CR066

Unlimited power for your data centers, with Michael Crabb

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[00:00:00] And are you comfortable about talking about risks of nuclear? Is that an area you're cool with? I mean, it's never come up before.

Welcome to Cloud Realities, a conversation show exploring the practical and exciting alternate realities that can be unleashed through cloud driven transformation. I'm David Chapman and I'm Rob Kernahan.

And this week we are going to look at power and power from a point of view of the vast increases of demand that our technology innovation cycles are driving, as well as how we're using devices and new things like electrically powered cars in our day to day lives.

But before we get to that, Marcel and I was stood last summer [00:01:00] in San Francisco, gazing out onto the San Francisco bay and we'd made a huge walk down from where we were staying because. Robert wanted to have a look at Alcatraz. So as Marcel and I were stood there directly looking at Alcatraz and, and discussing, you know, kind of how big and dominant it is in the San Francisco Bay.

Rob walks up and, and surveys the area in front of us and goes. where's Alcatraz? It's just one of the many moments of amusing confusion that keeps us going on this show. Uh, so let's have another Rob, what else has been confusing you this week? Thanks for that memory. Dave, one that goes down in my annals of things I'd like to forget happened in my life, but somehow somebody in my life keeps reminding me that it happens.

I can't imagine who that was. It's a good job we haven't recorded this. I just expected it to be more. Um, impressive. Well, you were saying earlier that you wanted it, wanted it to look more like Hogwarts. Yeah, I was expecting [00:02:00] Hogwarts on an island and I got like a little concrete square. And I know it's far away, right?

But, you know. When you put it like that though, it would be better if it looked like Hogwarts or something, wouldn't it? It'd be far more, uh, dominating in the bay, wouldn't it? Yeah, exactly. Imagine what the, uh, Escape from Alcatraz movie would have been like if it had been more like Hogwarts. I reckon they'd have like broomsticks and things and What not?

Yeah, well, it did that when the bit where Skate would be a lot easier, wouldn't it? Because rather than get the boat and have to swim in the bay or something like that, you just catch a broomstick and fly over. I mean, actually, yeah, that's a good point. Yeah. But, but there would have been a bit where Eastwood would have had to traverse the moving staircases.

Oh, yeah, that's how you keep in, you don't know where you're going. Mission impossible like. And the prison guards would actually be the paintings on the wall watching everyone as well. So we could have a whole, there's a whole fit. Have we just created a sub genre? Cloud realities, film productions, copyrighted, all of this, but also to my Alcatraz confusion, I was thinking about sort of generative AI and deep fakes, right?

So there's been a lot of press about deep fakes and [00:03:00] the ability to create content that looks like the individual, but not. And we see a lot of bad things happening and people creating videos of politicians saying things one else. However, there is a potential happy side to it. And I'm not sure if people would like it or not.

So imagine hyper personalization of communication, right? So you get a thank you message directly from, I'd know the CEO of the organization or whatever, and it's all interlinked to you and what you do and says, Dave, and it's like, you're watching this personal message coming down from the top and it would be, you know, sort of, you get the, the people put your name at the top of the email, but this could be like use technology to really totally personalize the message and the request.

And I'm confused. Would I like that? as it would be completely for me, and a load of effort had gone into making it for me, or am I just gonna go, it's just a fake, and it's, I know they're not actually saying that to me, and I go, poof, like that, and I can't quite work out if I'd like it or not, and this is the confusion that reigns this week.

I think I can, I can, I think I can help you with this one. This might be one of the rare ones, where [00:04:00] I think you're gonna be in the latter camp. Well, the, the, you just, yeah. Next, next generation of optimistic. You know, fishing, that kind of thing, you know, you just, you're not going to, I suspect you're not going to take that any more seriously than you would the sort of half arsed versions of it we get today.

Yeah, there was one this week where a deepfake convinced a finance controller to send 25 million pounds out of the thing because it was, they thought they were speaking to their CFO. So that is a, that is how good they're getting, right? They actually thought they were talking to the CFO. So maybe you don't say.

That it's it's personalized, but you actually think, Oh, it's an actual message. That's different though, isn't it? So there's a difference between sending a personalized message where, you know, it's a message. And therefore, if it's like, yeah, I dunno, Obama wishing you a happy birthday or something like that, you'd be like that.

It'd be like, Oh, that was quite lovely. I know it wasn't Obama, but it was so realistic. I'm perfectly happy with that as a illusion. That's different from, um, [00:05:00] the example that you gave where it's being used in a As criminal intent or even if it's not criminal in an attempt to like the subterfuge involved, you know what I mean?

yeah, I suppose it's that thing about if i'm aware, it's a Hyperpersonalized message then maybe I would like it like the birthday message from obama as opposed to the one where yeah Everybody talks about the nefarious date, uh deep fakes thing But actually there could maybe be a fun and happy side to it as well Well, let's leave it on that That little, that little beautiful notion of hope, shall we?

Yeah, I'm trying to be optimistic, because it's Friday afternoon and, you know, it's almost the weekend. Well, we'll take it. We'll take it. Now, moving on to the subject of today, one of the biggest subjects of our time, one of how do we solve the power increase versus the emissions problem, I am delighted to say that we have got Michael Crabb, the SVP of commercial at Last Energy joining us.

This is Michael. [00:06:00] Very good to see you. Thanks for spending some time with us today. Do you want to just say hello and introduce yourself and maybe say a little word about Last Energy? Yeah, sure. Dave, Rob, thanks for having me on. Yeah, Michael Crabb, as you mentioned the title. I lead our PPA origination, project development and project finance functions here at Last Energy, um, with a, you know, decade and a half of broad energy.

And power market experience, mostly on the buy side. So as an investor, uh, last energy, uh, is a developer owner operator of a 20 megawatt base load power solution for data centers and other heavy industry and excited to share more about that with you here as we move forward. Brilliant. So we're going to talk about power and this is a subject that is extremely timely and important.

Clearly there is a relationship between power generation, consumption and emissions that every organization in the world is dealing with at the moment from a sustainability and carbon footprint perspective. But what we [00:07:00] also know is that it's a dual challenge because not only do we have that problem, but we also have the issue of increased

consumption.

And being seen in the West for practically the first time in a number of decades, and that's been driven by, you know, continued innovation and technology and effectively, we need a route through that. So Michael, before we delve into the solution, why don't you set out that context for us and give us give us a bit of a perspective to start with.

Yeah, and there's some history there as well, right? We, uh, in the western world over the last 20, 30 years, outsourcing industry to other countries, right? Relatively flat demand growth for decades. Um, and now you got that combination that you described, right? Electrification of everything, AI demand growth and reshoring of industry all happening at the same time, all happening at a time where there's constraints and restrictions on energy resources, right?

[00:08:00] We have, we have geopolitical conflict, right? All these things happening within the same, like, three, four years has caused a real constraint on our energy supply. Um, and so, you know, data centers themselves, right? To kind of bring it back to what we're talking about today. About 1 percent of global energy consumption today from the data center space.

I think in the UK, it's like 3%, right? A very transaction oriented industry. Do you have a view of that by region? So you could see, you know, whether sort of West versus East, or the three big global regions, what that looks like? Oh, I mean, there's a lot of people much smarter than me that spend a lot of time and effort pontificating on what that view is going to be.

Obviously, I think there could be much more growth in the developing world, right? There's there is still a one to two billion people that don't have access to consistent power period, right? So refrigeration, like basic human needs, right? If it if the problem is you like [00:09:00] energy abundance for human flourishing, like that is where enormous growth could come from if we allow it and enable it to happen.

Uh, and then in the developing world, yeah. You're seeing a lot of this AI demand, electrification, electric vehicles, right? So shifting from hydrocarbons to electricity. I think there's still a lot of debate as to what percentage that is, right? I think the data center side itself, uh, you see, if you, if you look at it a couple of ways, um, both the size of the data center campuses, right?

It used to be 50, 100 megawatts. Now it's gigawatt, right? And like, right. And so that is a big impact. And then you look at the, the compute of the racks, right? We used to be kind of kilowatts size and now the actual racks themselves are five to 10 times, uh, per rack be just because of the density of equipment that's in those racks, density and CPU to GPU, right?

And right. So, you know, right, you're, so, you've got bigger facilities that are consuming on a per square [00:10:00] foot, more energy. And if we just took a linear curve to what we were doing. Right. That's still an exponential growth in energy consumption, 20, 30 percent year over year, which, which was pretty darn fast.

If you're starting at one to 3 percent of your demand, you feel like something's got to give in that, and it's got to be a set of things like driving efficiency, better chip design, but better, you know, design of we we've talked before about developers starting to write. Sustainable software by thinking about the computational footprint of the algorithm.

They're striking as well. But there is this thing that we can't escape, which is we need more power to be able to drive the need, regardless of how we might be able to affect the hockey stick for the better. We've squeezed a lot of energy efficiency out of the system. I didn't mention that on the front end, but that has been right.

I mean, over the last decade, folks have switched from, you know, to led lights, right? Like we've done all these things with buildings and on the data center side on, you know, creating efficiencies on P. U. E. And [00:11:00] those sorts of things like we have squeezed a lot. Of energy efficiency and demand reduction out of the systems and there is a limiting factor there around physics, right?

Like like that is a marginal aspect of what is an enormous problem hundreds of terawatt hours a year, right? It's like it's like too big to wrap your head around and think about a single solution I mean we need all of it and we I mean we want to create a world And I know i'm not supposed to talk about the solution yet.

We want to create a world where that energy is abundant You That it's not actually a fixed pie or a constrained pie because humans will find uses of that energy that makes everyone's lives better before we come on to the, the solution, let's talk about the emissions side of things. So that journey you describe of constantly increasing demand, but we've done some things that have tried to try to squash that, like the led lights example of varying other things that have gone along.

But clearly emissions is and continues to be a challenge. A sizable problem in this space, like how do you, [00:12:00] you know, what's your read of that situation at the moment? I mean, I think we're way behind where we need to be or want to be and we like to pretend that that's not the case, but I don't think we've even, we've reduced the amount of growth.

In emissions year over year, but we haven't even changed the curve to reduce yet. Right. So if every year we're consuming more power globally, every year we have more emissions, the rate of emissions increases has reduced, but it's still going up. Right. Right, right. So like from a from a from a trend perspective, we're nominally better, but we're nowhere close to what we need to be.

And then to make it not to start on a downer if we were to go net zero tomorrow, well, we still have all the legacy carbon emissions that exist. That's still a problem, right? So net zero while we're way off track is really an interim goal. Right because carbon is a long lived molecule and it will continue to have a [00:13:00] warming effect right the thing that we don't want while it's still in the air so this is where you hear direct air capture and some of these things right but that's like trying to trying to run on a treadmill you're not really going anywhere and now the treadmill is getting faster than what you're able to run on right so that so it is yeah we are not doing great it's a bit it's a bit I know it's a bit of a downer but I often wonder if the who's in control of the.

The the wider system and if the wider system is actually capable of solving the problem that you just characterize because all this focus and attention and the curve has dipped slightly but still increasing and you sort of wonder and I often think that it will be technology. Where we find a solution.

Cause I don't think the political will or the global will in the human is there to actually, there's just, you know, best predictor of future performances, past performance. And you look at what we've done so far with all this intensity of communication, we've not really dented the problem yet, which is depressing, but [00:14:00] also says maybe we need to seek alternatives.

Yeah. I mean, technology is certainly going to play a part, right? But we haven't really, we've talked a lot about it. People haven't really done much. To drive it. Yeah, right like we do have some emissions costs, but until we really say hey This is what we think the negative externality of this of this emission is and that can be driven from some corporates It can be

driven from policy but you know, I I think most of the world is focused on the economics of it all and it's really those of us that have the luxury Of being the worst emitters for the last hundred years that are now saying oh, okay Well, we got super wealthy doing this.

So now we have the luxury of pretending we care There was a report out today and, um, about EV vehicles have topped and Tesla sales are down, and there's a general declining demand for EVs because the, to your point, everybody thinks about economically and the economics don't quite work with electric vehicles compared to traditional.

And, [00:15:00] um, they're wondering what to do about, Subsidies and a lot has been driven by company car tax relief and things like this, which caused a curve up and now we're plateauing. So, yeah, I mean, absolutely serious. It's saying is for the average family, the E. V. Doesn't quite make economic sense. And that's what everybody's focused on, especially in an economic situation where we're not exactly.

flourishing, especially in the West, more so than the East, say. And so we're struggling with that, aren't we? Because we are stuck in this economic cycle. The depreciation on EVs that killed me. Yeah, it's a real, and the battery pack issue we haven't quite solved with the refresh, the renewal, and all this sort of stuff.

There remains to be done. to be a lot of unanswered questions about the life cycle. And if, you know, what people don't like is to buy something and then get told three years after buying it, there's a huge cost associated with it. And such that I don't think we're clear on how to deal with that correctly.

And it, and it feels like we need legislation. Governments need to step in to be able to help us. Yeah, I [00:16:00] think what I've seen from governments, the EV thing can be solved somewhat, I think, with technology and new business models, right? I mean, I know there's companies out there that, you know, lease the battery so that you can swap it, right?

Like, I think there are at least Mild solutions. I think on the policy side, what we see is the government right here, not talking to the left. Let's move on then to the solution that last energy think contributes to helping unpick one of the big hairballs of, you know, our time to start with. Give us a just a view on what last energy is and the philosophy of this, and then we'll dig into the solution itself.

Yeah. So, uh, last energy is a developer owner operator of micro nuclear power plants to decarbonize industry. So I'll unpack each of that moving forward, but I will bridge the fundamental ethos of the company. And that is how do we, how do we Enable a world of energy abundance and then do it in the most sustainable way possible [00:17:00] so we don't start from sustainability we start from energy abundance and then we want to do it in the most sustainable way possible and that requires an energy source that has the least amount of stuff in to get the most amount of stuff out right right and so we call as energy density and so if you looked at we didn't start you know we're not like.

We didn't start as nuclear PhDs that love the technology and wanted to find a place for it. We started with that like macro view. And if you start with that macro view, the most energy dense technology that exists in the world today is nuclear, and it's not like a little bit more energy dense. It's like 1 to 3 million times more energy dense.

Can't argue with that. It's like, it's like not a little bit. And it's the difference of taking the energy and chemical bonds, right? When you, when you burn something, you're breaking up the bond between atoms or breaking, breaking in nuclear, you're breaking the bond within the atom, right? Which is so much stronger and also so much smaller.

So [00:18:00] you have so much little material to produce so much energy. So I guess, I guess before we dig into. How it's leveraged, how you, and what these things physically are, let's just talk about the elephant in the room to start with, which is, you know, the safety elements of it. So clearly everybody's aware of issues in the past because they're global news when a nuclear power station has an issue or a breach.

What's going on here that kind of protects for that situation, Michael? Like, why is this safer at this point? Yeah, I think we like to separate the conversation around. The facts, right? The the actual safety versus the perception, right? Uh, so I think many of you have seen that like this world in data, um, graph, right?

So nuclear historically, even including the very public events is as safe as wind or solar on a death per kilowatt hour basis. Um, and I think it's, it's a very common sort [00:19:00] of a called salience basis, right? For a salience bias. If there's something that's big and newsworthy, we're going to remember it when a million people every year die from carbon emissions and particulate matter and air pollution.

Well, it just happens. It's just part of life. It's not newsworthy. We're not paying attention. Uh, and so what's happened historically with really the big three, right? Is Everyone caused a big fuss. It was a very expensive thing, right? Because these were very expensive pieces of equipment, but by and large at Fukushima and Three Mile Island, for example, there were there were no deaths from radiation.

So a lot of what you hear is projected impact. Right. There is this idea that, Oh, people would be harmed in the future. And we're, you know, now 10 years forward, right? 10 years forward again. And we, it's still project. We don't actually see the harm that people thought would happen. And it all comes down to the dose making the poison, right?

Water is incredibly deadly, but we drink it on a normal course of basis. Well, [00:20:00] you had too much water, right? Then you have a drowning. And so as we learn more about radiation, we actually can see that it's not a Toxic thing versus normal thing, right? I was just baby proofing my house for my daughter and you go through that and you're like, oh, we can't have this detergent now.

We can't have that bleach out. We gotta lock this cab, right? Like, like everything in your house is incredibly toxic if you were to eat it. Uh, and so, um, you know, nuclear is really no different. So that's, that's kind of the fact Of what happens and then it's the perception right that needs to be addressed as well because people still have that fear rightly or wrongly you can't bring logic to an emotional debate right and so um we have a couple of physical solutions and then we have more of the marketing solution.

The physical solution is we have just much less material. A very small project. This is the size of a research reactor that, you know, might be at MIT or at Kansas State and, you know, so [00:21:00] having less hazardous material. Right. And then we encase it in an enormous amount of steel. So we basically say, Hey, look, this is just bunkerized already.

We've protected it from anybody in the environment. And then from a marketing standpoint, it's about not leading with safety and risk. It's about leading with the value proposition for people. Let's use that as a bridge into it. So tell us, first of all, I know when I was first talking to you about this and trying to get my head around it, what helped me to understand it was physically, what is this thing?

So is it like, is it a box the size of a Rubik's cube that you can go and plug your data center into? Or is it the size of a articulated truck? Well, the whole, so fully assembled, it's about

two or three row homes. So it's, you know, 12 meters tall. Oh, I'm going to screw up the, you know, 20 meters long, maybe.

So it's kind of the size of a small row home. The nuclear module itself, we actually put on display right here in [00:22:00] downtown Washington, D. C. last month in front of Data Center World Conference. So we can send you the pictures of that to give you a sense of, a sense of scale. And so that's the full power plant itself.

Right, right. And how do I consume it? Do I like, do I buy one from you guys and then you roll it up and basically park it outside of my data center or adjacent to my data center and plug in and go? And is it, it then runs 100 percent of the time off that as a power source? Yeah, so you, you, uh, we sell the electricity, so we don't require the data center to, like, own and operate, you know, the data center developer is not sure I'd want it.

I don't think the average techie operating a nuclear power plant would want to figure out how to own and operate a nuclear power plant. I don't want that responsibility. Reactor up! Yeah, we've had DevOps, Model Ops, Infra, all that, or Ops, Reactor Ops is the next one. Yeah, that's right, and I've seen, I've seen some, what, what techies can sometimes do with networks, switch configuration, never mind this thing.

Don't trust them with a network, let alone a [00:23:00] reactor, yeah. What is funny is there's, there's quite a bit of overlap between just sort of power plant operators and some of the data center development space So there's actually quite a few sort of ex-navy nuclear folks in the data center in the data center space So we do have very technical conversations with folks sometimes But yes, I I totally agree with you.

They don't want to whether it's our plant or other Plant where they don't really want to own and operate power generation so they have this problem with the grid but they don't want to create a whole other business line when what were we saying 10 minutes ago they want to grow 20 percent year over year you don't do something else while you're trying to grow and take market share and so yeah our model is hey we really look like a utility or a microgrid operator to you so we own and operate the plant sometimes will take over any existing grid Connection and then we'll optimize the balancing and scheduling around hey here's market price here's the electrons were delivering to you and you kind of manage the either ramp up of load right or any [00:24:00] fluctuation of load over the course of what's the power range you'll supply to these places so we are each unit each power plant is twenty megawatts and so we can build up to as many they're all individual units.

So we can have an infinite number if you had enough land for as many as you need. I think the, um, well, the largest active project right now in the pipeline is 10 units, 200 megawatts. Uh, we, um, we're scoping projects that would have multiple phases that could be as high as five or 600 megawatts. And I suppose it fits in with the sort of View of power for the future, which is a less centralized generation, more micro grids builds higher resilience into the network.

There's lots of good reasons why you want lots of small bits doing it as opposed to because when you've got the electric car and batteries in the home, the power dynamic is changing an awful lot. Between some supply and then it's taken give and take [00:25:00] and give etc so that the ability to create micro grids is also a big strategic element for the future which this fits into quite nicely.

Exactly in the resilience thing that you had on as well as a kudos you got there quickly if there are technical people megawatt power plant. And I build one really big one, right? And yes, that's nominally more economically efficient from a physical materials perspective. But

yeah, far harder to get the uptime required on the microgrid, right?

There's a reason you don't build one big diesel generator for your backup, right? Or one big IT Tower, right? Having the redundancies allows us to provide a much higher uptime to our customers who value that so much. So as I'm buying it, then it's a fully managed service. Effectively. You guys have then got teams that come out and do the servicing and all of those sorts of things.

What's the, what's the lifetime on one, you know, I'd be like a hundred years longer. The power plan is designed for a 42 year [00:26:00] useful life. Most of our contracts are between 15 and 25 years. Um, you know, the, the, the time value of money is such that anything past say 30 years is just. Not impactful to either party and anybody trying to do a contract for 30 years plus, right?

Like it's just no boards gonna care. No That's the truth. That's the truth. And what are the challenges that you guys face or Consumers of your service face in in executing this it's such a bold Proposition in a lot of ways, you know, it's it's it's so clearly got you know, numerous advantages, but it's a bold proposition.

So what does that look like? And maybe it's, maybe it's partly what you're talking about earlier, which is the marketing solution aspect of it. Yeah, there's definitely a marketing component. I think the nuclear industry historically has done itself no favors. In fact, it often works against itself. Every time you think about it, it's used hazard [00:27:00] symbols as the symbol for their industry, which isn't great unless you're trying to set up a specific vibe, is it?

Yeah. I mean, look, yeah, you hit it. That specific vibe. If you, I mean, if you look at Companies and you see the kind of what roles people are in, that's generally going to tell you where they focus, right? So if data center developers, they have a lot of operators or engineers, they're going to like have really good ops and probably really crummy marketing or sales, right?

Um, and so if you take that same lens to nuclear space, maybe 80 percent of the people in the nuclear space are actually radiological protection people there. They're actually like they needed to be dangerous because their whole job is then protecting against that danger. It's a bit like, you know, what that reminds me of, uh, Marcel will appreciate this, but it's like enterprise architects, isn't it?

Oh, easy Dave, straight into dangerous territory now. You know, they make a fuss about how enterprises are a mess and a [00:28:00] complex thing. And you know, guess what the solution is? More architects. That's it, isn't it? Mate, the more architects, the safer the situation becomes. 100 percent correct. Uh, and it, and it, well, it's, and it's true for everybody, right?

Like every, you, a perfect example. I mean, what you P listen to people closely enough, they'll tell you what they want and what they need you to believe in order to do what they're trying to accomplish. Exactly. Michael. Exactly. It's brutal Chapman. Brutal. Yeah. So if I, um, so I've got a data center, uh, I need 40 megawatts of power.

How long from, you know, having the, I need some power and the big grid can't get it to me, can I get one of these on my estate? Yeah, I wish that was like a one size fits all answer. I'll say I'll say two to four years Uh, so if it's in a place where we have active development already and we're building relationships with local stakeholders and local permitting And licensing offices that's to the shorter end if It's a place where we haven't [00:29:00] done any of that work.

Well, there's a lot of groundwork that needs to happen to kind of develop the project, and

that would just be for the first unit, right? Then we would have to work through what your scale would be. We'd have to work through what the milestones are on development because it's the same Development process.

It's the same activity I have to do that you have to do to build out your data center. You need your construction permit, you know, maybe you have an air permit for your diesel generators. Maybe you have your, your zoning plan, right? We do the same thing. It's just with a different product. Uh, and so we spend a lot of time with our customers ahead of time, making sure we understand their objectives, their scope, and then we can tailor the particular proposal and milestones to what they need.

And what's the long pole in that lead time is it the permitting element of it or is it the the design and is each one slightly bespoke to a particular situation now it's very important to us that it's the same product every time so we have made design decisions that actually make our plants [00:30:00] slightly less of you know thermally efficient.

In order to have it be the same plant every time so our tertiary loop, the cold side of our steam turbine, we use air cooling, not water. And so engineers say, well, water so much better. Why not use water? Well, because then you need a local water source. You need to have that permitting. You need to find that engineering.

There's a whole separate water treatment facility, right? So we've said, well, to hell with that. We need to be able to deliver the same thing every time. So the design and engineering of this, what is effectively 70 year old technology, that part is. Doable. It requires execution, but it's, you know, that is really what we've spent the last few years making sure that we could deliver on the permitting and the licensing.

That's where the timeline uncertainty comes in. Different places have different people in different requirements. And so that's where it becomes a little bit more, Hey, if you're in this industrial zone in Northeast UK, well, that can be pretty efficient if you're in the suburbs of London, that's, I [00:31:00] mean, maybe impossible, right?

Right. And are you global with this at the moment? We are in four markets in Europe, the United Kingdom, Netherlands, Poland, and Romania. Right. Wow. And actually maybe just to bring our conversation for today to a bit of a conclusion, maybe let's do a bit of future gazing. So when you're thinking about this and you're projecting out, I don't know what's a useful time frame, 25 years, 50 years, what does the evolution of this look like?

To you, you know, given the extremely complex context that this exists in that we've just been exploring in today's conversation. Wow. Yeah. You're going to go 25 to 50 years. So who knows? I'll say this every time Dave does this, everybody loves a tech Prediction. So we will hold you to this as well. And we'll come back in 25 years and go, you said this, I said, no one really pays attention to anything after 25 years.

So I'm highly confident. You will not remember nor follow up with me on my training in [00:32:00] AI. That's ultimately going to keep all of these predictions and follow up on those for us. Um, yeah, I think, look in 25 to 50 years, we're going to need to find a way to consume double, triple, four times the amount of energy we consume today.

That's just. The reality of the world that we live in and nuclear is going to need to be an enormous chunk of that. Otherwise, we're going to have all sorts of problems as a global society over time fighting over resources. So our part of that, you know, we can see thousands of our 20 megawatt solution across various industrial uses.

But at some point, we'll break into additional product lines, right? We need to get really good

at executing on the one thing that we provide today. But over 20 years, 25, 50 years, right? We might have a hundred megawatt option. We might be building 500 megawatt options. We might be doing heat only nuclear plants, right?

There's a whole number of use cases beyond the base load distributed power [00:33:00] generation opportunity. That's right in front of us in the next two decades that will start to scale and capture. And if I was a consumer, like a data center owner, whether it be a private data center in a, in an organization, a multi tenant or a hyperscale, How do I get started on something like this?

You know, it just seems like one of those extraordinary agenda items. You know, you like coffee, uh, tea, yeah. Air conditioning, uh, nuclear power. Hang on. Do you get power? I don't think of it. We, yeah, we want that to read electricity. We don't want to complicate what is just an electricity deal with someone having to worry about that complexity, right?

And while there's more involvement on kind of unit one, unit two, right? Like, like people want to make sure that we can execute and deliver on our development timelines. At the end of the day, they are buying power and the data center space already has teams dedicated to procuring power.[00:34:00]

Uh, so Dave, since we're in reverse world this week, what have you been looking at? Well, I've been actually looking at the cloud and sustainability in quite some detail. I did a, I did an interview earlier this week with a magazine on the subject and therefore did, you know, dipped in, did some research and did some prep on this.

And one of the big questions in the conversation was about hyperscale data centers and you know, whether the growth of hyperscale. And the density and the new functionality that's all very, very power hungry, whether from an emissions point of view, this was like a net bad because actually, you know, you can, you can constantly see this growing over time and as it should, but actually the way that I was thinking about it and the way I sort of Asked us to zoom out of that conversation was you can't take that in isolation.

I [00:35:00] don't think I think what you have to think about say and just focusing specifically on data centers is you have to see the macro global footprint of data centers, which means yes, at one end, you've got hyperscale, but you've got multi tenants and still a very, very, very large estate of multi tenants.

And then you still got privately owned and a very significant privately owned Data center estate and i think you have to look at the whole picture in the round where at the hyperscale end you're gonna have state of the art they're gonna have set up a series of procurements around as close as they can get to clean and green power.

They're very, very professionally managed as a high rate of innovation going through them and a high level of investment going into them. And at the other end of the spectrum, you might have, let's say, less well invested, privately owned data centers that, you know, maybe have got legacy equipment in them, you know, kind of air conditioning that's not as efficient as it could be, et cetera, et cetera.[00:36:00]

So my thought was that. If you think about that whole thing as a, as a big global system and there's movement with of workloads within that system, isn't the important thing to look at the macro picture here and ensure that the direction we're taking, whether it be by power, by chip innovation, by code.

By, you know, kind of all of the different elements now in the complex picture of making this whole thing have the smallest impact on the earth that we can, you've got to consider the

whole thing and then ensure that it's a net down of emissions in that whole system year on year. What do you guys think?

Rob, what do you reckon? Uh, well, if only we had an expert. With stats from the power sector that knew all about this that could maybe answer your query Dave. So as much as I would like to. Was that a block in return? That was a block in return to say, maybe we should ask Michael what his view is and maybe has some interesting stats on it.

You know, from a global [00:37:00] perspective, if data centers are about 1 percent of global energy consumption, right? 300 terawatt hours or so are projected to grow. By a thousand terawatt hours over the next four or five years, right? So three times the growth in aggregate across all of those different classes.

And yeah, you're right. If you have a few hyperscalers, then you have a lot of, of multi tenant and then you have even exponentially more privately owned, those are all just continuing to add to that scale. And it seems to me that the, the aggregation around hyperscaler is helpful on so many different levels because one, you know, in any, in any data center migration program, you're going to want to, in some ways, reduce your footprint and reduce your, and reduce your power.

You've got direct utility costs on what you're consuming around your processing power that really. Means you should be enforcing like fin ops type disciplines around that stuff, which can extend to green ops. You've got the levels of investment in innovations [00:38:00] that. You know, hyperscalers are putting into the problem, if you like, that you just can't do at smaller scales.

Yeah, and that's the curve, isn't it? If you do cloud right, and your FinOps is baked in right at the beginning, so your architecture's efficient, your software delivery lifecycle's efficient, your compute's efficient, then you take something from an old, crappy, inefficient, Arena and stick it into a more efficient one.

So even though we might be demanding more compute because we're you know, It's more devices out there and everything else You can double down on the efficiency of the compute consumed and I think that's the right thing It's financial cycles as well So all the great things about cloud are actually the things that can cause cost overruns and lots of people Are now hyper focused on that when you've done a capex outlay into a data center That capacity is just there and free to you so we don't become conscious of capacity until we've hit the conversation where we go, we're about to run out of capacity.

So it's a much less efficient cycle. So there's this, this, this [00:39:00] sense of being better at engineering around power and consumption that cloud helps develop within corporate systems. There's a long way to go. And a lot of people haven't quite got there yet, but actually the onward push to that means that efficiency will, will grow and grow and grow.

I do think Rob, you've got a decision making friction there because there's always something better and so it's like, do you do that upgrade or consolidation now, right? Or do you wait till next year? And then is that good enough? Right? So yeah, it's a lower capex to refer, but it's like, when are you going to refurbish and how are you going to refurbish that?

I think it's hard for people to wrap their heads. Yeah, it's almost like the financial Approaches to I. T. Haven't quite caught up with what technology can potentially deliver and cause. It's almost like the finance teams have to force the architects to go and design in a particular way to say you need to design this differently because we're now thinking about our financial.

Models differently. Did you, uh, did you notice the way he brought architects into that? Michael? He's [00:40:00] just got a yeah What's the british a bug in his bonnet? Is that? I don't know. I don't know but no you your point is exactly well served which is there's there's new disciplines That are forced in here And and a level of financial scrutiny in here that's all to the good because you know Presumably organizations are tightening their spend, controlling their spend.

But at the same time, that has a direct knock on impact on emissions. So look, good discussion. And Michael, thank you so much for spending some time with us today and giving us insights into one of the real high potential solutions here. Yeah. Thanks for having me. It was our pleasure. And we end every episode of this podcast by asking our guests what they're excited about doing next.

And that could be something in your personal life. Like you've got a good film you're going to go and see at the weekend that you've been looking forward to. Um, or it could be something in your professional life or it could be both. So Michael, what are you excited about doing next? Well, I think I've talked plenty about my professional [00:41:00] life.

I have a second daughter on the way. So that's for, uh, yeah, prepping for one more girl in the house is a little bit terrifying, but, uh, that's, that's front of mind for me. Wow. And what's the, what's the timeframes by a fourth quarter? Uh, November, early November is the, uh, estimated timeframe. So we have some time, but it's, you know, I find picking a name the most complicated thing because it's the, it's the first permanent decision that you make for your child and that, you know, that's hard.

I mean, up there with some of the most difficult decisions I've ever made in my life. I, I found it almost, uh, yeah. Marcel just said, ask AI. Ask AI to name your child. What, what a way to offload responsibility. I love it. We just asked AI. And that was that. One of the most important, one of the most important things you have to think about in your life.

Yeah. Dad, why am I called Epsilon Delta? Well, it's a long story.

It wouldn't be that long of a story. It starts with the primitive [00:42:00] AIs that we had in, uh, in the year 2024. Well look, Michael, we wish you All the very best with that. What an exciting time in anybody's life, you know, um, I I do think the second one was a little easier than the first. Oh, you're blase with number two.

You've done it, seen it, got it. I've heard both ways. I've heard both ways because we were like two, you already have the experience, but it's double the trouble, right? Well, it's more than double. It's more than double. So they always say that, that's the thing that I'm nervous about. And it's that thing about, you're now, uh, you're now equal numbered so you can tag team with one, with two.

Right. Oh, right. Yeah. Good luck. Thanks for the vote of confidence. You could have just lied to me like everyone else. I was good cop and Rob was bad cop in that situation. I think you'll find. I've got two. They're a bit older, but yeah, I still remember the moment. So, um, yeah, anyway. Wonderful stuff. Well, thanks again, Michael.

It's great to see you. Yeah, thanks, guys. A huge thank to our guests this week, Michael. Thank you so much for being on the show.

Thanks to our active producer Marcel, our sound and editing wizards, Ben and Louis, and of course, to all of our listeners. [00:43:00] We're on LinkedIn and X, Dave Chapman and Rob Kernahan. Feel free to follow or connect with us and please get in touch if you have any comments or ideas for the show. And of course, if you haven't already done that, rate and

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