your data centers as everyone knows, use a lot of energy so how does that create unique challenges for you, and then we'll get into specifics of your strategies for addressing them.

A: Sure, so as demands for our products and services grow, we continue to grow and have to site new locations for new data centers and what we are seeing right now is our customers are asking for the ability to implement AI and this new computing power in their own systems so that they can grow their businesses in the same way and so that's really spurring the demand growth we're seeing in this new digital infrastructure computing capacity in the U.S. with growing data center needs and demands. Our role on the power side of this is really to figure out: (A) How do we meet those demands in the timeframe that are required, and then (B) As you mentioned, how do we do that in a way that has a path to full decarbonization, both to meet our decarbonization goals but more importantly to be a part of this clean energy transition that we need to see on our electric grids.

Q: So, you've had a fairly impressive success rate in the last 12 years, roughly 2010 to 2022, of generating 10 gigawatts of clean energy through the data centers through Purchase Power Agreements. Now, that's the equivalent according to your estimates of 31 million solar panels. I assume you've done it through Purchase Power Agreements and talk about that success and why previous strategies used to get to that number have led you to try a new approach.

A: Yeah, so we've, as you've mentioned, we've signed well over 10 gigawatts now of clean energy and for us, that is clean additional new energy that would not have otherwise have been put onto the grid if not for our contracting to purchase that power. A lot of that has come from, as you mentioned, from our Power Purchase Agreements where we buy electricity and sell electricity in deregulated wholesale markets in the U.S. but also in markets where we don't have access to wholesale market participation. It also comes in partnerships with our vertically integrated and regulated utility structures where we partner with them to access clean electricity through the utilities directly and a lot of times that looks like building a new rate class or a terra structure by which we can catalyze by building this growth. We're constantly looking for and innovating on ways that we can decarbonize the grids where we operate and as mentioned, that takes a lot of different forms, and I'm happy to talk through some of that.

Q: So, before we get into that, if we look across the 10 grid regions that you operate in, my understand is when it comes to 24/7, around the clock operations, seven days a week as your data centers must operate, you're averaging right now maybe two-thirds are carbon-free energy powered, is that correct?

A: So, we are matching 100% of the electricity we use on an annual basis with new additional clean energy that we put onto the grid somewhere in the system or in the world. Our higher standard of our 24/7 carbon-free energy goal actually takes that a step further and says if we're truly going to decarbonize the grid where we operate we need to make it first local, meaning we can't just only sign a new contract for wind or solar, for example, in the Midwest to offset our data center in Singapore, right? Carbon is a global problem but we also need to find solutions directly where we operate if we hope to truly decarbonize our system and so our 24/7 goal looks at how can we bring it locally in the same balancing authority at the grid where we operate, and then how do we match on an hourly basis? And what that's doing is moving it from an annual matching so on aggregate of our over 24 terabyte hours of electricity we consume globally, we do match. But then how do we break it down to find solutions to decarbonize on an hourly basis? And once we look at it at that more granular level, right now, we're matching at 64% of the hours which we operate with carbon-free energy in each hour when again when that hourly number is also aggregated annually.

Q: So, that brings us to your Clean Transition Tariff that you've struck deals with NV Energy in Nevada and with Duke in

the southeast. Talk a little bit about the concept of how the Clean Transition Tariff works and how it becomes the tool to get you that 24/7 objective.

A: So, there's multiple reasons why the Clean Transition Tariff is really important and why we worked with it with our partners at NV Energy. As you mentioned on our 24/7 goal, it's critically important that we find carbon-free energy that can decarbonize every hour of the day and that means not just from solar or wind which has gaps in the hours which they can produce and so through the Clean Transition Tariff we were able to bring a new geothermal capacity partnering with Fervo who's an advanced geothermal developer, which can provide that firming capacity around the clock and every hour of the day so that's...

Q: Amanda, if I could just interject; we're talking about Nevada now which does have regional geothermal resources. In a case like Duke, is the goal to get other non-carbon emitting backup to intermittent renewals?

A: So, when we...the Clean Transmission Tariff is really a rate-classer construct that can be replicated in many different markets. As you mentioned, in Nevada geothermal is a resource that's available today. That is not a resource that is available in every market. What we're trying to do is say if we want to recreate the lane by which we

can work with our vertically integrated utilities to figure out what that solution is in each specific market and to your point, it will look different in every market, so it's geothermal in Nevada. It may look like something different in Duke or other service territories depending on what's the most economic and commercially available resource that can be applied but it also allows for creativity for things that we haven't yet figured out today and acts in greater clean capacity so that could look like, how could we use a Clean Transition Tariff to support utilities and building out grid-enhancing technologies to increase the capacity from existing infrastructure before going out and trying to build a new transmission line or build a new generation resource. How could we use the Clean Transition Tariff to think about demand response products? That's a way to think about energy efficiency in thinking about the two-way grid. How can we think about it with virtual powerplants? So, there's many different avenues that aren't just geothermal or even just generation that this new rate structure between our utilities and ourselves can allow, can open up to allow us to bring and make available clean capacity on the grid.

Q: So, I'm probably not telling you anything you're not aware of but traditionally utilities have been viewed as inherently cautious and conservative, guaranteed monopolies that did not

have to reinvent the wheel to be profitable. Do you represent the new class of customer when you walk in and say, this is what we want in terms of power and we want to talk about ways to get there and what kind of reception are you finding out from utilities?

A: We're; as a customer, we are absolutely saying that we need to grow; it behooves us to and it behooves the country to allow for economic development for customers to grow and we need to rethink how we do it and the reception has been, how do we do this? We want to work with you. We see the same challenges. We talk about the clean energy transition. It is not an if, but a when, and so every utility partner that we come to recognize that this is going to happen and the conversation really comes around, how can we do this intelligently? How can we do this in a way that meets everybody's needs and how can we do this efficiently? And so, I think that the reception that we're getting is, we hear what you're saying and how can we do this together, and that's why collaboration is so important here.

Q: So, to put a point on it, Google is circulating documents that quotes from a Princeton study that says that in the next decade or at least by 2030, two and a half trillion dollars needs to be invested in clean energy to get to where we need to go on top of a normal business as usual spend of nine point four

trillion dollars. Does everybody get that and let's widen the discussion we talked about utilities. What about state regulators? Are you finding them receptive? They're all over the block where they come from and frankly if you study their longevity, many of them are not there long enough to learn the intricacies of the business, so talk about your day-to-day work. Do you work with regulators as well as utilities? Is it an uphill slog or is it moving faster than you would have dreamed possible?

A: Our work with our regulators and our utilities, it varies by market and it varies by state if we're talking about the U.S. in particular. That said, I do believe that what we have encountered is a universal recognition that we are in a unique moment in time. A moment in time where our grid structure looks very different than it did 10, 20 years ago in terms of the makeup of generation. We are not actually building out interstate transmission at the scale that maybe we have in the past and so that's creating new challenges and for the first time in decades, we have real load growth in the U.S. and so that new moment in the confluence of factors has really brought everyone to the table where really we're just trying to figure this out together whether you're a customer or a regulator or a utility and so I actually think this moment that we're in is

really creating the opportunity for change and actually to be a catalyst whether it has been historically or not, I think it is and what I am seeing is it will be in the future, a catalyst to advance that transition faster. Our goal in that is really to be a helpful provider of what we're seeing and how can we think about a large electricity user, what role can we play and what that looks like in the future.

Q: Amanda, as I sit here in the middle of the continent in Kansas City, I am aware that you've announced a one-billion-dollar data center that you're putting into Kansas City. You've already identified 400 megawatts of solar that's going to be coming from a solar farm. I bring this up as an example, you're moving into this market. How are your conversations with Evergy, the local utility, going? Have you sat down with the Missouri state regulators? And now you have something to show them what you struck in Nevada with NV Energy and what you've agreed to with Duke. Is it getting easier as you go along? And talk about the specifics of Kansas City.

A: Yeah, well what we're seeing and Evergy's been a good partner to us and working with us to figure out what's the right structure that can actually can actually give us access to cleaner electricity over time. We appreciate the challenges that the grid has in having access to capacity so we're also looking

at how we can be a good partner there as well. I see, when you talk about Clean Transition Tariff and seeing that in other states and then applying it, how does that change the conversation? In Kansas City for example what we're doing is showing that it can be done, right, and I think that's actually extremely helpful to regulators and to our utility partner in Kansas City to understand if it can be done in Nevada then there is a pathway to show how this can be done here in this state and that's really what we're trying to prove out to move those conversations forward.

Q: As you brainstorm this, could you tell me there's no geothermal I know of in Kansas and Missouri and this region. What kind of resources do you see backstopping the sizeable wind portfolio that Evergy already has and the solar portfolio it helps to buildout?

A: Yeah, and this is the conversation that we have with our utility partners. We can bring our perspective and our modeling but there's always a two-way conversation to better understand it, and I think the solution could look like obviously, what role does storage play? Is there...are we talking about meeting a few peaking hours, and is there actually a demand response opportunity there to help balance that? Is there interest in other new firm leaning technology that hasn't been deployed

today, and that's the conversation that, what are those, right? If you don't have geothermal, what does it look like? Storage is the one that we have found is the easiest to come to the table with but even within storage, are we talking short-duration storage? Long duration storage? Are we talking about generation located next to or close to generation? Next to or close to the load, or completely independent on the system to act as a balancing resource and so, that's really kind of the opportunities that could be available in places like Kansas City.

Q: We just finished an interesting conversation with Chris Levesque of TerraPower. Might small modular nuclear or new generation nuclear play a role in Kansas City?

A: We're absolutely supportive a new nuclear buildout. As you know, nuclear has had a complicated history in the U.S. and getting built and fear of cost overruns and more traditional nuclear buildout but we are absolutely looking for opportunities whether it's Kansas City or elsewhere that continue to buildout a nuclear power because it is a great solution for providing large firm resources to the grid.

Q: Have you met with state regulators in Missouri to talk about any of these issues yet?

A: We continue to meet with regulators to talk about what are the solutions that make sense and...

Q: And not asking you to toot your own horn but is there's an excitement about the level of sophistication and operation that Google brings in in terms of bootstrapping the region to a higher level of energy efficiency faster than it might have otherwise gotten to?

A: You know, I hope so. We're excited; I could speak to that. I really do hope that our partners see us not as, or rather see us as trying to be a partner and I don't know that that always has been the case or that others would paint us in that brush but that is our goal and the way to do that is to listen and to be transparent to hear about what are the challenges that our utilities are facing and then what are the challenges that we are facing, and to work together. That's the only way that we're going to get there and so, what we're trying to bring is our own experience to the problem cause we recognize that not many people have faced this in their 20-years' career within the power industry.

Q: So, this story you're telling me reminds me of a story about a decade or two back when Walmart played a similar role of getting really insistent about energy efficiencies, cleaning up their own operations. Who are some of the allies Google has in

this campaign and you're not doing this by yourself. Other people need data centers and is there an alliance that's really coming together that's pushing the needle more than Google, as sizeable as it is, maybe able to achieve on its own?

A: Absolutely. We are partnering across the industry and across multiple industries with likeminded customers that are trying to find solutions here. We do that through different industry groups like CEBA, Clean Energy Buyer Association; also, our U.N. SE For All Compact for others who want to figure out how to decarbonize their electricity footprint on a 24/7 hourly basis. We have over 100 companies that have signed that Compact to advance this not only in the U.S., but in Europe as well. And then recently, maybe more specifically, we just announced our Advanced Market Commitment which is our partnership working with Microsoft and New Course specifically to say hey, we all want to see the adoption of these advanced technologies on the grid. We are aggregating our demand to go to market to try and support this, so there are a number of ways that we continue to partner because as you said, we recognize that Google alone can't solve the decarbonization of electricity grids, even if we solve it for ourselves so we very much focus on how can we scale this? How can we find good partners and how can we build solutions that are repeatable and scalable?

Q: Given that each one of your data centers is almost a city into itself in terms of the energy needs, what kind of promising research do you see internally at Google to maybe slash the energy needs of your data centers? Is there any promise there that new approaches to data centers that might have a big impact?

A: We are constantly innovating. If there's one thing Google does and does well, it's innovating both the design of our data center and the way that we think about meeting future growth. But we are constantly building more efficient computing chips, each more efficient than the last but when we think about the role of our data centers we're also looking at, what is the load of the future look like for AI, and how can we be responsive again in partnering with our utilities for when our load needs to run and when our load doesn't need to run, in addition to our decades-long energy efficiency efforts that we are constantly doing. It behooves us as a large energy customer, energy costs money, to use the least amount of power for the most amount of compute so incentives are naturally aligned on the energy efficiency as well.

Q: I'd like to just take a minute maybe as we wrap up here to go back to the Clean Transition Tariff and what it allows you to do beyond the PPA.

A: Yes.

Q: Are you in fact incentivizing the utility for example, as your partner to see a path to revenue by incurring expenses that give you the resiliency of your sustainability approach? Is that basically bottom line what you're doing?

A: I think it's yes and we're hoping to reduce the premium of the first-of-the-kind new tech by under this construct as a customer receiving not only the energy credit but the capacity credit and value that these new technologies are bringing to the grid and I think that is something unique to the Clean Transition Tariff that's important to know that couldn't be done or isn't able to be done in a PPA only so let me maybe explain that a little more. I could go buy, for example, geothermal or nuclear to talk about the technologies we discussed. In a wholesale market and buy and sell that electricity; however, right now in most places, there's not an option for me to buy the capacity which is critically important for me to be able to grow as a customer with firm reliable power and so that value is being left on the table if you will in the wholesale markets. Through the Clean Transition Tariff, we are paying the premium for that new technology that exists today for the first-of-the-kind. We are also; however, receiving the capacity value that that firming technology can bring in addition to the clean

energy attributes associated with the electrons for the electricity itself. That for us as a customer also helps to reduce the first-of-a-kind premium for this new technology while as you say, works for the utilities because they aren't wearing that risk nor are they having to share that risk or distribute that risk to other ratepayers.

Q: Got it. So, you have it what, in two states now?

A: So, we have executed the first full contract that the CTT and NV Energy and we've executed a MOU to figure out what is the structure? What could this look like in Duke territory? And then we are hoping that this is just the beginning of many markets.

Q: And what are you doing with Duke in North Carolina or other states as well?

A: We're located in Duke in North Carolina.

Q: So, as you have an MOU with Duke and proceed with the regulators in North Carolina, as you've already succeeded with the regulators in Nevada, how long do you think it will take to get other states to sign on especially now that it's not a new concept; they can see other states that are doing this?

A: Yeah, our goal is that each conversation becomes progressively easier because the playbook has already been written. It is publicly available in filings for others to see so it's hard to know exactly how it would take. It is our hope

that it will be faster and easier now that we've done it once and are doing it twice.

Q: So, I wouldn't be doing my job as a journalist if I didn't ask you, you've got 17 campuses now in 13 states, five additional campuses coming. Do you think in two to three years, all 22 of those campuses will be covered with tariffs like this? Is that realistic or will it take longer?

A: It's hard to know what the future holds. I will tell you that whether it's through the Clean Transition Tariff or another structure, we're working very hard that all of those campuses will have a pathway by which we can decarbonize our footprint on an hourly basis.

Q: Thank you, Amanda.

A: Thank you very much.

We've been talking with Amanda Peterson Corio, who's Google's Global Head of Data Center Energy.

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