Ep 2 Technology

**Interviewers:**

Trudy Lewis and Russell Goldsmith

**Chatting to:**

James Eddison – Chief Technology Officer, Ruby Mitchell - Senior Operations Manager and Gilly Ames - Front-End Developer

**Trudy**

Thanks for downloading the latest episode of Inside Octopus Energy, where the topic of conversation this time is the unique technology that sits behind our products and services that is helping us to deliver cheaper, greener energy. My name is Trudy Lewis, and together with my co host, Russell Goldsmith, we're joined online by three of the team responsible for shaping and developing the Octopus Energy technology platform, the aptly named Kraken.

**Trudy**

Gilly Ames is one of our Front End Developers working on Kraken's API. And Ruby Mitchell is a Senior Operations Manager supporting a wide range of partners who have licensed the Kraken technology to use for themselves. And so we'll come back to both of you guys shortly. But let's start this conversation with James Eddison, one of the company's co founders, our CTO, and would it be fair to say creator of Kraken?

**James**

I think it would be fair to say co-creator, just as the company has many people behind it, Kraken is the result of a team effort. And we've had some great people right from the outset, working on Kraken, a piece of technology like Kraken needs to have design on so many different levels. There's sort of a design of the functionality. There's also the design of the technology and the architecture. There's a team of people who've built that from the outset.

**Trudy**

Well, before we dig deeper into the story of Kraken, and how it's driving the business, let's bring Gilly and Ruby into the conversation. So Gilly, do you want to start by giving us a quick overview of your role in the team?

**Gilly**

Sure. So I joined the team about three years ago, back when we had just the two websites to look after. So we had Octopus Energy, and we had Kraken. And in those early days, I was mostly concerned with trying to improve and build on the experience that customers have when they interact with us digitally, whether that's through the website or through emails, and also to work with Ops team members to try and give that same experience to Kraken. So ops have always had a massive influence about how the technology platform has evolved. And that comes from working really closely, both with people like James and people kind of designing it, but also from people like us who can help to polish and improve the user experience of the application. And my role has really evolved now from mostly looking after Octopus Energy customers into developing API's and a white label experience that we can give to clients so that we can help look at those customers as well.

**Russell**

And how about yourself, Ruby?

**Ruby Mitchell**

So I joined four years ago, actually, as an Energy Specialist, so frontline ops and looking after customers. And then over the last four years, I guess my role has changed quite a lot. So moving on to look after payments or transactions collections, working with the tech team to build functionality for that. And then most recently, looking after migrations and joint Kraken Technologies to help support clients moving on to the Kraken platform and get them set out with not only as traditional Octopus way of working, but the tech platform that enables that way of working.

**Russell**

Ruby, you said that you joined the company four years ago, I think I'm right in saying you only graduated four years ago. And here you are looking after partners worth hundreds of millions of pounds to the business. I mean, what does that say about Octopus Energy's culture and the trust the leadership has in the team?

**Ruby Mitchell**

Yeah, so I graduated four years ago, I think I had eight weeks without work and unfortunately ran out of money pretty quick. But luckily came across Octopus, which at the time, was, I think 25 people in a box room in Hammersmith. And I remember in my first week, we were already doing our Friday night dinners and in a very different way. But Greg was speaking about how we're going to hit 1 million customers in five years and I was thinking goodness gracious, we'll see. But it's happened and beyond. So that's pretty fantastic. And when you're living in the fall for years, it seems quite normal and natural. Everything's been quite organic.

**Ruby Mitchell**

But when you look back in hindsight, it's really nuts, the opportunities that I've been allowed to have, I guess, there's definitely an aspect of being listened to, I can think back when I cheekily asked for a month off before I'd even been here six months. Jon said yes. And when I left, I've been doing a lot of stuff manually to do with home moves. And I wrote out this eight page document for James and I said, "Can we please develop all of this stuff, technology?" And most people would say, "Who is this girl? Who does she think she is? She's got no career experience." But that wasn't the case. And actually, some of it did happen. So it's really nice here, in the culture, is that if you have good ideas, and I guess knowledge is power in a certain way that no matter where the idea comes from, you're going to be listened to. And I think the senior management team has taken a lot of risk. And I'd like to think that that's paid off with the people that are allowed to rise up.

**Russell**

Brilliant. That's great to hear. Well, James, let's go back to the start of this technology journey, then you're setting up the business with Greg Jackson and Stuart Jackson in 2015. So talk us through the thinking behind developing your own technology platform?

**James**

Yeah, I think there was never any question about us building technology, it's what we're going to have done for the last 15 or 20 years is build technology platforms. So there wasn't really ever a conscious decision, it was on the business plan from day one to say, we will build our own technology. If we have to rationalise it, I'd say there's three things, which from the outset, were the obvious reasons. One is managing our customer data, both for this sort of protection of the customers and not having that with multiple third parties. were responsible for it, but also for the value of the business in terms of being able to structure it in a way that works for us, and not in a way which a third party thinks works for them. Secondly, is achieving efficiency, even on a simple activity like recording a meter reading, if a customer's telephone, or emailed me to meter reading through that certainly on a more complex task, which Ruby mentioned, one of her first pieces of work was helping design the process for managing housemates. And Ruby's contribution was, she was using, at that stage, a third party tool to do the process. And you've got somebody smart, who says, This is insane. I mean, how long did it take to do a house move using a third party piece of software?

**Ruby Mitchell**

I think about three and a half minutes, a single one. So when you're doing hundreds at a time it does add up

**James**

And using the process which you helped design, in fact, and how long does that take now?

**Ruby Mitchell**

Less than 30 seconds.

**James**

Okay, so you have sort of like a seven fold, increase in productivity and efficiency, because we can design it around what our people need to do, and their experience. And then thirdly, the reason for building our own technology has been that we can genuinely differentiate ourselves. Kraken does all of the core activities of the business, if we were using third party software, we would be constrained to the ability of that software, we could put a different brand on it, charge a different price. But essentially, you're going to be constrained as to the service you can offer.

**James**

By building our own technology, we've been able to offer the tracker, the Agile type products, genuinely different approaches in the industry. And we've been able to do those to our design and to our time scale. And without needing to write the beholden upon asking a third party when can when can we have our ideas, please? And that is why, should we say, being a technology business means that we think we can genuinely bring them bring a new approach to the industry, and differentiate ourselves, but also help move the industry forward.

**Trudy**

So Ruby, how has Kraken changed since you joined the business?

**Ruby Mitchell**

It's changed big time, really, I think when I first started, we were utilising two systems. James and the team have always had quite an iterative approach. So how can we add things slowly based on what the ops team needs, which is always going to be based on what the customer needs. And then as we get all of those building blocks together, it's really grown in lots of different ways. And that growth enabled us to move away from the third party platform. And then we had some time building Kraken and focusing on how we can ever improve it. And then getting to a point where we're able to do migrations and moving other customers onto the platform and then also selling the platform to other companies.

**Ruby Mitchell**

So yeah, it's changed a lot when I think about right at the beginning, some of the things that we were doing manually, as a growing company anyway, you always do manual stuff at the beginning. But I can think about putting occupier paper bills in letters and putting on stamps myself and writing them in the post box, then James and I are on a Friday night and would sit and go through occupier bills manually.

**Ruby Mitchell**

The tech team has always been really hands on with that kind of work, it's practice makes perfect. Do we have a system that we've been doing maybe in a workaround sense that we're really happy with? And then once we have that, we'll transfer it into an automated way. And then soon something you spend half an hour to an hour doing on a Friday evening is something that you kind of forget about. And then all of a sudden, we send out 10,000 e occupier bills each month. So just something really small, tiny process that you take for granted, you soon forget about when it's automated, actually has a journey in itself.

**Russell**

Gilly, can you talk us through how the relationship works between Development and Ops?

**Gilly**

Sure. The way that Kraken has evolved is, as I was saying before, very Ops led. And there are various things that help feed into that. In the early days, I think it was a lot easier. There were so few of us, and we all sat in one room. And if something didn't work very well, you could turn around and say, why does this do that? Why is that a tricky process? Can we make that better? And one day, the guy who's the head of Front End Development these days, Ash was just sitting working with somebody in Ops, whose desk was covered in these post-it notes. So this might have been James actually now I think about it. And the idea is like, well, let's make a reminders feature in Kraken, and I think Ash's one was, he was watching somebody goes through the incredibly laborious process of trying to explain a complex bill to a customer, and they had a calculator out, and they had a page of notes on the screen, and they were trying to make these things kind of work together. And Ash was like, we can make that better, let's make a little tool where you just click on the different bits of Kraken and it gives you the sum and these little wins, these little productivity, quality of life things.

**Gilly**

They're so valuable, we've kind of built an initiative around it, we call that Yaygering, during which is a reference. So Pacific Rim is a sci-fi film, but the idea is you get a better, stronger process by putting together these two people, an ops team member and a developer. And it's not just the technology wins we get out of it as well, it builds this trust and empathy. And it helps us keep that going, even though the teams are growing. So we still do that, even over lockdown we get people together on zoom calls. And it helps in the little features that come out of it. But it helps new team members get to know what Ops really do as well. It keeps them really connected to that process. I think that's been invaluable as the business has grown and changed.

**Gilly**

And it's not just about Octopus Energy anymore, because as we were saying, we're doing more to licence this technology out to other platforms. So in the early days, it was how do we take the power of the Kraken tools that ops use every day? And then how do we put that in the hands of users? How do we help them self serve these features now that we've worked out exactly how they're supposed to work based on the knowledge of the ops members who know the industry like the back of their hand? How do we put that safely in the hands of a user so that they can solve their own problems? And now we're doing that through API's so that we can give that to our white label clients who can then pass that power on to their users and empower them to solve their own problems. So it's really that partnership between the tech, between the ops that just creates this brilliant feedback loop that helps make Kraken better and better.

**Russell**

And can you just tell us how many are in each team? Just so you know, for the benefit of listeners, we know the size of the teams working on the platform?

**Ruby Mitchell**

Sure. So I think I'm right in saying about 70 in the tech team these days, they're kind of organised into different kinds of small sub teams around either, parts of business or in the front end. We've got more multifunctional teams these days. So we've got Charmander, Bulbasaur, and Squirtle teams, looking after the account management, the onboarding process, and then some dedicated kraken front end developers as well. Now that's about 10 strong these days.

**Russell**

And how about in Ops Ruby?

**Ruby Mitchell**

So Octopus ops, there's 450 I believe, an ever changing number I think, still recruiting 20 people a month, but yeah, about 450.

**James**

Just on those teams Russell was also mentioning, I think one of the other benefits from Kraken, which is perhaps obvious in hindsight, but I wouldn't claim I anticipated it in advance. But I think both Gilly and Ruby have touched on how well the teams work together because we're doing our own thing. And people in the company do very much work as one large team, rather than a sort of a tech team in one corner and an ops team in another. And in both sides we've got, shall we say, retention rates to be very proud of but certainly for the Ops. I felt that there's a lot of companies who set out and say, we're going to hire great people and we're going to reduce the cost to our customers, and they're going to be smart and such, we've really done that. And one of the ways of keeping good people is you don't then fill up their day with tedious tasks. So if you go back to that example of something, so I'm taking three and a half minutes or less than 30 seconds, if you give people tools, which is binary, they've got ownership of, and they can influence, but partly just make it so that they don't spend so much for time folding a complicated series of dull buttons, and they can spend more of their time concentrating on adding value to the customer, and having a more worthwhile draw. That's been an education. And I think a factor of Kraken is contributing to that culture.

**Gilly**

Can I pick up on that, actually, because I wanted to say that I think a huge part of that is the trust that you get, as a member of the team, the company culture has always been incredibly supportive of learning by failing for one thing, which a lot of companies say they do well, and perhaps when it actually comes to it, not so much. But you really do get trusted to run with something in the company. And I remember a meeting, as Tech Talk, we do these tech talks once a week, the head of engineering, David Winterbottom had said to me over lunchtime once, "Have you had this graph QL technology, this new API technology?" And I said, I've heard of it, I've not really played with it and he was like "You should go and have a look at that. It's interesting". And I went away and had to play with it. And then I gave this talk to the team, because I thought it was quite cool. And I thought maybe make a nice, internal tool for Kraken to help people find data that they're interested in, and James was in the meeting. And I remember he looked up at the end. And he was like "That looks pretty good, we'll have one of those in production plays for the consumer side. And we'll use that for the white labelling process and the API's". And I was like "That sounds great." And now it does power all of these white labels.

**Gilly**

There are so many places you could work that would either have said it's too cutting edge, we can't put that in production, or that's an interesting thought. But it's not kind of our top priority, or you're a front end developer, maybe you shouldn't be building our API's, any of those things would have been completely reasonable points to make. But that's not how we work. It's not how we treat our people. And a lot of what we get out of Kraken comes from that trust that we put in people.

**Ruby Mitchell**

And I think with that trust as well, we get a lot of the agility that allowed us to grow so quickly in the last four years and do things like migrations and timelines that no one thought was possible. I think back to when we didn't in January, we had kind of a tech lead, ops lead and a project lead who was in most of the conversations, and we were empowered and enabled to make decisions on the spot, on a phone call. And maybe if we're nervous, we check back in and make sure that James is happy, or our ops director thought it was also a good decision. But it's really empowering to be able to make decisions on the spot without having to get it okayed or signed off or go through the layers and then come back down again. And that means that we were able to migrate 100,000 customers onto the platform in about two and a half months. Pretty smoothly to be honest, so I was pretty happy with it.

**Trudy**

Okay, so James, earlier on, you gave us a quick overview of things, but talk us through exactly how Kraken works and what it does?

**James**

Yeah, I mentioned Kraken is essentially the platform at the heart of the business. So anything to do with looking after customers. So the core part of the business is something that should be in Kraken. And so essentially for customers, we supply energy and we've got a responsibility for looking after, and managing the supply and metering of the energy to their property. So Kraken does that. Interacts with the industry, and it manages those processes. Secondly, we need to support customers. And generally that means talking to them. So Kraken handles the communication with customers, and the areas which we might call or generally called CRM. And thirdly, we're a business so customers need to pay for their energy. So Kraken manages the billing, the payment connection and accounting for customers. So that financial element. At its heart, it's everything we do for our customers.

**Russell**

And James, we've heard how many people are working on the technology in the project, how often is it being updated? What version are you on now, for example?

**James**

We run a process called CICD, continuous integration, continuous deployment. And what that means is, we are rebuilding the application and indeed, the infrastructure the application is sitting on continuously. And that by example, that's now about 50 times a day, that we do a new version, and a new build of the infrastructure and the software running. So every incremental step is really small, and it's very well tested. And it's very safe, because the impact of a small change is going to be small. And we've got strategies, we can either fix forward, or occasionally roll back, if we had too. I think we've had to roll back about three times in five years, that's very rare that we take that decision.

**James**

But overall, it's a little bit like a glacier, you might not see it changing minute to minute, but actually basis can move quite quickly. And you come back a month later, and you say, well, that's changed a lot. And for the ops users, there's a constant drip of changes or improvements, which we announced internally through Slack, or through Kraken itself. And so you know, rather than saying there's a new version coming, you've got to come and learn these hundred new features. There's actually just a feed, I'm not going to say it's exactly one feature a day, it's all tied up. So sometimes there'll be three or four things, and then there may be a couple of days without an announcement, but it will be just little changes, like that pain problem you had when you reported, you can now do that, there's now a new button to do that, or whatever.

**Gilly**

I was gonna say I was already looking at the number of closed CR's, I make it about 18 and a half thousand. So you could look at it as that many versions of Kraken.

**Russell**

Well. James, one of the things you said earlier about the reasons why you developed Kraken was for differentiation. So I guess that leads to the question, why licence the technology to your competitors?

**James**

If you go back to the aim of the company, we want to make what we call internally a green dent in the universe, we are very committed to trying to address climate change. We think that the solutions for climate change are going to need to be assisted by technology. And the industry as a whole has a lot of areas where the technology systems are not sufficiently flexible or scalable for making the rate of change necessary. So in part, the objective is to introduce technology and new approaches to the industry. And for that green dent to be meaningful, it's got to have sufficient scale.

**James**

If our objective was to create an energy supplier in the UK, being one and a half million plus customers is successful. But on a global scale, that's not going to be really influencing change. We've said, publicly, we want to have 100 million customers on the platform by the end of the decade, ideally sooner. To do that, we're going to need to have a much greater scale and be international. Having genuinely our own technology, means that licencing the technology to other parties who already have some of the scale means that we can accelerate that growth. And we can achieve that growth faster. And when the objective is trying to put in place technology that the industry can change or adapt new ways of working, as soon as possible for climate change, the sooner the better. So really, it's to advance that growth faster.

**Russell**

And Ruby, can you share with us how many companies are actually using Kraken now?

**Ruby Mitchell**

Yeah, we can look at it in two parts. So we have E.ON, NPower, Good Energy in the UK using Kraken or about to use Kraken in the midst of moving over. And then in Australia, we have Hanwha and Origin as well. And then the second half is companies that are powered by Octopus Energy. So we have partners or white labels called M&S Energy, Co-op, London power, and then Tesla Power as well as our most recent one.

**Gilly**

So we've also got customers using our API's to build great tech. And this goes all the way back to when we first developed these innovative tariffs, when we had a hack day and just invited a bunch of people to come together and see what they could make out of the API's that we developed for these tariffs, because we've got a lot of API's at this point that support different use cases. But that's only grown into more exciting things and we've now got an app called the Octopus Watch app, which has been developed completely independently by Kim Bauters who is a civil engineer. And he joined Octopus Energy just as a customer, to receive the great service that we're really proud of. But he found that there's actually a lot more to our ecosystem. And that's really exciting, because it means that the technology that we've built, that we can think of great ways to use and ways to make people's lives better, we can really put in the hands of our customers, and they can build great things as well. And they'll come up with stuff that we've never thought of.

**James**

And that's a really good point, really, because it goes to the heart of what I was saying and that's the examples, when we sort of say, we think technology can help drive the fight against climate change. It's very specifically the fact that we've got agile pricing to encourage people to dynamically move their consumption, sounds a frightening and complicated concept. But then when you get third parties, building an ecosystem, using the API's to automate that process, it actually becomes transparent to the customers. And you get customers who are very much more highly engaged and understanding of some of the challenges and the issues about where our energy comes from, and the constraints in distributing it. So that is genuinely those API's that Gilly works on that are enabling that transition to a more sustainable future.

**Trudy**

And James, when someone joins the company, where does Kraken sit in terms of the priorities, in terms of introducing it to them?

**James**

It's funny, so we're still at a size where I meet every candidate for the technology team. Yeah, in that first discussion with them, I'm at pains to make sure that they understand the values of the company. And I've been putting those values really as twofold, which are looking after the customers and the fight against climate change. Those two to my mind, are the extent of our focus. I actually listened to one of Ruby's colleagues, talking about the culture and the onboarding process to Origin and Australia recently, and Lily said, "There's three values which we have". And I thought there's a bit of a difference. And she said, "One, looking after customers, Two, fight against climate change." I thought, so far, so good. So what's your third? And she said, "Three, great technology."

**James**

I thought, that's really interesting, because actually the ops team when they're onboarding people that have been sent to the new recruits, great technology is part of the culture of the company. And it's somehow I as CTO, it's one of the things which I've been failing to say, it's actually one of our values to our technical recruits, I take it as granted that they know, they've seen what we've published in the technical space, and they know some of the individuals and, that's why they're in the room. But it was really heartening and warming that was actually the expanded values from the ops team.

**Trudy**

And how do you see some of that changing as you get bigger and bigger because that's exactly what's happening?

**James**

I hope it doesn't change, those values should be consistent. And we should fight very, very hard to make sure that the culture and the trusting of people and treating them like adults, when they come through the door, is something that even as we get bigger, we make sure that we manage the company in such a way that we retain that.

**Ruby Mitchell**

Can I just add from an ops perspective, when we onboard the ops team, Kraken. The first thing we introduce people to and I guess, it is the second thing after thinking about our attitude towards customers, the reason that we're here and what our role is in operations, Kraken is the key enabler for that. And when I was working within Octopus ops, people come in, they're aware, and they go "Yeah, cool set up, It's fine." And what's been really magic about working in the migrations and working with other clients is actually being able to, so when you're doing training, or just explaining how Kraken works, see the reaction from people who know where Octopus isn't the norm and Kraken isn't the norm. And they're just really in awe of the things that you can do on Kraken.

**Ruby Mitchell**

It's almost like this freedom from all of the repetitive, long winded and just pulling your hair out, why do we need permissions to do this and that and why can't I serve my customers in the way that I want to? Actually, as soon as they see how Kraken works, there's so much excitement there, that all of the red tape they've had before it's disappeared. So that's been really lovely to see working with other clients and it is a bit of a reality check when you're in the day to day, you often forget just how great what we're creating is.

**Russell**

It's quite amazing to see and I genuinely mean this Ruby and Gilly, as you're talking about your experiences, how much you're smiling, it's clearly a great thing to be working on. I'm not just saying that, it's genuinely coming across, which is great. I want to finish off just looking at the future plans. And it'll be just good to know what you're all working on next with Kraken. Ruby, let's come back to you on this one first.

**Ruby Mitchell**

So really I think the next two years, my biggest focus is helping, Npower and E.ON on moving on to the platform and build their company, E.ON next to hopefully, be one of the leading energy companies in the UK powered by Kraken and I guess as the centre of enabling that, I think from a Kraken Technologies point of view, we've got quite interesting and potentially challenging periods coming up where we're almost formalising our processes a little bit more, which is like probably a swear word actually out, so maybe I'll undo that.

**Ruby Mitchell**

But really, they would never want to say no to an opportunity. And sometimes I think Greg and the senior management team are a bit mad, like what we do best what, why we do this, but it's working so far. And we dive into things all hands on deck, let's make this work. As we start to repeat and bring more clients on board, and see them move towards out of a migration phase and into kind of a BAU, looking after them long term as their business grows, it's going to be a new challenging period for us something we haven't done before and migrated, we've done nine of them now it feels like it's pretty normal to do. So I'm quite excited for that.

**Russell**

And Gilly, how about yourself?

**Gilly**

Definitely one of the amazing things about working at Octopus is, you never know what next week is gonna hold. You never know what new projects are going to get announced. And then suddenly, it's like, oh, wow, okay, cool. we're enabling this, this week, wicked. I've got long term aims to continue that process of taking features from Kraken into API's and giving them out to customers. And that will be an ongoing process for a while. But that is something that has to sit alongside making room for the innovations that are going to come out of like, whatever mad schemes that are going on, that James could probably tell us a bit about, actually.

**Russell**

Well, that's a nice cue over to James then.

**James**

One of the analogies we used with the team earlier in the year was to think about the company's growth and achieving its mission as a space rocket. We've been going just about five years, four and a half years in the market. And we set that in the context of saying, that is stage one of the rocket, it's like the first 90 seconds. There's been an awful lot we've done, it's been great fun. It's been challenging, but we haven't yet changed the world. And that is the mission.

**James**

We've got additional backers, we've got a great team. And I think now we look at this like, what is the second stage of this rocket? Because we've achieved more than I think, and Ruby touched on it earlier, when Ruby joined, the vision was that we have a million customers in five years. Well, we've shattered that target. But the targets we set ourselves are genuinely big. And it's now that second stage, how can we surprise ourselves with what we can achieve, still looking after the customer, but also now start to do much more to look after the planet to0

**Russell**

Are there other areas or industries that you're looking at taking Kraken into?

**James**

I wouldn't say we are looking at other industries directly. I think other parts of the industry, I think one of our challenges is, we need to be enabling people to be able to understand the source of their power or if not, knowledge to understand it, to be consuming power at the point where it's cleanest to produce and therefore, by whatever mechanisms necessary, we should be more directly linking the generation of clean energy with the consumption, the biggest domestic areas of consumption, our transport and heating. Those needs to be electrified as part of decarbonizing society, from where we are now, we may be looking at sort of technologies and approaches to help control that, and also to be looking upstream in the supply chain to match the generation of energy with the consumption of it.

**Russell**

I was just gonna say and looking further ahead, James, I mean, what do you want Kraken's legacy to be, let's say?

**James**

For me personally, I didn't come from an energy background. The thing that I heard about back in 2015, which should we say was a big source of influence for me personally on the journey. Was described as the energy trilemma. And the energy trilemma is how can we achieve a source of energy that is sustainable, reliable, and affordable. When you see that challenge thrown down, you realise if we can solve that or make a contribution to solving it, it is not only going to be great for the planet environmentally and ecologically, it's also going to have much wider geopolitical benefits for the population of the planet. And so, I think the legacy I would like us to have from our effort, my effort and, from Kraken as well, the best possible legacy is that it made a contribution to solving that trilemma. And certainly whether we succeed or fail, we've had a damn good try to/

**Trudy**

That's a really lovely way to finish and good luck with all those future plans. But for now, Gilly, Ruby, and James, thanks so much for talking to Inside Octopus Energy. As always, if you've got any comments on anything our three guests have discussed today, please do get in touch by the website at octopus.energy or via the usual social channels. But for now, from Russel Goldsmith, and from me, Trudy Lewis. Thanks for listening and goodbye.