AI’s Power Demands: Do We Really Have the Energy for This?

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Ariana Brocious: I’m Ariana Brocious.

Kousha Navidar: I’m Kousha Navidar.

Ariana Brocious: And this is Climate One.

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Ariana Brocious: Kousha, I don’t know if you know this about me, but I’m somewhat of a slow-adopter of technology. I had the same smartphone for ten years and only recently replaced it because nobody would support the operating system anymore.

Kousha Navidar: Holy cow, you must have had one hell of a phone case. You don’t try to get a new phone every couple years?

Ariana Brocious: Not at all. So I wasn’t totally captivated by the release of AI programs like ChatGPT. That said, artificial intelligence is ubiquitous in all of our lives. I use AI nearly every day as part of the editing program we use to make this show – it transcribes our interviews way faster than a human and in the last couple years it’s gotten SO much more accurate.

Kousha Navidar: Yeah, I feel like there was this boiling point a couple years ago where this technology just took off. I remember back in 2017 when I was living in DC as a speechwriter, I was sitting at my kitchen table with my roommate and our mutual friend, and Ariana I kid you not, I said, “I think I should start a business that uses AI to write speeches. I feel like in 10 years that technology is going to be present everywhere. And Ariana, I was wrong. It didn’t take 10 years – it took 5. And that really underscores the **speed** of transformation.

Ariana Brocious: Yeah and obviously, you're a visionary, so when you have another idea, follow it.

Kousha Navidar: Thanks!

Ariana Brocious: And as we'll talk about a lot in today's show, all that ramped up computing power requires a TON of electrical power. We've talked on the show about how shuttered coal fired power plants have been rebooted to run cryptocurrency operations… There's something similar happening with AI. We've seen companies like Microsoft walk back some of their ambitious climate goals because they see the money to be made from their booming AI sector.

Kousha Navidar: And some of those same companies are exploring nuclear power as a way to provide what's known as "firm" carbon-free power to run some of these plants. "Firm" meaning it's always on, unlike wind or solar.

Ariana Brocious: And even being somewhat of a luddite myself, I know that in spite of the power demands and other environmental impacts from AI, it also has some really clear climate benefits. It's made it possible for satellites to detect methane leaks that we didn't know about, and it can generate faster, cheaper, and more accurate weather forecasts.

Kousha Navidar: Right, AI is not all one thing. It's not all coming from one company, and it's not all about generating weird images to post on the internet. So yes, AI can do good things. And, the power demands and server farms needed to fuel that artificial intelligence have real-world impacts.

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Ariana Brocious: One place familiar with this is southwest Memphis, where Elon Musk's company XAI set up shop practically overnight, to the surprise of many local residents. I talked with KeShaun Pearson, executive director of Memphis Community Against Pollution, about how this has affected the place where he grew up.

KeShaun Pearson: Where I grew up, is a place, heavy black population, beautiful black people, and our community, was one where people care for one another, and really chose to treat one another like family. There was never a place that I felt like I was othered or felt like I wasn't around people who cared about my genuine well being. Whether I was at school, whether I was at Mount Pisgah Baptist Church, or I was at the corner store. My grandmother, my grandmother Pearson, I felt like she knew everybody. The way that folks would come up and greet her every time we were out. And even my grandmother, Gwendolyn Griffin. She would take us everywhere. but one of the places she took us often was like to the bank because we could get candy. And, it just always felt like whether it was the grocery store, whether it was the bank, whether it was, T.O. Fuller Park, where we had our family reunions and everybody else had theirs too. It felt like it was just one big family environment. and you just felt safe, and you felt like you were cared for because, you know, if you did something wrong and an adult was around, you was in trouble no matter who it was. Yeah. It was beautiful. It is beautiful. Westwood is a beautiful place in South Memphis.

Ariana Brocious: And hearing you describe the community, how tight knit and loving and generous is really beautiful. It really sounds like a wonderful place to grow up. And I also want people listening to know just for context that this part of Memphis also is close to a lot of industrial development, right? And that contributes to poor air quality and some negative things that come with being in this part of the city.

KeShaun Pearson: That's right. And so while the community, which is very strong and was very strong growing up one of the things that never escaped me was the smells you know, whether we

were, you know, just out in the field playing football or, even when we were on trips to the grocery store, you know, there would be an odor. And the simple, understanding that I had was that, you know, this is just, you know, how things are, right? That happens sometimes, and you keep moving forward. And the other thing I remember is just being in the shadow of smokestacks. If you go to Southwest Memphis, if you go to Westwood, the thing that you see is not, you know, the lush trees that are in T.O. Fuller Park, you don't see a big sign that says Westwood and welcome to, you know, our community. It's literally an oil refinery and it's smokestacks, you know, so you see smoke, you see fire, and these huge metal objects that are so foreign, right, and so different from what you are used to seeing on an everyday basis. And I think for me, I just got used to seeing it, right?

And unfortunately, it wasn't until I got, you know, into my teenage years that I realized, um, you know, that when I did travel further out into, you know, majority white areas or more affluent areas. There were no smokestacks. There were no oil refineries there, right? There was no odor. And so, that actually started to, to kind of mean something to me because I started to realize that, you know, where I'm from is different from other places. And other people see it as bad. That is something that I've always wanted to change perceptually. Where I'm from isn't bad, right? It's not less than, it's not a place where people are any different. We still want the same thing. We want to live, grow, play, and have an environment that's safe and healthy. Just like everybody else.

Ariana Brocious: We've talked with your brother, Justin J. Pearson, Tennessee State Representative on the show, and we talked about the efforts that you and he put forward fighting the Byhalia Pipeline, which was going to be routed through that part of Memphis, and, that fight resolved well, you all were able to defeat that part of the pipeline not, not coming through your neighborhood, and now there's another challenge. Elon Musk has come to town and his XAI company has built a massive data center, in this part of Memphis called Colossus. So how did you first hear about this project?

KeShaun Pearson: I literally first heard about this project sitting with the mayor of the city of Memphis as we talked about plans to make Memphis more environmentally sustainable at the conclusion of that meeting the mayor told me and the folks who were present, Elon Musk is building a facility in South Memphis. I don't know much more than that, but that is what's happening. And there is a different type of disappointment that you feel when you have sacrificed so much in order to protect your community, protect your family, honestly, and be presented yet again the fact that where you live, the place that your family has been for generations is again a target of environmental racism and I asked about the pollution immediately right because that is my key concern is what type of pollution is going to be attached to this project. Because I know what you're saying it's going to be placed, right and I know why people continue to select us and they continue to put facilities in this area Because they can continue to get away with policy murder, right? It's signed on the dotted line, and they can move forward and continue to kill people. And, so, for me, my heart is racing. And I've asked the question, and he doesn't have an answer, right? A clear answer. And says that, you know, he doesn't have all the answers, but he wants to get them.that may have been even more frustrating to learn that all of the precautions to protect us weren't already taken before this announcement. Right. And so blindsided, frustrated, and just really disappointed that it wasn't. At this moment, after the defeat of the Byhalia pipeline, after the defeat of sterilization services of Tennessee, we then have one of the most notorious environmental dangers in our backyard. Following that conversation, I got with Latricia Adams, the CEO and founder of Young, Gifted, and Green, Sarah Houston, executive director of Protect Our Aquifer, and we drafted a press release that elevated the concerns of the community. When we looked at what this data center could possibly look like based on the size of the facility that they want to use, we immediately saw that they would need an exorbitant amount of power. For one, and that was a huge question, because MLGW, Memphis Light, Gas, and Water, who provides our power, they struggle already. It could be

a beautiful day out, and you can lose power. And so how are we going to bring in, you know, such a mega absorption site of energy and be able to keep our grid sustainable, right? We already were lacking in resilience.

Ariana Brocious: Yeah. And there's some really unsettling parts of how this came about, how few people were informed, even city council, how few of them were involved in any of this decision making before this approval was granted and turning to this question of power usage, we know data centers require a tremendous amount of power. As you said, the local utility says this facility is going to need about 150 megawatts of electricity. That's enough to power 100,000 homes per year. And in a statement of its own, the utility says it has enough water and enough power, enough gas to supply Colossus without impacting other users. And so what's your response to that?

KeShaun Pearson: That is selling a dream, right? Because we don't have the resiliency that we need. This same utility company has lobbied our city council and their own board at Memphis Light, Gas, and Water to raise the rates for our rate payers in order to pay for improvements that they are consistently lacking. Now, the other organization that has to be mentioned here is the Tennessee Valley Authority. The Tennessee Valley Authority also released a statement saying that, our power grid is not, as. resilient as it should be, and that there is no way we can handle the growing demand, right? And so to say that TVA, who supplies MLGW their power doesn't have that same faith is something that we have to pay attention to because again, it is providing this magical thinking that is harmful to our community because we are the ones who suffer. We are the ones who get the notifications that say, You have to, you know, turn down your water use or your power use and conserve energy. You, the rate payers, the people. Right? Not the corporations, the people have to suffer and make those sacrifices, but we will, we will sell this magical thinking propaganda that we can continue to absorb more and more power demand. And that is dangerous for us, but it's just unsettling to know that folks can really say whatever to attract these companies. And then we are trapped. With the longevity of the situation.

Ariana Brocious: And just to underscore or recap what you said, Tennessee Valley Authority, this gigantic utility is saying we don't have enough bandwidth basically to give you the power you need. So. For the meantime, Colossus is being powered by mobile methane gas power plants. So they're, they're not even using the grid right now. They're waiting on that. What's the impact of all of these gas turbines burning locally in Shelby County, which already has an F in air quality, and sort of globally as well?

KeShaun Pearson: So, the power that they're using are methane gas turbines, right? Methane itself is a greenhouse gas and we know that that warms our planet. The other byproducts of burning methane gas are formaldehyde, nitrogen oxide, chemicals that we know create smog in our air, and that goes into the lungs of the people who breathe it and causes all types of respiratory issues. Now, you're suffocating people to run a machine, right? And you're doing this at this exacerbated rate. You're moving super fast. The announcement was June 5th. They have these turbines up and running by the end of June, and they start polluting with no permits. Why is anyone able to move this fast and cause this much damage? Now Shelby County Health Department is who oversees our air pollution control, right? and that's who we are counting on to protect us. June happens, we get no word. July, August, nothing, right? The only statement that they make says that they are reaching out to the EPA for guidance. And so, it is our public institutions practicing what I believe is this learned helplessness. And instead of doing what it takes to protect us, doing what it takes to say, this project has to shut down until you pass the right regulations. Right until you check the right boxes until we know that this is safe for our community.

Ariana Brocious: This Colossus plant was put together very quickly, came online very quickly, as you've said. And it's not planning to stay small either, right? There are plans for further expansion.

Can you tell us about those?

KeShaun Pearson: Yeah. So this facility a hundred thousand GPUs graphic processing units, right to train this model For the data that is supposed to process. In December They announced that they wanted to 10 times that to a million. And my thinking is you're going to do 10 times the pollution. You need 10 times that power, 10 times. And so how is that going to happen? When just months ago we got notices to conserve power, as a community. And. We know for a fact we haven't had the infrastructure built for this. And so how much more pollution is it that we have to breathe in? How much more pollution is it that we have to take or accept until somebody does something, right? At this rate, the precedent has been set and they are going to continue to operate until somebody stops them. They're going to continue to expand until somebody stops them. But in this moment, there has been no authority, no public institution, no person that has stood in the gap for the people who need them to stand the most, right? The people in Boxtown. are a community of resilient people. They show up, right? And we have continued to show up at city council meetings, but the most recent votes even show that there is a lack of political will, and truthfully, a moral compass that helps guide people to make the right decision, even if it's the tough decision.

I think we have to examine our relationship to convenience. Right? It is convenient to put it on somebody else. It is convenient to do nothing, but we have to challenge that in order to do something different that protects people for generations to come. We can't only and be solely focused about right now because the greenhouse gases that are spewing out the toxins that are spewing out, we know for a fact these toxins contribute to detrimental respiratory issues that we know we are experiencing. I believe we deserve a result that says a corporation, no matter how big, no matter how small, no matter who's at the helm, but especially if it's a billionaire who is hell bent on consistently increasing the size of a factory that is choking the lives out of the people in the surrounding area, especially him. We should be saying, how do we slow this down? How do we stop this to make sure that it is something that does not continue this perpetual cycle of environmental racism and environmental injustice, right? And this is why we have to shift gears in this moment because we're entering an era of artificial intelligence and development that many people don't even yet understand.

Ariana Brocious: Yeah, I mean, I think that's a key part of that is that this is an attractive proposition for a local government. You can see how the prospect of a billionaire bringing an exciting new factory in can sound good. Especially when the local utility says it's no problem, they're going to bring in more money. They're going to invest in utility scale battery storage, which is, you know, kind of a component piece of this. We're at an interesting inflection point with AI and data center growth, but where do you think data centers should be built if they should be built at all?

KeShaun Pearson: So a little bit of background on me, right? I've got two degrees, one in business administration, one in information technology from Old Dominion University, right? And what I understand about both business and technology is that you want to streamline your processes and find the most efficient way to do things. There is nothing efficient about how things are being done here in southwest Memphis. Right? And if you are to move forward, data integration or data centers development, you have to start with understanding what it is that is required for your processing. And I think it starts on the ground level with just reexamining the code, right? And examining how much you can scale down before you scale up. Bigger is not always better. And doing more, doing it faster, is more damaging than taking the time to do it right. One of the most prominent AI models is deep seek, right? And we know that they didn't use 1 million GPUs. They didn't have to buy 2 million square feet of property and factories and build their own power plant. They didn't. And so it is a different way of imagining how to move forward. The intelligence, innovation without the sacrifice of our environment and our health is possible, but it does require restraint. It does require guardrails. It does require changing that relationship to convenience because it is convenient because you can

do it doesn't mean you should. These are people who are suffocating, right? These are funerals that we're going to. And if the people factor is not included then we continue to repeat the same cycle, right? I would just ask that we take just one step backwards. to take a more full look at the picture before we continue to move forward in the name of innovation and we continue to crush civilization.

Ariana Brocious: KeShaun Pearson is Executive Director of Memphis Community Against Pollution. Thank you so much for joining us on Climate One.

KeShaun Pearson: Thank you. It was a blessing to be here. Thank you all for having me.

Ariana Brocious: We reached out to XAI for comment. They did not respond.

Kousha Navidar: Coming up, some are concerned about how fast AI has infiltrated all parts of our lives, even before we've reckoned with its full impacts:

Irina Raicu: Think about having hundreds of millions of people playing with these tools without realizing that they're spilling water on the ground or just using energy at the level that they are. That's the challenge here.

Kousha Navidar: That's up next, when Climate One continues.

This is Climate One. I'm Kousha Navidar.

Ariana Brocious: And I'm Ariana Brocious.

Kousha Navidar: The debut of Chat GPT in late 2022 felt like a huge leap in the human computing journey. And even as we've seen how power hungry the technology can be, AI is not going away.

Ariana Brocious: The US Department of Energy estimates that data center power demands will double or even triple in just the next three years. And it also requires huge amounts of water to keep those servers cool. So what can we do to reduce AI's environmental impacts?

Kousha Navidar: That's an important question. Our co-host Greg Dalton explored it with two guests in a recent live conversation at the Commonwealth Club in San Francisco. Joining him on stage were Irina Raicu**,** Director of the Internet Ethics Program at Santa Clara University, and Kate Brandt, chief sustainability officer for Google.

Greg Dalton: Kate, for my first question to you, I uploaded Google's 2024 sustainability report to Google's AI tool called Notebook. And I asked it what I should ask you. So here's what it generated: Given Google's ambitious goal to reach net zero emissions across all operations by 2030 and the nearly 50% increase in total GHG emissions the last four years, what are you going to do to reverse this trend and ensure the achievement of this critical net zero target?

Kate Brandt: Yes. Well the way that we look at this topic, as an innovation and an information company and AI first company, is that we really need to approach AI both boldly and responsibly. So when we look at our own operational footprint, you know, as a global company, we're operating data centers around the world that are powering AI and all of our products. And we have a value chain that enables the hardware for those data centers as well as for our consumer hardware devices. So, uh, that footprint number that you're looking at is towards a very ambitious goal that we've set for ourselves for 2030, which is that we wanna be net zero across that whole operations and value chain from a 2019 baseline. And as you can imagine, as a high growth business, our business looks quite different today than it did in 2019. So the way that we're getting after those reductions is, predominantly around clean energy. Both clean energy for Google, for our own operations, as well as

supporting our value chain. Our suppliers that are manufacturing semiconductors, hardware for data centers, hardware for cell phones and other devices to decarbonize their manufacturing processes. So that's the biggest lever for us. But then it's also low carbon building materials for data centers. It's the utilization of sustainable aviation fuels. And then after we do all of that work to reduce our footprint, we're also going to purchase carbon removals that will actually remove carbon from the atmosphere. So it's an ambitious goal. We have a lot of work left to do, but we also have a strategy. And we think that strategy is important not only for us to reduce our own footprint but to be early adopters of things like geothermal power, advanced nuclear power, carbon removal solutions that will have the ability to scale and reduce emissions in a wider economy way.

Greg Dalton: Because broadly speaking, within tech, there's real concern that Microsoft was gonna erase emissions from their history of the company. Google, I think has been, early on this from the early days of renewable energy, less, you know, cheaper than coal a long time. But the energy demands of AI are really putting at risk a lot of big tech's sustainability pledges and promises because it's juicing profits and the resource needs are enormous. And so, is it fair to say that AI is really threatening sustainability pledges and goals?

Kate Brandt: We remain absolutely committed to our goals and I think it's good to level-set a bit on where are we today. So if you look at all global data centers today, so that's powering AI and everything else that data centers operate, it's about 1% of global electricity use between five to 15% of overall economic output. So a pretty efficient use of electricity per economic output. Now if you look at a lot of studies that come out recently, the US for example, one of the more recent studies pointed to by 2035 data centers would represent about 20 to 25% of load growth in the US. That's about half of what we would see from electric vehicles. So absolutely AI load growth is a critical topic. It's absolutely important that we're looking at how do we make model training more efficient? How do we make AI hardware more efficient? And then how do we bring more carbon free energy, more clean firm power onto grids to power that load?

Irina Raicu: Can I, can I jump in for one second? In terms of the energy uses, because the computing power required to power all of this is doubling between 100 days and six months. This is what we're talking about. I mean, we're talking massive, very rapid growth, and that's mostly for the training of models in terms of inference, which is the actual processing. Every time you run one of the generative AI for example. Google itself has said that the energy required is going to grow by orders of magnitude. So it's not just that it's growing, it's growing at such a rapid pace that we are not able to keep up with it. And Gardner research came out in November with a study that said that AI data centers are going to be restricted in terms of their power by 2027. So that's in two years.We're not only running into long-term issues, but short-term issues where, where even the data centers themselves won't have the power required. So I think, a conversation about why we're putting AI into everything so quickly is part of what's needed here.

Greg Dalton: Yeah, even think Sam Altman has commented like the, you know, the amount of energy needed is kind of mind blowing to do this stuff. So, Kate, are –

Kate Brandt: Well, let's, yeah, let, let's get into it because I think there's a lot of really specific work that we are doing and of course that you're seeing across the industry. But I think where we're seeing, a lot of progress is on efficient model training. So as you noted, that's a really important area. So we published an academic journal article not long ago that looked at ways that we're reducing, the energy requirements for AI by a hundred x, the emissions by up to a thousand x through specific techniques and how we can more efficiently do our training. When you also look at AI hardware. Each generation, the hardware is getting significantly more efficient. So our, our custom AI chips are called TPUs tensor processing units from one generation, from the fifth generation to the sixth generation alone, they got 67% more efficient. And again, I think what you're

seeing here, as we've seen in the data center industry for many years. Is strong alignment between the business outcome, which is to do the work more efficiently and the environmental outcome. And you may know John Kumi, who's a professor at Stanford, who's been very preeminent in the space. He looked at this period of time from 2010 to 2018 when the internet was growing significantly, when data centers were growing significantly in that time capacity increased by 550% in electricity only by 6%. Now, I'm not saying I predict that to be the same case here, but it's just good to look at this as a sector where the environmental reductions and efficiency is actually quite business aligned. And then it's about the carbon free energy. And as you point out, there's a lot of conversation right now around capacity. One thing I would point out is the best thing we can do for ourselves in the near term is better utilize the electricity we already have on the grid. That is going to be our most near term solution. We've done a lot of work at Google to look at how can we do load shifting in both time and space, so to times of day when the grid is cleaner or to locations where there's more capacity.

Greg Dalton: So train the models at night when there's a lot of electricity or during the day when there's excess solar and California is actually exporting it to other states.

Kate Brandt: Indeed. So looking at that flexibility, and again, for us, although AI is a growing part of our data center workloads, there's a lot of work happening in our data centers, around storage, around photos, around other activities that can be delayed by some period of time. Some of the work has to be done immediately, some of it doesn't. So again, it's looking at how do we more effectively use the electrons we have, and then how do we use this to continue to drive a renaissance of clean firm energy? You know, we signed a first of a kind agreement with Fervo, which is an advanced geothermal company. Getting a first of a kind advanced geothermal power plant online in Nevada to power some of our operations there. We signed a first of a kind power purchase agreement with Kairos power for 500 megawatts of new clean firm power, looking to 2030 and beyond. So again, I think this is also an opportunity to get more clean firm energy resources onto the grid in this moment of load growth.

Greg Dalton: And by firm you, you mean like reliable, not intermittent, like wind and solar. So, so, but if Google has a choice between siting a data center where energy is clean or it's cheap. Cheap wins, right?

Kate Brandt: So we have a commitment that by 2030 we want to power all of our operations across the globe on 24 by seven carbon free energy. We're 64% of the way there. In spite of continuing to really grow significantly as a business. We have multiple sites that are already up at 90%. And so that is something that is a moonshot. We like to say we like hard problems at Google. This is a very challenging aspiration that we've set for ourselves, and because we have this bold aspiration, it pushes us to innovate, it pushes us to get creative. And of course that's good for the whole sector because we wanna be driving towards these solutions that can scale and be cost effective for everyone.

Irina Raicu: You're right that it's aligned with, with business incentives in some ways. But to your broader question about whether we're smart enough to answer this, I think we're smart enough. I don't think we're committed enough because the level of financing that goes into deploying AI right now is not matched by the kinds of projects that companies are doing with vulnerable communities or with replenishing water. It's, it's at a different scale and you see researchers like, I've been meaning to express my gratitude to Dr. Sasha Lucconi and Shaolei Ren and Emma Strubell who've talked about, you know, the need to educate the public and lawmakers and everybody about the energy impact and about the water needs because the companies are not right now stepping up enough to counter these effects.

Greg Dalton: Right. Well, Irina, you know, you're the ethicist. Markets are amoral, right? And their primary function of publicly listed companies are to generate profits and return capital to shareholders. Isn't it foolish to expect companies whose primary purpose is to generate profits to do anything other than maximize those profits?

Irina Raicu: Right. We shouldn't rely on them. We should rely on lawmakers to put the brakes on some of these efforts. We should rely on consumers being educated so they can actually make choices about what products they want to use and what they don't. And right now, without more disclosure for the companies, it's hard to make any ethical decisions, right? You can't balance the benefits versus harms if you don't know what the harms are. And most people are still really surprised when they hear the kind of numbers that we're talking about here. It hasn't seeped into the general consciousness. And often lawmakers are enticed to bring in data centers into their areas because they bring certain benefits with them. The whole discussion that needs to happen around the environmental impact has followed very late compared to all of the promises and, and the hype that came first.

Greg Dalton: Well, I mean, until chat GPT, most people kind of thought AI was this futuristic thing. It exploded pretty quickly. Let's pick up Kate on disclosure. Several bills were introduced in the California legislature this year, calling for companies operating large data centers to disclose how much energy they use and protect rate payers from cost increases caused by these giant facilities. There is concern that this demand is, you know, is pushing costs onto an average person. So where do you stand on disclosure and protecting average citizens from price pressure on their utility bills?

Kate Brandt: Yeah, indeed. I think disclosure is absolutely the baseline for any corporate sustainability program. We've been reporting our corporate greenhouse gas footprint for 19 years to the CDP, the Carbon Disclosure Project. Uh, we've published a very detailed environmental report for the last 10 years. We'll be publishing our 10th one this summer, and that's where we detail our overall emissions, how we're doing towards our goals, on carbon free energy, our water replenishment program. We haven't gotten into water yet. We have a goal to replenish 120% of the water we consume. We actually just shared our progress on that for World Water Day. So absolutely, disclosure is essential.

Greg Dalton: You mentioned water, Irina, water is used to cool data centers. Most people have never been inside one, but they're just massive racks of huge servers creating lots of heat that needs to be cooled. Could you explain the water requirements and potential conflicts with local communities, especially in water stressed regions.

Irina Raicu: I really appreciate the report that Google puts out because I read it as well. And, um –

Greg Dalton: Oh I didn’t read it. I just asked the AI thing to read it for me.

Irina Raicu: I did read it and it makes some –

Greg Dalton: You’re a better human than I.

Irina Raicu: It makes some excellent points about all of the things that Google is doing. But it also points out that even in 2023, which is the last year that is covered by the ‘24 report, 15% of the water usage came from water scarcity areas. And the global greenhouse gases emissions increased and the energy requirements increased. So even as all this work is happening, that, that we are talking about, the environmental impact so far is only growing. And, you know, I don't mean at all to pick on Google, Google is one example, but there are many companies all in the same boat, all of which are using more energy and more water for their data centers.

Greg Dalton: So Kate, your company, Google, has faced pushback over water usage and drought prone areas like Arizona, South Carolina, and Oregon. So how do you, how do you address, I know you've made this pledge to replenish, but you're only 20, well, one six of the way there and –

Kate Brandt: We just shared more progress over the weekend actually, that I can tell you about.

Greg Dalton: Okay. So you're more than 18% there.

Kate Brandt: Yeah, indeed. And I, I really appreciate the nuances that you're raising around what we think of as climate conscious cooling. So there is a trade off between energy efficiency and the use of water based cooling. And so in every site that we go to, we look at that trade off. And so sometimes the option is to find non potable water sources. We use gray water, sea water, canal water. A whole variety of non-potable water sources at data centers around the world. , we also have data centers that don't use water based cooling, where we just decide to make that trade off to take a small hit on energy consumption because it doesn't make sense to use water in that location. So that's how we're approaching it on a site specific basis because as we know in some places water is plentiful and this isn't an issue in some places, as you point out, water is stressed and then we need to take a different approach.So that, that's kind of the first order work that we do. And then beyond that, we've said we wanna replenish 120% of the water that we consume by 2030. And for World Water Day on Saturday, we shared we've now been able to replenish 4.5 billion gallons of water through projects around the world. A lot of the more recent ones that we shared updates on are around agriculture. How do we support farmers from California to France to Chile in different irrigation practices? We've also done a lot of work around nature-based solutions. As we know, nature-based solutions enable us to better recharge groundwater to replenish water that's been depleted. So we're doing these projects globally, that 4.5 billion gallons as compared to the 6.1 billion gallons that we used in 2023. So we're making progress. We need to keep scaling towards that 120% replenishment.

Greg Dalton: But as of 2023, you're only replenished 18%. So –

Kate Brandt: Indeed.

Greg Dalton: Got a long ways to go to get to 120% in seven, in seven years.

Irina Raicu: Not just that, but the kind of deployment that we've seen since 2023, right? 2024 was a year with a lot of deployment of AI in all kinds of contexts. So this situation might be very different again, even with the best efforts. And I feel like we're doing a little bit of a disservice by talking about AI broadly as if it's one thing. Because first of all, we need AI to even assess climate impact, to crunch all the vast data sets and to understand what's happening. So AI is extremely important in the climate fight. But different kinds of AI have different environmental footprints and generative AI, which is the hot stuff that everybody's been talking about since chat. GPT came out is the one that has by far, the biggest environmental impact and the biggest demands. And those models that are being deployed are growing in size, and they're being deployed again at a massive scale where we're talking about hundreds of millions of users playing with these right now, free tools often and having some that they're paying for. And even within generative AI, the impact of producing images, for example, is very different than the impact from producing text. and there's been research that says, producing one or two AI generated images, takes up the equivalent of charging your phone. That having, 10 to 50, prompt conversation with a chat bot is the equivalent of using half a liter of drinking water. So if you think about having hundreds of millions of people playing with these tools without realizing that they're spilling water on the ground or just using energy at the level that they are. That's the challenge here, and this is why now that we're talking more because of laws coming up in Europe about things like AI literacy, we need AI literacy and we need AI literacy to include a

conversation about the environmental impact. That's something I haven't seen yet. Even when we talk about ethical issues around AI you often hear about bias. You hear about copyright issues and privacy and all the concerns. But often the environmental impact is still flying under the radar.

Ariana Brocious: We're going to take a quick break. When we come back, we'll hear how Google is using AI to advance global climate goals.

Kate Brandt: Using AI to understand traffic patterns, the grading of roads, and a variety of other factors. That's already enabled our users to avoid 2.9 million metric tons of CO2e. That's like taking 650,000 vehicles off the road.

Ariana Brocious: That's up next, when Climate One continues.

Kousha Navidar: This is Climate One, I'm Kousha Navidar. Let's return to the conversation Greg Dalton recently hosted at the Commonwealth Club in San Francisco, diving into the climate harms and benefits of AI. Joining him on stage were Kate Brandt, chief sustainability officer for Google, and Irina Raicu**,** Director of the Internet Ethics Program at Santa Clara University.

Greg Dalton: Every time we send an email there's like a puff of energy somewhere.

Kate, with the power that Google has to educate people, seems like there's a tremendous opportunity, perhaps responsibility for Google to pair awareness with these cool new tools. So when we're like, oh gosh, I didn't know that. I just burned a liter of drinking water with my little, I wonder what ChatGPT will say for this.

Kate Brandt: Yeah, indeed. I think this is something that we're, we're having a conversation around and it is, it is tremendously challenging because as you look at how a data center functions, it's operating many different tools and products and services. So sort of aggregating and segregating out exactly that number is more challenging than you think, but it's absolutely something we're working on and I think it's something that would be interesting to share more around.

Greg Dalton: But I wanna come back to the kind of, the, the positive impacts of, you know, AI, thank you Irina, is is not one thing. There's many different kinds and, you know, training models is where the, where the real energy is used. Kate, what are some areas where AI can be used to, you know, deforestation, traffic, routing, et cetera? You know, there's some very powerful tools. Yeah. On the one hand, it's making the climate crisis worse. On the other hand, it can help us address it.

Kate Brandt: Yes. And we see a huge opportunity for this. So much so that we've set an aspiration for ourselves that we wanna enable businesses, policymakers, individuals, to avoid a gigaton of emissions by 2030 through AI and all of our platforms. That's like the emissions of Japan.

Greg Dalton: Thank you. 'cause I don't know Yeah. I don't know what that means.

Kate Brandt: Yes, indeed. So that's a very ambitious aspiration. And so we've really gone deep on particularly energy as a sector and transportation as a sector where we need to see decarbonization and where AI can be a really useful tool. So for instance, we have Google Maps. Some of you may have used Google Maps to get here this evening. There is a little green leaf icon and Google Maps that is showing you the most fuel efficient route, which we've calculated in the background using AI to understand traffic patterns, the grading of roads, and a variety of other factors. That's already enabled our users to avoid 2.9 million metric tons of CO2e. That's like taking 650,000 vehicles off the road. We've also been working with cities to help them better sequence their traffic lights. This is really powerful, because it reduces starting and stopping events. And when a car is idling at an intersection, it's 69 x the emissions of when it's on the open road. So we're able to reduce those

starting and stopping events by 30% and emissions by 10% just by working with cities to do better sequencing of their traffic lights. We've also been working with aviation, commercial aviation. We talk about this as a very hard to abate sector. It represents about 3% of global emissions, well, a third of that 3%, uh, according to the IPCC is from contrails, those plumes that you see behind jets. we have been working with American Airlines and Breakthrough Energy to use AI to better understand why are they forming. It turns out it's about time of day and temperature and altitude. And then to work with pilots to make small adjustments in their altitude to reduce those. We've already shown that you can do that by more than half, by 54% in these 77 test flights that we ran with American. So these are the kinds of solutions that we're seeing that can be extremely powerful, that can drive emissions reductions across these hard to abate sectors and much more to come. We're looking at agriculture and nature-based solutions. It's going to be a really powerful tool. You mentioned the foundational science, climate modeling also a very powerful application for AI.

Greg Dalton: So many, uses of this, Irina, and yet I have a hard time measuring all –

Irina Raicu: Let me jump in because those are all very powerful and, and wonderful uses, but I think that's when you get the critics saying that we're boiling the oceans in order to summarize emails. Right? That's a very different kind of generative AI than the kind of uses that we were just talking about. So, you know, do we need all the chat bot interfaces in every aspect of our lives right now? That's the kind of thing that's uses a lot of energy and potentially with a lot less return value.

Greg Dalton: So is there an ethical framework you think society ought to be using to, to, to evaluate all these competing goods and bads?

Irina Raicu: I don't think we can have a society-wide ethical framework. I think this is a conversation that needs to be much more contextual and it depends on the particular kind of industry and the particular kind of AI used and, you know, the location. There are just too many factors to apply one framework. But I, what I will say is that we deserve, we as the non-scientists and non-business people, to have choices. And in order to make ethical choices, we need the information in the first place. And to your point, I mean, to be fair, I don't mean, again, to put it just on Google. I think all of these companies have a role to play where they could actually provide a lot more information so that people can apply their own ethical framework depending on, you know, their own values and the choices that they're making. And so we don't have enough information to do that, and we don't have enough choice at the design level. For example, right now, if you wanna do a Google search, you can't choose as far as I know, to turn off the AI overviews. I think that would be a really interesting place to allow people to make choices. If they feel that that's something that they value and that they prefer, they should be able to use it. But right now there are these deployments at scale on all of us where we don't really get to have that kind of input.

Greg Dalton: So Irina you mentioned, individual companies would have their own frameworks, but, you know, the internet is minimally regulated. Pharmaceutical companies need all sorts of approvals before they put a product on the market. Tech companies do not, you know, they can roll out social media tools that, you know, damage girls' brains and, you know, and then we have to kind of play catch up. Now comes along AI moving very fast. Policy leaders don't understand it, the public doesn't understand it. It's moving like wicked fast, even for Silicon Valley standards fast. So will voluntary, action restraint be sufficient by these individual companies. We're all competing against each other. Well, if we don't do it, they're gonna do it. And if Americans don't do it, China's gonna do it. So let's do it.

Irina Raicu: Right. No, I don't think it will be sufficient. I think we need lawmakers, and again, I think we need lawmakers who themselves are better informed.

Greg Dalton: Right now they're pretty clueless.

Irina Raicu: Well, I mean, I think it's a difficult, you know, it's a new technology and then they're supposed to know everything about everything. So what I would say is that I think lawmakers need to assign staff people who will keep track specifically of AI related issues because it's that important. Right now, I think there needs to be a lot more education, and I think lawmakers have an opportunity to engage with academics in their own areas, in their own states, and in their own cities, who have very different incentives than the business folks do. Right now, the business technologies are the ones who are being heard, but there are a lot of AI researchers who are working in academia who could be fountains of information for lawmakers who are looking to. draft better laws. And I do think we need some laws. And I think what, whether I think so or not, they're coming and they're coming at the state level and they're coming pretty fast.

And not just from California, but from many different states. So companies are going to have to comply with some new laws in the near future.

Greg Dalton: Google's also invested in carbon offsets, kind of a murky area. Some people think that there is scam. I buy them sometimes. I don't kind of hold my nose the better than nothing, but not fully what they proclaim. What's your position on offsets? 'cause they're, they're very controversial and complicated.

Kate Brandt: So today where we are is, we talked a while ago about our net zero goal that we have this ambition to reduce our footprint 50% from 2019, and then to manage the rest with both nature based and technology based carbon removals. So this is a particular form of carbon credit that's about actually removing carbon from the atmosphere, which the IPCC tells us. We need to do both. To stay on some trajectory towards the Paris Agreement, we need to do both. We need to both dramatically reduce emissions and remove carbon from the atmosphere. So we see it as being a positive thing for us to be early investors in that space to be sending a demand signal because these technologies have to be developed for the science. So for instance, we've done work around advanced rock weathering. We signed an agreement at the end of last year with a company called Terradot. Advanced Rock Weathering is using basalt to put into soil to more quickly absorb carbon. It's a natural process that would occur much more slowly, but you can add it to soil to enable more carbon to be removed from the atmosphere. We've also looked at similar strategies that can be done in water. We've looked at reforestation projects. We've also done work around using direct air capture to remove carbon from the atmosphere. So it's gonna take a portfolio approach. This is a fairly new area, and what we see is that we can be an early adopter. We've now joined advanced market commitments called Frontier, as well as Symbiosis, which are focused on either a thousand year permanence, so more technology oriented removals or more nature-based removals to really try to advance the science and bring these technologies forward more quickly. So we think it's an important part of the work, and the science really backs that up.

Greg Dalton: Irina, some people would say that direct capture, these sorts of technologies, Kate just mentioned create a moral hazard because they can allow us to keep burning fossil fuels. It sort of enables this, the status quo to continue. It's kind of like putting a filter on a cigarette. We can keep smoking, we'll just put a filter on it.

Irina Raicu: But they don't even do that because with all of the efforts that we're talking about, again, we're seeing greenhouse gas emissions increasing year over year. We're seeing water being used more and more. We're seeing the demand for electricity going up again, doubling every 100 days just to train the models. And then the inference cost is actually much higher. The World Economic Forum, estimated that, about 20% of the energy use goes to training models and 80% goes to inference to just the fact that we're all playing with these tools all –

Greg Dalton: Inferences means we're, we're we're using.

Irina Raicu: Yes, exactly. Generating an image, generating, you know, putting in a prompt and getting some response. All of those are called inferences. So, at this scale you're talking about sort of greenwashing, but even the greenwashing is not keeping up if that's what it is. Again, these are very, real efforts and, and I think we should embrace all of them and, and, and encourage all of the companies to keep doing them. But I think we have to talk at some point about slowing down the deployment and allowing people to make more choices and, and figuring out where this really belongs and where the energy use and the water use is worth it and where it's not.

Greg Dalton: Okay. So, Irina, you know, everything you've heard Kate say this evening. What did you hear that you most agree with? Where's there common ground?

Irina Raicu: I agree that there's a lot of opportunity and I think that the companies are, are trying to, to take it. But I think again, the level of investment that we see in deploying these tools is not being matched by the level of investment and the kind of efforts that Kate is talking about. And I think that's what we should be demanding. There should be an equal number of dollars going into green energy and all of the things that she mentioned.

Greg Dalton: Kate, of all things that Irina mentioned, what do you have most common ground, most agree with?

Kate Brandt: Yeah, I mean, I think, as I mentioned at the outset, we as a company are really committed to developing our AI in a both bold and responsible way. And, and I think all the issues you're raising are very near and dear to my heart and to our heart. How do we make AI as efficient as possible, both from a trading and a hardware perspective? How do we bring as much carbon free energy online as possible? Have a thoughtful approach to water that evaluates water, stress, the trade off between water and energy, replenishes the water that we need to consume. Working with academics. I really appreciate what you were saying about policy makers and frankly companies. We do a lot of work with academic institutions, um, because you all are at the forefront of helping us think through this. So I really value the work that you're doing, that academics are doing to help us think through this. And again, to be as bold and responsible as possible.

Greg Dalton: Kate and Irina, it's been a fascinating conversation. Thank you so much.

Kousha Navidar: And that’s our show. Thanks for listening. Talking about climate can be hard, and exciting and interesting — and it’s critical to address the transitions we need to make in all parts of society. Please help us get people talking more about climate by giving us a rating or review. You can do it right now on your device. Or consider joining us on Patreon and supporting the show that way.

Ariana Brocious: Climate One is a production of the Commonwealth Club. Our team includes Greg Dalton, Brad Marshland, Jenny Park, Austin Colón, Megan Biscieglia, Kousha Navidar, Kevin Lemons and Ben Testani. Our theme music is by George Young. I’m Ariana Brocious, thanks for listening.