

Batteries on Wheels: Why Vehicle-to-Grid Is About to Leave the Pilot Phase

PT1 Live at The Drop 2026 with Claire Miller (independent advisor, mobility and energy) and Bryony Cooper (PT1)

Recorded live in mid-September 2026 at The Drop in Malmö, Sweden.

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TL;DR

- Vehicle-to-grid (V2G) lets an electric car do more than charge: it can also send power back to the grid when the grid needs it.
- The guiding principle: a vehicle has a job to do first. Moving people and goods comes before balancing the grid, and pilots fail when they forget that.
- The bottlenecks are no longer the technology itself but harmonised standards, certification, proven business models and consumer understanding.
- Utrecht is the reference case: 500 bidirectional Renault 5 car-share vehicles help keep a congested city grid below its limits.
- The most common myth, that V2G wears out your battery, does not hold up. Early data suggest moderate cycling can even be good for battery health, and EU rules set minimum durability.
- Commercial V2G offers from carmakers are launching now in the UK, the Netherlands, France and Germany. True plug-and-play interoperability is likely five or more years out.
- Companies mentioned include Octopus Energy, TUAL, Installer, Terra One, We Drive Solar and Renault.

Edited transcript. Smoothed for readability and trimmed of filler and pre-show conversation; statements and meaning have been preserved. Figures, projects and regulations mentioned are documented in the source appendix at the end. The audio recording is authoritative.

Welcome and introductions

Bryony Cooper: Thanks for joining us. My name is Bryony, I'm Director of IR and Comms at PT1. We're an early-stage VC investing across Europe in technology that upgrades the physical world, and one of the three buckets we invest in is electrification. Claire is an advisor to two of our portfolio companies. We met earlier this year and, as you could probably tell from our chat before we started, we had a lot to talk about. So I invited her to share her expertise on vehicle-to-grid, and especially on how we can use vehicles to support the power grid. Claire, give us a little background on your career and why you care about these topics.

Claire Miller: Thank you, Bryony, and thank you for having me. I'm a mechanical engineer by training. I like solving problems, and I've always been drawn to places where physical things happen in the real world and change something. Cars and mobility have been a personal passion, and over the last seven or eight years that has come full circle with electric vehicles.

Claire Miller: I was part of the team at Octopus in the UK that built their EV leasing business. In parallel I was programme director of Powerloop, a vehicle-to-grid pilot that set out to answer some basic questions. How do you make the technology work? How do you get cars talking to the grid? And how do you get customers to trust that when you take energy out of their battery, there will be energy back in it when they need it?

Claire Miller: With the PT1 companies, I work with TUAL, which helps van fleets electrify when their depot doesn't have enough grid capacity. And with Installer, which is about getting physical equipment into customers' homes in a seamless, digitised way. Domestic vehicle-to-grid installation is very complicated at the moment, and they can help make it smoother.

Bryony Cooper: Installer was also our first Nordic investment. They're based in Norway, so it's nice to be up here.

Why EV adoption varies so much by market

Bryony Cooper: Let's start with the big picture. Electric vehicles have been around for a long time now, but adoption scaled more slowly than many of us expected, largely because infrastructure didn't keep pace with vehicle manufacturing. Why has it taken so long, and what is still holding things back?

Claire Miller: It's interesting to ask that here in the Nordics, where adoption is huge. In Norway almost all new vehicles are electric. So it really is market by market, and a lot of it comes down to policy and pricing. The UK had very favourable policy and subsidies in the early days of EVs. We could spend the rest of this session debating whether the government reduced subsidies at the right time, and the same debate has played out across European countries.

Claire Miller: Beyond policy, it's about general confidence in switching to electric, and charging is a big part of that. If you have to rely on public charging, it's harder. Where people can charge at home, we see strong uptake. And the logical next step on that journey is your vehicle helping you keep your energy bills low.

Carmakers are learning a second business

Bryony Cooper: You work with all the stakeholders in this space: founders building the technology, policymakers shaping regulation, and the carmakers themselves. What do the manufacturers think about vehicles turning into an emerging energy asset class?

Claire Miller: There have been some great battery sessions here today, about chemistries, materials and manufacturing. The part I find fascinating is what happens when you put that battery into a vehicle. It has a job to do first and foremost. It's a mobility asset. It might be driving you to the shops and the station, it might be a delivery van, it might be an electric truck.

Claire Miller: For legacy manufacturers this is a big change on top of a big change. They're already switching powertrains from combustion engines to electric, and now they're learning about energy as well. Their business was built on selling a car and then supplying everything that wears out: oil, filters, maintenance. Most of that disappears with EVs, because maintenance on an electric vehicle is extremely low. So energy services become one way to replace that income.

Claire Miller: New entrants build their vehicles as electric-native platforms from scratch, but that is still an automotive skill set, and the energy piece comes next. So for any kind of carmaker, the vehicle comes first and energy comes second. What we're seeing now is different manufacturers with different risk appetites, some wanting to lead in smart charging, dynamic charging and ultimately vehicle-to-grid, others holding back to follow.

Leaders, laggards and the German example

Bryony Cooper: Yesterday I heard something fascinating and a bit shocking. At a panel during a corporate venture event, Daniel from World Fund used Germany as an example: once one of the world's automotive leaders, now overtaken by China, because the industry resisted new technologies and kept backing the legacy ones. If I remember correctly, he said China's automotive market is now seven times bigger than all of Europe's countries combined. That's mind-blowing.

Claire Miller: I'd agree with the direction of that. Do you run towards clean technology as an opportunity, even though it's high risk, because it's clearly where things are going and it's better for everyone's air quality? Or do you dig your heels in and hang on to polluting, carbon-emitting technology? You can see manufacturers' trajectories becoming very clear now, and some German manufacturers are an example of the latter.

Claire Miller: As a counterpoint, companies like Renault have pushed very far and fast into electrification, and so has Hyundai Motor Group with Kia and Hyundai. So not all legacy manufacturers will be laggards.

Energy security and a battery's second job

Bryony Cooper: It's also worth looking at incentives from a European perspective, beyond mobility, around energy security. For years the argument was that we need renewables for the climate, and that alone wasn't always a strong enough incentive. Now geopolitical tensions have added the fear of depending on other markets. Is that pushing companies to change?

Claire Miller: There are many transitions happening at the same time, which is part of why it's hard to separate the signal from the noise. There is immediate, short-term pain for anyone running a vehicle on diesel in a market where fuel prices are exposed to the geopolitical climate. So we see spikes of interest in EVs from people who realise they need a cheaper way to move around. Businesses look at total cost of ownership, which is a killer metric for delivery and freight companies on very thin margins.

Claire Miller: And on resilience and sovereign energy supply: storage has to be part of any story about transitioning to renewable energy, whether for individual homes, businesses or entire nations. People may think I've completely drunk the Kool-Aid, but when you consider all the effort, energy and materials that go into building a battery, and then we put wheels on it and give it the primary job of mobility, we should think very quickly about its secondary job: supporting the grid and giving people energy security in their homes and businesses.

Claire Miller: That's what gets me excited. How do we go from interesting technology, a nice pilot and some early innovation money, to something that becomes an investable asset class, and to services that are simply a normal part of running your home or your business?

What it takes to scale: standards and business models

Bryony Cooper: Put like that, it's a no-brainer. So what needs to happen to get there? We have the regulatory framework, the technical capability, financing, and viable business models for providers.

Claire Miller: When we prepared for this, I told Bryony I had to be careful not to go too deep into standards, because you could spend all day on the standards required for the different parts of this system. But in short: if you think of the vehicle as a battery connecting to the grid, there is a whole series of standards that need to be harmonised, along with testing and certification. It sounds dry, but stick with me. The boring, routine path of bringing a new model to market, booking a test, getting a certificate, doesn't really exist yet for this. Today it borrows from the rules for standalone batteries or solar, and

different markets handle it differently.

Claire Miller: There is a lot of work under way. Europe is moving to harmonise grid codes, meaning the rules and performance requirements for connecting batteries and other storage and generating assets to the grid. That will make life much easier for carmakers, who won't have to comply with many different national grid standards. The Nordics are going the same way, and the UK is following closely.

Claire Miller: On business models, it's still very early days. There are no consumer propositions at scale yet, and by scale I mean hundreds and hundreds of EVs connecting to grids and proving that customers trust it and that there is money to be made. That said, every market needs to balance its grid, and where there are open markets for trading storage and exports, there are live opportunities today. In the UK, just by smart charging and letting an aggregator control when your car charges, you can earn something like three to four hundred pounds a year.

Most people don't know this yet

Bryony Cooper: Do people know that? Do we need more education and PR, both to build consumer trust and simply so people realise they could be doing this?

Claire Miller: Absolutely, there needs to be much more education, about energy in general and about how individual homes can become more resilient. Most people don't know that a grid fundamentally has to balance: supply and demand have to match at all times. Because of how the market has evolved, there is a market for balancing the grid, and markets for other technical services that keep the grid healthy. Those markets will grow and become more local.

Claire Miller: You don't need to know much more than that to realise: so I sign up to a service, I won't really feel anything, and my EV will be ready when I need it. Or more broadly, my heating keeps me comfortable, I use energy when it's cheapest, my life isn't affected, and I get rewarded financially or pay less. That national conversation hasn't happened yet in the UK, and probably not across Europe either.

Bryony Cooper: Energy prices are one of the most talked-about topics in the news and one of consumers' biggest fears.

Claire Miller: Exactly. It's encouraging that the UK energy regulator is looking at putting innovation funding into the bigger topics, like resilience and making sure the grid is fit for purpose. But the conversation still needs to happen. As soon as the penny drops, people ask why we aren't doing this already. Once they get it, they really want it. We haven't been through that moment yet, because the products haven't launched at scale. That's what is coming next, and it's exciting.

Closed ecosystems now, interoperability later

Claire Miller: What we'll see first in Europe and the UK are carmakers launching what we'd call closed ecosystems, where a specific car works with a specific charger and service. I think next year is really exciting, and over the next three years we'll move from asking whether this is still a pilot to asking when interoperability will be mandated.

Claire Miller: Carmakers should be allowed to launch products the way they want, test and learn what customers like and don't like, and learn how their products perform. But ultimately we don't want a world where you buy car A, move into a house with V2G charger B, and the two can't talk to each other. That's what I mean by interoperability.

Utrecht: the bidirectional city

Bryony Cooper: Can you give us a concrete example? You told me about Utrecht earlier.

Claire Miller: Utrecht in the Netherlands is a really interesting place. The city set itself the vision of becoming the first bidirectional city in the world, which is a pretty audacious goal. They secured Horizon Europe innovation funding and brought together a consortium: the local government, local innovators such as We Drive Solar and early pioneer Robin Berg, and the local grid operators.

Claire Miller: The key takeaway is that the Dutch grid is heavily congested in many places. If you keep adding EVs that simply charge, the infrastructure can't support them. V2G becomes a huge benefit, because if you can orchestrate the vehicles, telling them to charge at certain times and discharge at others, you move energy into the car batteries and out again and keep the grid below its limits. That means grid operators don't have to build as much new cable, as many transformers and substations, and can keep operating safely.

Claire Miller: Over several years they built relationships with carmakers and charge point manufacturers. It is still a closed ecosystem, so not every car can join in, but they have just added 500 Renault 5s to a car-sharing fleet. When those cars are waiting for their next driver, they aren't just standing around. They are literally balancing the grid, acting together like a small grid-scale battery. The model is now expanding to other Dutch cities, and the carmakers involved are bringing cars with these features to market. It's a great example of innovation money piloting something and the learnings turning into real products and services.

Bryony Cooper: Remind me after this to connect you with a friend who consults for Volkswagen. They're talking about autonomous fleets coming to Germany that could be used for this too.

Flocks of autonomous vehicles and resilient cities

Claire Miller: That's a great end goal. Once we have autonomous fleets, there's even more reason to make sure they interact with the grid. People call it a swarm, which sounds a bit scary, so I prefer a flock. Robotaxis that are helpful during the day could support the grid in the evening. Take it further, and grids could call on autonomous vehicles when a specific substation or area is constrained.

Claire Miller: It matters for resilience too. In a power outage, vehicles could come and help keep hospitals, schools and other critical places running. We've just been through a really scary hot summer, and sadly probably one of the coolest we'll see for the rest of our lives. Vehicles can play a part in running safe, cool spaces, particularly if the grid goes down. It is complicated to get up and running, but it will unlock huge potential for other services.

Where pilots fail, and why bin lorries work

Bryony Cooper: Utrecht is the positive example. Have you seen a V2G pitch that sounded great on paper but didn't work in practice, because of consumer behaviour or vehicle availability?

Claire Miller: We haven't seen propositions at scale yet, but there are lessons from fleet pilots. There's a lot of hope for fleets as a strong use case, but you have to respect the operational duty cycle. The vehicle has a job to do first: maybe it's an ambulance, maybe it's a freight vehicle. Pilots have failed where the enthusiasm for V2G was put above that job. I've seen a few where I thought, that's beautiful, but in the real world that vehicle can't be plugged in at that time.

Bryony Cooper: You gave me an example of a use case you love: garbage trucks.

Claire Miller: Bin lorries, yes. They have a very reliable, repeatable duty cycle. They collect rubbish at set times, often overnight in big cities, because you don't want them on the roads during the day. They need large batteries because they're heavy and get heavier as they collect. And for quite a while, batteries won't be specified precisely for each use case, so these vehicles end up with batteries bigger

than the job requires. Big battery, predictable schedule, plugged in with charge left at exactly the times the grid is struggling, and able to charge flexibly in the hours they need to.

Claire Miller: That flexibility matters more and more, especially in southern Europe, where very high solar yields are causing problems with too much solar on the grid. The grid needs energy in the early evening, when everyone is using it, and at other times we desperately need places to store energy.

Bryony Cooper: That's exactly why we invested in Terra One at PT1. We developed our battery storage thesis back in 2022, because renewables are volatile. It depends how sunny and windy it is, so without storage you get wasted energy at some times and not enough at others, which causes big swings in energy markets and prices. Battery storage is a necessity for the energy transition, and V2G is one of the ways to solve that too.

Claire Miller: Completely. We are solving the same grid problems.

The open question: who gets paid?

Claire Miller: To come back to the commercial case: we are still waiting for propositions that really test and prove it. That's the next step. Over the next one to three years the question is who makes money from this, and whether customers get a big enough cut to think it's worth signing up. The value is clearly there in the markets that support the grid, and those markets will grow and create new opportunities for vehicles. But if not enough of that value is passed back to the consumer or the business customer, it won't gain traction in the long term.

Bryony Cooper: That's a tricky one. I was also wondering how we finance more pilots and scale-up. Do we depend on government funding like Horizon Europe, or should it come from the automotive corporations? And will they share their toys and give consumers a cut?

Claire Miller: It's a fascinating moment. We're recording in mid-September 2026, and we're about to see real commercial propositions launch in the UK, the Netherlands and Germany. At the same time there's more innovation money. The UK has just announced more funding for consumer-led flexibility, with one strand for V2G. So we have real propositions and more innovation funding at once, and I think it will take three or four years for that to wash through.

Myth-busting: does V2G wear out your battery?

Bryony Cooper: We have about ten minutes left. One thing we wanted to cover is the myths and misconceptions, especially among consumers, because they may be one of the blockers for adoption.

Claire Miller: The number one thing I hear, even from people in the EV industry, is battery degradation: why would I let someone do this to my car battery, it will wear it out. I think that comes from our mechanical understanding of vehicles, as systems that wear out and need maintenance and lubrication. We're moving to an electric world, where battery chemistry is what matters most for how we move and store energy.

Claire Miller: Batteries don't wear out the way engines do. When V2G runs at lower power levels, in the domestic range of seven to twenty-two kilowatts, early data show those cycles are actually good for batteries. They help condition the battery and reduce the growth of dendrites, the structures that make a battery perform worse. So that's my number one myth to bust: V2G does not inherently use up your battery, and in many ways it could extend its life. What we need now is data from carmakers as they put these vehicles on the market and learn at scale how their batteries perform.

Claire Miller: The other piece of good news for consumers is regulation. EU vehicle rules, under Euro 7, set out how long EV batteries have to last and at what level they need to perform, and carmakers

back that with warranties, typically eight years.

Bryony Cooper: I wish they'd do that for iPhone batteries.

Claire Miller: This is an industry that is here to stay. There are rules for bringing a vehicle to market and for how it has to perform over time, and the carmakers launching these products know their batteries and set the rules for how they are used. So there is a lot of reassuring information for anyone who is otherwise sceptical.

When can I actually buy this?

Bryony Cooper: How long until I can walk in to buy a brand-new EV and they sell me these add-on services?

Claire Miller: Weeks to months, depending on which vehicle you'd like to buy, madam. Right now, for example, the Renault 5 in France offers V2G services, and the Ford Explorer does in Germany. There are plenty of vehicles on the road that already have the technology on board. It's just on the cusp of being available to customers.

Claire Miller: A lot of my projects and conversations across the ecosystem are about unblocking exactly that. How do you get the first proposition out to customers? How do you smooth the customer journey? How do you get standards agreed? So it's very close. Being able to pick up any car and know your charger at home will just work is further off, probably five years or more. Nobody wants a market where customers are locked into a specific car and a specific charger. That isn't an open, healthy market, and that's where we need to get to next.

Audience question: a Kindle model for cars?

Ashley (audience): I used to work in EV smart charging, and I agree the business model, the consumer proposition, is part of the blocker. While you were talking I thought about similar things in other markets, and my brain went to the Amazon Kindle. You could buy it, and then suddenly there was an ad-supported version that was much cheaper. Is that the kind of model we need, where a carmaker says this version comes with V2G, we manage the battery, and you get a discount on the vehicle? We've seen that when EVs get cheaper, people buy them.

Claire Miller: Great question. My answer is yes, and. So far we've only seen propositions being piloted, not what appeals to which part of the consumer world at scale. I do think there will be a segment of drivers happy to give a lot away, perhaps even access to the vehicle at certain times, because it makes the car so much cheaper. Like watching an ad for free viewing time. We'll see some of those.

Claire Miller: There are also early adopters who want full control of the vehicle battery, the way you might control a home battery or your solar generation. That will be harder and take longer. Most likely we'll see a plethora of propositions in the middle: an exchange of value that builds trust. Something like, drive ten thousand miles a year and it costs you nothing, but you give up any revenue from smart charging and V2G.

Claire Miller: At the real budget end I'm sure we'll see offers like: this car is free forever, drive however you like, just always plug in. That's where we'll find the edges between it's a car and it's a battery on wheels, for different demographics. And how big does the reward need to be before it passes the so-what test? We can't really get away from the power of free. Free is extremely attractive. Those are the ones to watch.

Closing

Bryony Cooper: We're right on time. I want to thank Claire for sharing her insights and expertise. I found it fascinating, and I hope you did too. Enjoy the rest of the conference.

Claire Miller: Thank you very much.

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Sources & References

Reference apparatus for the projects, figures and regulations mentioned in the conversation. Statements marked as speaker estimates have not been independently verified.

1 • Event and speakers

- 1 The Drop 2026: invite-only climate tech gathering in Malmö, Sweden, 15 to 16 September 2026, organised by the Malmö-based venture fund Pale Blue Dot; 2026 theme “Borrowing from the Future.” The event does not share its attendee list. Source: [thedropconf.com](#); Pale Blue Dot (Substack); Nefco.
- 2 Claire Miller: former Director of Technology and Innovation at Octopus Electric Vehicles (Octopus Energy Group), founding team member of the EV leasing business, led the Powerloop domestic V2G project from 2019; MEng Mechanical Engineering, Imperial College London; now independent advisor and non-executive director. Source: Future of Utilities; Prolific North; Fully Charged.
- 3 Powerloop: Octopus Electric Vehicles' V2G trial with bidirectional chargers and Nissan LEAF vehicles; a £7 million project within the UK V2G demonstration programme delivered by Innovate UK. Source: UKRI; Octopus EV.

2 • Regulation and standards

- 1 Battery durability under Euro 7: electric and hybrid cars must retain at least 80% of battery capacity for five years or 100,000 km and 72% up to eight years or 160,000 km; for vans 75% and 67%. Source: European Parliament press release (December 2023); electrive (April 2024).
- 2 Grid code harmonisation: the move towards common European requirements for connecting storage and generating assets to the grid, as described in the conversation.
- 3 UK funding for consumer-led flexibility with a V2G strand, as described in the conversation (status September 2026).

3 • Projects and market data

- 1 Utrecht V2G car sharing: Renault Group, We Drive Solar, MyWheels and the City of Utrecht; 500 Renault E-Tech vehicles with Mobilize V2G technology; partners estimate the fleet can provide around 10% of the flexibility needed in the Utrecht region; about 35% of rooftops in Utrecht carry solar panels. Source: Renault Group; electrive (November 2024); pv magazine.
- 2 UK smart-charging earnings of roughly £300 to £400 a year: speaker's estimate, not independently verified.
- 3 China vs. Europe market size (“seven times bigger”): quoted from memory by the speaker from a third-party panel; not independently verified. Europe-30 registered around 8.7 million new passenger cars in the first eight months of 2025 (Inovev). Readers should treat the figure with caution.
- 4 Commercial V2G offers mentioned: Renault 5 (France), Ford Explorer (Germany), as described in the conversation.

4 • Companies and organisations mentioned

- 1 TUAL (Powerbank Pro-Charging): high-power charging for fleets on grid-constrained sites (PT1 portfolio).
- 2 Installer: Norway-based platform connecting climate-tech brands with installation professionals for EV chargers, solar and heat pumps (PT1 portfolio).
- 3 Terra One: battery storage (PT1 portfolio).
- 4 Octopus Energy / Octopus Electric Vehicles; Renault Group and Mobilize; We Drive Solar; MyWheels; Robin Berg; Hyundai Motor Group; Ford; Volkswagen; World Fund; Amazon (Kindle, as an analogy).

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