Wicked Problems PODCAST

Wicked Problems – Series 3, Episode 16:

Claire Miller of Tellegen

Transcript

Recorded date:	15 July 2025
Release date:	23 July 2025
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Transcript

Toby Corballis (00:09)

Hi everyone. Today I'm joined by Claire Miller. Claire is an independent expert in the EV space and is a non-exec director and a consultant for various companies. She's worked with companies like Octopus Electric Vehicles. She's worked with Fuse. She works with Clearwatt. She works with Tual. We're going to talk about some of those companies and what they do in this episode. And we're also going to be talking about, what's this thing, V2G. Vehicle-to-Grid is what it means. But what does that mean? So, Claire is super fascinating, super interesting, really knows her onions. So, you're going to enjoy this for sure.

Claire, hello. Welcome to Wicked Problems. We're thrilled actually to have you here. How are doing?

Claire Miller (01:02)

Thanks for having me. Yeah, equally thrilled to be here. Thank you. Yeah, I'm really looking forward to the chat.

Toby Corballis (01:06)

Tell us a little bit for the sake of people watching and listening. What does Claire do? What does she get up to?

Claire Miller (01:12)

People say, what don't I do? I have really rich and varied day-to-day. No day is the same. I work as an independent mobility and energy advisor, and what that means is I like to work with companies, usually in the early stages or when they've got an early stage problem, so a zero-to-one challenge and helping them with EVs, EV charging, energy, and all the interconnections and touch points that that brings. That might be solving the technical problem itself, building out customer journeys, thinking about

commercialisation, all the way through to market design and policy and things like that. So yeah, it keeps me nicely busy day to day.

Toby Corballis (01:06)

Quite a broad church there. And what aspects of the EV, 'cos EV's just a big kind of beast, isn't it? There's a lot to it as an industry, I mean, and it covers everything. You've got charge point operation, you've got, you know, getting the electricity to the charge points. You've got different types of vehicles. You've got the different power levels. You also got new technologies coming online. Do you get involved in all of that or, or, or just as certain aspects?

Claire Miller (02:19)

Yeah, I mean, pretty much, yes, in lots of different ways. So, building ecosystems is really what this transition to electrification of transport is really about. And more broadly, that electrification of our grid, it is inherently interconnected. And so, when you start talking about EVs, you naturally start talking about energy. And then you start thinking about, well, where can I get that energy from? If I'm a customer, can I charge at home? If I'm a business, should I electrify my depot? All the way through to the grids. How can I decarbonise my site? How can I get access to cheap electricity? So actually, I try not to put those boundaries up because the more open you are to those interconnections, the better it is, actually. The easier it is to find solutions. And often, the solutions are in partnership rather than just all within one company.

Toby Corballis (03:07)

So, it sounds like we're going to have a lot to talk about... One of the things that's just come out in the news, like very hot topic, is I would say it's not really reinstatement, but new grants for EVs, for the purchase of EVs. I mean, I don't want to get too into the weeds of that because I'm not sure that the detail has been completely fleshed out yet. But in broadly, broad speaking, do you think that that's a good thing? Is it the other

things that we could be doing? I think everybody, there's a lot of chatter, if you like, I've seen on LinkedIn and places saying, this is great. Some people saying, well, maybe we could actually have done some other things as well. What are what your views?

Claire Miller (02:19)

It is a very live one. So I'm conscious we're recording of a Monday[1] and this might not come out until a week on Wednesday. And so, by then we will have more detail, not just on the car grant, but actually on a suite of funding that was announced over the weekend by the government. So interesting to see the criteria for all of those funding streams, particularly going back to the new car grant. You know, I was around building Octopus EV, which was my role before doing this sort of varied advisory role. My role there was around, you know, director of tech and innovation, building that lease code and in parallel leading something called PowerLit, which is Vehicle-to-Grid, which I know we're going to talk about in a bit. But focusing on the leasing side for a minute, I remember, you know, how we had to administer that car grant and it seems like it will be down to the Lease Cos and the dealerships to administer that grant. And it's the OEMs that are going to benefit. The complication, I guess, is the criteria that make vehicles eligible. So yeah, definitely need to see the particularly interesting carbon intensity of manufacturing requirements to access the grant. That might be a subtle way of precluding dirtier grids where cars are manufactured where coal is a big part of the grid. And that's a really interesting way of making sure that the carbon intensity of manufacturing is considered in this grant. However, the total number of vehicles that be eligible is something in the region of 170,000 to 200,000 vehicles, which is not that many new vehicles, particularly coming so fast after the changes to the ZEV Mandate, which in themselves were not planned, were kind of precipitated by moves by the UK auto industry. It's a really interesting one. I'm still processing it. Again, live issue. I do feel that it has not really taken into consideration the challenges that exist already in the second-hand market – residual prices, residual values; that's the

[1] Just a slight correction: we actually recorded on the Tuesday, but who hasn't made that mistake before?

amount the vehicle will be worth at the end of a lease term. And that needs to cover the depreciation of the vehicle. And I think the challenge we've got is right now we're still in the thick of like, how do you set a residual value on a new vehicle, new technology, as technology is moving very fast. It's already quite challenging in the second-hand market. And I do think as the sums wash through, we'll see cases and examples where it's cheaper to get a brand-new vehicle with this new grant than a second-hand vehicle with finance. And I think that's a huge challenge because if the second-hand market isn't vibrant and healthy, and if those second-hand vehicles aren't going to folk who would normally buy a second-hand vehicle, then adding more new at the front doesn't necessarily translate to faster sales at the end. And ultimately what that means is customers will end up paying back what this grant is to the manufacturers. In terms of the cost to finance new cars on the road to cover the risk that the RVs won't be strong in three years' time. So, it's a bit of a live issue and it's quite in the weeds of the leasing model, but it's really, really important that we get that balance between the new cars going on the road, yes, but the second-hand vehicle market is where most people are buying their vehicles, so I'm really hoping to see more on that in weeks and months to come.

Toby Corballis (07:06)

And residual values haven't held very well for some models, right? I think that that can create, I mean, does that not create an opportunity for me as someone going to buy a second vehicle sometimes to get a cheap EV?

Claire Miller (07:19)

Yeah, I mean, it's depressing prices across some models in the second-hand for sure. And it remains a brilliant time to buy a second-hand vehicle. But I think it's going to be interesting in terms of that ongoing financing around second-hand vehicles, what that actually does to the cost of finance. Because again, most people aren't buying in cash. There is still ongoing depreciation to consider. So, you're right, there are good prices out there, but I think you've got to consider the whole thing in the round and think

about, could be a good time to buy an EV if you're in the market right now for second-hand EV and you can find a bargain. But the industry as a whole, in order to be healthy and to get the balance between the new and the second-hand, we have to consider the whole thing in the round holistically.

Toby Corballis (08:05)

It's not just about new cars. There's also funding provisions, I think, being announced for things like NHS sites, for example. Well, can you tell us about that?

Claire Miller (08:15)

That's a lot clearer actually. So, Sunday was a busy day looking at the announcements that were coming out around a range of areas actually where the government is going to put investment. Today's announcement on the new car grant has rather kind of now taken the media attention. So, £63 million in total announced on Sunday. One part of that will be £8 million for expanding EV charging at around 200 NHS sites, which is fantastic because we know it's cheaper to run an electric vehicle than it is to run a petrol / diesel vehicle. And when that's applied to blue light and other support vehicles, it means it's less of a burden in terms of running costs on the hospital trusts, which means that money can go to something maybe more important and impactful than paying petrol diesel. So that's really exciting. One of the companies I work with is Fuuse, an EV charge point backend management system. And they already work with a number of those NHS trusts, blue lights, and they're very excited because it means they can help more NHS sites electrify and support them in electrifying their vehicles. So that's really exciting. And another part of that funding package, is going to help individuals, consumers, is about cross street solutions, getting some funding. So about eight-million-pound funding for cross street solutions, which will help people in terraced houses access their home tariff by parking outside their houses and charging that way. yeah, that was really, really good to see those investments, those announcements.

Toby Corballis (09:44)

So that things like gullies where the pavement has a sort of gully put in it that the cable can then go in and then it's flush to the pavement so it's not becoming a trip hazard.

Claire Miller (09:58)

Yeah, exactly. So, you know, the customer could have a standard home charger and with a gully solution, they just feed the cable across the pavement. And there's a variety of solutions that talk to that, so I think that's really exciting to sort of acknowledge folks who don't have driveways. I think that's really important that that's publicly supported by the government now with some funding. The other announcements that were interesting, one around depots. So, a nod to commercial fleets... awaiting more detail on that one. That's another very live one. think we'll hear more maybe tomorrow, Wednesday, this week around how will the fleet access that money? What's a depot? What's the criteria? But really exciting times. Another company I work with, a company called Tual, who provides solutions for depots that are hard to electrify on remote and rural locations to support operational fleets. I'm really hoping that it could support them a bit with helping to electrify those routes and depots where maybe it's a landlord owned depot, so you can't necessarily dig up the depot and put your own kit in because it's owned by landlords. So, there's some really interesting stuff to come on there, but again, need the detail. The final one, which is still a bit of a cliffhanger, is around the strategic roads network, so the rapid charger fund, which everyone waited for, 900 million pounds funding, waited a long time. Now it's been scrapped. We are waiting for more details from an announcement on Friday, which said that the government was still intending to put investment into strategic road network, EV charging infrastructure. So, I wait to hear more on that one. So yeah, very busy, busy, busy weekend of news. Great to be talking to you about it today and just trying to make sense of it all live with you on the podcast.

Toby Corballis (11:39)

Yeah, so there's a lot in there that you just talked about. So there's, for example, I think that, you know, that cross pavement, the sort of gully thing that we talked about, really important because there's so many people who can't access their own, they can't get a home charging price and therefore they're having to pay more for on street charging, which has its place. It's good to have on street charging in it and it works well a lot of the time, but it does open up as a significant portion. I think that the NHS stuff is really good as well. And the fleet stuff that you're talking about, because there are a lot of places where grid upgrades aren't necessarily that practical. Or at least they're not practical in the short term. So even if the landlord gives permission or you own the site, actually you might not be able to get the power to the site anyway. Or it might take quite some years to get.

Claire Miller (09:58)

It is a real challenge for depots. It's all well and good saying build depots, build bus stations, build these things where there's grid connections. That's a very flippant kind of throwaway comment to make. You can't just pick up a depot that is an operational depot and move it somewhere where there's more grid connections. And also, we know that the grid queue is very congested anyway. So yeah, we do need solutions that are in the short to medium to long term whilst grid upgrades and grid build out is coming.

Toby Corballis (13:08)

The grid build out, and this is maybe a good place to segue into talking about what is called V2G – we'll discuss what that means in a second – but we've got a grid upgrade going on. It's an immense infrastructure program, Probably the biggest upgrades of a grid that you and I will ever see, and our children, probably, right? And maybe even their children. It's that big. And because we're trying to decarbonise, we're moving to this whole electrification thing. The grid traditionally, I think it's outgrown what it was

intended for originally and therefore we have to expand it. So, it's not just about, I can build lots of chargers and put them in the ground. I've actually got to have the transmission capability to get to those chargers, and that can mean putting the cables in. It can mean upgrading the ability, also the power that can go through those cables to that site, et cetera. One of the ways that I think National Grid is, you know, looks to EVs to help with balancing the grid is through the ability at some point of electric vehicles to be able to give back to the grid. And that is, I think, something that you know quite a bit about and probably a lot more than I do in my slightly amateurish intro to it there. And I wonder if you could just explain, first of all, what does V2G mean? Because there's also other terms of people hear: V2X, V2L, V2H and so on. What is V2G and what makes it compelling?

Claire Miller (14:46)

Well, first of all, you're right. It's sort of acronym soup. V2X is starting to win out as the umbrella term where V is vehicle and X is everything or anything. So, encompassing every use case from powering a building, powering your home, powering other vehicles. And I guess in the other dimension, we think about the V as a passenger car, but that could be a van or a heavy-duty vehicle, or it could be a boat, or it could be anything that otherwise moves and has a battery. So, V2X is probably the broadest term. And then the other terms that people might have picked up on recently or over the years and months. You've got a vehicle to grid, which is about you as an individual being able to use your vehicle to put energy back on the grid for a benefit.

Toby Corballis (15:35)

Sorry, that was, I think your sound just came out when you said the name of it. V2.

Claire Miller (15:40)

Okay, so V2G is vehicle to grid. And in that sense, that's about your vehicle exporting energy out of its battery. So, the opposite of charging the battery at home is taking

energy out of the battery and that energy finding its way back onto the grid and you as a customer getting a benefit for doing that. So, you might get paid directly or you might get access to cheaper tariffs. And then V2H, vehicle to home, which is none of the energy makes its way back to the grid. You're just using your car battery as a way of running your home. Or V2B is another example of that – vehicle to building where larger vehicles might be supporting the energy needs of the building it's parked up next to. And finally, V2L, which is, and I should say, the ones I've just spoken about are still coming to market… Okay, so you can't go out today, right now, buy a car, get a charger, put it all together and you've got access to those services. So that's still a work in progress and we're to talk a bit about that. But V2L is something that maybe folks already have who are listening to the podcast or have seen as a feature on lots of EVs now. That's using the car as a kind of power pack. So, the vehicle having three pin plug of some description where you can plug in devices to charge directly off your vehicle. So yeah, so there's a wide range of ways of getting, once you've got the energy in the battery, you can get it out again. It can solve a lot of problems and you can do an awful lot with that.

Toby Corballis (17:10)

So if I have an electric vehicle, I've charged it up fully, I could use it to maybe if there's a blackout for some strange reason in my local area, it could see me through that by charging the house, providing electricity, excuse me, into the house so I could still make dinner or have the lights on or watch telly or whatever it is in that time. So that would be vehicle to home.

Claire Miller (17:36)

Well, I'm afraid, no. Extra complications. So that definitely exists and will exist. And there are folks who do live with an intermittent grid, even in the UK. So particularly friends up in Highlands Council, I know some of the folks up there in particular have this for themselves at home using a domestic installed battery. If you do have an intermittent grid, then having the ability to use your vehicle, it will be brilliant. You'll

need an extra bit of equipment in order to disconnect your home supply from the grid supply. So, it's a little bit more complicated than that, but I'm sure in time those systems will emerge. But the initial systems will require the grids to be live at all times.

Toby Corballis (18:16)

V2G, which is Vehicle to Grid, so my car is plugged into my house. It's actually got a full battery. The grid needs a bit more. It can pull from my car battery. And then I get some money in some form or other, whether that's a discounted tariff or actual money into my bank account. Effectively, I get paid by somebody for allowing that electricity to come out of my car battery and go back to the... back to the grid.

Claire Miller (18:47)

That's it. I think that it's such early days, even this concept to some of the listeners might be a new one to them. It takes a bit to get your head around because the initial reactions are often, well, hang on, this doesn't make any sense. I charge the car up because it's a car and I want to drive the car. If I'm a fleet operator, I've got an operational schedule that that vehicle has to perform. It has a job to do. I think it's important to keep in mind that first and foremost, this is about vehicle being the vehicle, and then these energy services can come into play around the mobility kind of responsibilities that that vehicle has. I think it's important to keep in mind, this is not about buying a car and then parking it forever. But our passenger vehicles are parked up a lot of the time, like 90 % of the time. So, when the vehicle is not being a vehicle, it's a battery on wheels parked up somewhere. And when it is parked up somewhere, then we have the opportunity to make the most of that battery and keep it working hard. The next thing folks say is, isn't this going to use up the batteries? It's not going to damage the battery, or will this not add wear to the battery? Well, I am and will forever be a student of battery chemistry. I'm a mechanical engineer by training, so I did train to design machines and engines and things like that. And actually, battery chemistry works differently to an engine in that sense. The good news is that the gentle charging

and discharging at low power levels actually is quite good for batteries. We're seeing some pretty promising results around that being quite a nice life for a battery. Some of that higher speeds may be on the larger vehicles and also in hotter climates we need to be careful of generally on our vehicles. So we don't need to worry about the impacts on the battery in that sense as well. And then you think about the grid. Like, so, okay, why is someone paying for that? think the bit you said there is really good. Like someone pays, question mark, like who is the someone, right? So, it's valuable to electricity grids to have ways of storing energy when you have intermittent supply. And so, as we move to renewables-based grid, sun doesn't always shine, wind doesn't always blow, we need places to store energy. So, we have optionality, we have choices about how and when we use energy. EVs are brilliant places to put energy. Before we even get to the clever exporting bit around the V2G, we can choose when we charge our vehicles. And actually, that's really exciting; that's here right now. Hundreds of thousands of people are taking advantage of tariffs that support controlling when the vehicle charges. V2G puts an added layer there where you also have the opportunity to export the energy when it's needed. And so then final piece on *well who are the someones who's paying?* Well, the grid, both the national grid and our more local distribution network operators need to keep the grid in balance. Supply and demand have to balance. If not, we get into trouble on the grid. That's just how an energy grid works. And so, they are paying to buy as a service, places to put energy and also for extra generation to be put onto the grid. And so, there's lots of different markets that exist and more that are emerging that enable customers to get paid. And that is really exciting just at the start of those markets starting to mature. It could be that you get a cheap tariff from your energy supplier or indeed an all-in bundle around your vehicle. So that's starting to emerge now. You might get free motoring if you keep your car plugged in and energy can move in and out of the battery, or you might get directly rewarded for some of these services from different providers. So yeah, lots to come on this. But the fundamental is: Grids have to stay in balance. EVs are great places to store energy. And as we start to see vehicles coming onto the market that can export

energy out of the battery when you're not using it as a car, it opens up the full potential of that battery on wheels.

Toby Corballis (22:52)

So, I think one of the things that's interesting and what you were talking about there is this is sort of evolution of how we interact with our energy suppliers. So, you know, once upon a time, I just I had an electricity connection. I paid a flat fee, you know, whatever it was. I could maybe shop around, but I ended up somewhere and I paid an amount and that was my kilowatt hour rate. You then, I think, just touched on what I think people call Flex, which is where you can subscribe to a tariff where the electricity company is allowed to then lower the amount of energy that's being provided to the home as it is experiencing capacity issues potentially. And then the next phase seems to be in what you're saying there. Well, vehicle to grid, actually I can draw that electricity straight out of your battery because you're not going to be using it. It's maybe a higher tariff time so you're going to be earning more than you paid for it last night when it was sitting on your drive overnight, getting a cheap tariff feed into it. So, you could potentially be earning money, so that relationship with my energy supplier becomes more dynamic and potentially lowers my bills. I wanted to ask you on that because I did read not long ago there was an announcement by Octopus, I think it was Octopus, BYD, and ZapTec, who said that for £299 per month you could subscribe and get all in V2G. So are they like the first to market with this or is it it's good but not everyone can utilise it yet or, you know, this is a nascent market so they're first in and there's more coming. Do you know much about that? Maybe you don't.

Claire Miller (24:41)

Well, happily I do. And it's a really proud moment for me. I have not been involved in this launch directly, but the reason I actually joined Octopus EV back in the start of 2019 was to lead a large Innovate UK part-funded innovation pilot called Powerloop. And on Powerloop, we developed an initial customer offering, which looked at leasing a vehicle, getting your charger installed, supporting the customer through getting

permission to export and the install journey, and then a product offering around that and a digital customer experience around that, which enabled customers to set and forget their vehicle, let us know what time they wanted their vehicle back in the morning and what the charge was they wanted. We set a floor level for the energy in their battery, and then we were able to, ultimately use V2G, to move energy in and out of their vehicle. That project proved that the concept could work. It's using now a slightly different technology, but the principles are exactly the same. And in terms of that customer trust, understanding the customer experience and understanding how you need customers to engage with this to make it work, all of those elements are super valuable. So, yeah... so it's wonderful to see this Powerpack bundle now launch and all of that hard yards, hard innovation, know, it's hard stuff at times. It's really great to come to market. In terms of who's first and who's scaling and who's going to be there? Well, I guess technically first to market was Renault in France. So, Renault brought a V2G bundle with a Renault 5 to market there last year. We expect Renault to come to market in the UK, maybe the end of this year, into next year, with their V2G offerings. But in terms of UK first, then yes, Octopus and BYD have managed to get the scoop. And so yeah, that's an all-in for customers.

You asked about restrictions with any of these products coming to market. Like this is a first. It's, I mean, it's not a spoiler alert that it will probably be bumpy to start with because it's still a new product to market and customers are still getting used to it. So, to make it simpler, my understanding is it won't be open to folks who already have that green tech, clean tech in their home. So, folks who have solar and battery already will need to wait a little while. It's just going to be focused solely on the V2G element. Other complication? Although again folks will start to get used to this and it will probably become more commonplace, is it's a bundle and a tariff that's focused on the car so it will be combined with another tariff that covers your home use. So yeah, it's really exciting to see it come to market. I'm super proud and I'm really pleased for them all. It's absolutely fantastic to see it the first in the UK properly coming to market, but

fingers crossed, it won't be the last. We'll start to hear more and more on V2G over the coming months.

Toby Corballis (27:33)

So, you mentioned that it's not available to people with green tech in their home already. I think just for the sake of anybody listening or watching who maybe doesn't know, it is possible depending where you live, size of your house, et cetera, to install a solar array, have a battery electric storage system, which is basically a battery that you put on the wall, and trickle charge that from the solar array and then be able to charge your car from that battery that sits on the wall as well, at least in part. So, for those people, they're already getting a sort of discounted rate through that mechanism, right? But they won't be eligible for the deal that we were just citing there, the Octopus deal.

Claire Miller (28:09)

Not yet. And I have to be honest, like we learnt an awful lot about how complicated it is to manage multiple systems like that on Powerloop. And actually, you know, when you're trying to help someone, I guess, get the best deal, but also live a comfortable life and managing all those different variables, like that is very complicated. And I do think there's an area for innovation that we'll start to see in coming years around managing the day-to-day elements within the home versus the kind of rewards and benefits you can get from trading some of that energy or sharing some of it back or providing places to store. So, it's not never, but I think it's sensible to start with just a clean deployment that keeps it simple. I think also early adopters are wonderful. They are willing to go out with all kinds of bumps and lumps in the road when you're trying new things, but actually to get to scale on V2G, we actually, need those sorts of mass market customers who are happy to get a really good deal, get their car, they don't mind plugging in, letting someone sort it out for them, and they get access to a cracking deal. I think that it's not necessarily a negative thing. It's starting to open up to the mass market. And that's what we need in order to see these propositions scale.

Toby Corballis (29:28)

To be clear, you can't have just any car being V2G. The car would need to be having a slightly different battery technology or connection mechanism. From my understanding, again, very much not as advanced as yours, but it can't just be any car.

Claire Miller (29:51)

The joy of V2G is that there's never a straight answer. So, apologies, but I'll try and keep it brief. There's two ways of working with a vehicle and getting it to export energy. one of those ways is, and I should say that the vehicle wants to consume direct current into the battery, and our grid supplies alternating current. So, we need some piece of equipment which can turn the alternating current, the waveform, into a direct current that we can put into our vehicles. If we are, you we're doing this vehicle to grid and we're going backwards and forwards from the car. And so, you can do that on the vehicle with the new vehicles that are coming to market. They have the technology on the vehicle to do that. But with existing technology, with the vehicles that exist now, there are systems which have that inverter technology in a charger. The charger is much more expensive and it's definitely not cheap to buy. It's definitely not in the same realm of expense right now as a standard home charger. And so, the beauty of the first system I described where this technology is on the car – so to your point, it's not every EV right now that can do it, it's only the ones that starting to come to market – it means that the domestic customers don't have to buy an expensive charger. They will need an upgraded charger, which can cope with the AC going in two directions, but it will be around the same price. Whereas if you use the DC version, which you do this in an expensive charger on the wall, yes, that means that it could do that with most EVs, but it's very expensive to buy those chargers. Probably that DC method is going to be more applicable to commercial applications. For example, bin lorries, big lorries, where their duty cycle means they go out and do their job, they come back, but they've still got quite a lot of charge left and now they're going to sit for long time in a depot. It makes sense maybe to put the investment into that inverter technology in the depot and not

on the vehicle. But again, there's these two opportunities to do V2G. I think what we'll see in the domestic sphere is it very much leaning towards that AC. So, it's on the car so that if you plug in at home and you've got a compatible charger, you're sorted at home. But also, we'll start to see this coming into the public realm as well. Because ultimately, this shouldn't be the preserve of folks who just have a driveway and can park up next to their houses ever so close. It should be available everywhere because if you think about, *where do cars dwell*? We talked about, you know, most cars don't move that much during the day. You might be parked at the station. You might be, you know, parked up at your office. Actually, if there's a big solar array on the roof of your office, or if there's an opportunity to soak up, you know, daytime solar parked at the station, then these vehicles could also be taking advantage of that. And so there's going to be some really interesting business models and, you know, reward opportunities for customers. I think we'll see free parking for cars that can make their batteries available, for example, where the reward for you parking all day and letting someone charge your vehicle is actually outweighed by the amount that that company is paid by the grid for providing somewhere to store maybe solar energy during the day, where otherwise the grid couldn't cope with it. Yeah, having the technology on the vehicle is going to be the right way to go for a lot of passenger vehicles, but there will be opportunities for it to be done the other way as well, I think.

Toby Corballis (33:16)

Just a reminder, because you mentioned it earlier, but car batteries aren't like, well, I'm going to say like phone batteries, right? Because phone batteries do wear down if you over cycle them a lot. But that's because there's a different technology within the battery and the battery, the car battery is actually designed not to have that over overcharging, over cycling going on. Actually, they're built to be able to have that inflow and outflow, inflow and outflow. They have a very long life as a result, and therefore you can cycle them many, many, many times and actually you don't appreciate the battery that much at all. So, I think that's an important point just to reiterate because you mentioned earlier.

Claire Miller (33:57)

Yeah, it's a really important one to keep in mind – that car batteries are designed to be car batteries. I know that again, that sounds a bit flip, but actually an awful lot of design effort goes into ensuring that these batteries have the longest life possible. When we talk about cars sitting, doing V2G and charging and discharging, again, it can sometimes conjure up this image that you're kind of somehow using up the battery. Well, actually that car battery was designed for you to put your foot down off the lights. Anyone that doesn't do that, then I don't believe you because they are really fun to drive. They're very responsive and they are designed to go through these rapid discharge kinds of moments, which is when you set off from being stationary or when you accelerate. So, vehicle battery is already designed to cope with many thousands of those sort of demands being put on it. So that's the really great thing. The other thing to say is that car battery as a car design is moving on rapidly. So, we have things like cooling on the batteries. We have preheating. So, you can plug into your vehicle if you're going to do a DC charge, so a rapid charge, a fast charge. The battery can be warmed up in order for it to be ready to receive that charge, which helps to reduce degradation. We can also try and charge it when it's cooler. So actually, it needs to be in this window of operation for charging that helps it. Not letting it sit at 100 % or a very low percentage. Also, it helps the battery. it's a chemical system and there's learning around it, I'm making this probably sound more complicated than it needs to be for most drivers, particularly in the UK, even though we've had a bit of a hot spell recently, it's still not the kind of hot temperatures that really upset batteries. So actually, we are seeing EV batteries lasting a lot longer than the manufacturers expected. And actually customers should be on the whole, very confident in buying second-hand EVs.

Another company I'm involved with, ClearWatt, is working really hard on that, building confidence in the second-hand EV market. So actually, they have products out there where folks can find out more information on the specific vehicle they're buying, and that helps customers and dealers actually understand what's been the life of this vehicle, and actually also have an independent way of verifying the battery state of

health. So, without relying on anything the manufacturer might sort of tell you about the vehicle, they have methods for you to actually understand and verify that this car battery is in really good condition. So, you can make purchasing decisions based on that. Yeah, I think car batteries is a technology that's here to stay and here to last.

Toby Corballis (36:26)

Thank you. It's been really fun talking to you. I've learned so much. I'm just thinking if people want to learn more about the work that you do and you mentioned a few companies, I will put links to those companies in the show notes. But if they want to learn more about the work that you do and where can they go? Have you've got a website or is there someplace they can go and have a look?

Claire Miller (36:47)

I hang out on LinkedIn. So come and find me LinkedIn, join the conversation, drop me a message. I really enjoy engaging with the work that everyone's doing out there in this space because as I say, it's about building networks and building ecosystems. So yeah, please look me up on LinkedIn.

Toby Corballis (37:01)

Thank you so much for talking to us. I think, you know, this is a story that's going to run and run and run. It's going to evolve. You said it's quite nascent and you can really see that. So maybe if you don't mind, we'll get you back in in six months or whenever and we can see how the evolution has progressed.

Claire Miller (37:18)

I'd love that. Yeah, thanks for opportunity and I look forward to coming back.