

## Episode 189

# **HPH189 : Is an electric car the perfect accompaniment for a low energy home? with Robert Llewellyn from Fully Charged**

The show notes: [www.houseplanninghelp.com/189](http://www.houseplanninghelp.com/189)

**Intro:** Building methods and domestic energy production can contribute to a better and more efficient home and even help the planet. What if the technology in our homes could revolutionise not just the building industry but the car and energy industries as well? Actor and electric vehicle enthusiast Robert Llewellyn talked to us about cars, batteries and the future of energy and transport. Best known for Red Dwarf and Scrapheap Challenge, I started by asking him how he ended up here.

**Robert:** It's a question I've had to ask myself because sometimes I wake up baffled going, 'what the hell am I doing?'

I think it is fair to say Scrapheap had a very large role to play in it because particularly talking electric vehicles, that was when I first became aware that there could be such a thing.

I'm going back to 2001 in California. We made an American version of the show called Junkyard Wars and it was when we were making that in California – we did it from 2001 to 2005, I think – I had one ride in a Prius. I'd never heard of it, didn't know what it was, had never seen one before, didn't know it was a Prius when I got in it because it was late at night, and this car drove away without an engine running. I went, 'how did you do that?' It felt like a wire was pulling it. That was the very first experience I'd had of anything like it.

I wasn't impressed. I went, 'that's stupid. Why would you put an electric motor in a car? It makes it really complicated.' So, it wasn't an instant thing. At the time, I was driving a borrowed 1969 mint-condition fastback Mustang. So, really the antithesis of anything remotely ecological or even vaguely efficient. I think that car did seven miles to the gallon.

It was through that, through experiencing why anyone would bother to go to the hassle of making a hybrid car that I then started to find out more.

Particularly in California and Los Angeles, it was air quality. Los Angeles was one of the first cities to become really aware of very high levels of childhood asthma, very high levels of breathing difficulties in older people and very specifically, people who were near big freeways that went through Los Angeles. It was very, very connected to tailpipe emissions from internal combustion cars.

It then made me have to reconsider what I was doing and what I was, in a sense, interested in and by default promoting, in a way. Because I was very much into big V8s and American muscle cars and all those sorts of things. I went, 'oh, hang on. It's a bit awkward.'

And then also being very impressed with the technology. I saw what was called the T-Zero, I believe. An experimental electric racing car or sports car. The engineering team behind that then went on a few years later to set up Tesla and the rest of that is history. This is pre-Elon Musk Tesla, which not many people know it existed before him, although he made it happen.

That's kind of where it started, and then it was a very, very slow progression. It involved selling a very thirsty, hot hatchback and buying a Prius in this country and then getting my first electric car in 2009, seeing what that was really like and going through all the normal anxieties about it. Particularly then, there wasn't a charging infrastructure in this country.

So, what I've really been in the ground floor of, witnessing, and I didn't know this would happen and I couldn't have predicted it, was the transition that's now finally gathering pace.

It hasn't felt quick to me. It's felt very slow.

Ben: I think these things always are though, aren't they? That they take a bit of time.

Robert: They take a long time. The intriguing thing is the S-Curve of adoption, which a lot of people in the electric vehicle arena are now discussing. You can see it in the past in things like television, telephones, mobile phones, the internet.

More recently, the Snapchat one is the most amazing S-Curve because there was a day when 43 people were on Snapchat and

two days later, 72 million were. That's more like an I-Curve with colossal increases.

But all the signals are there for now there to be a very rapid adoption of electric vehicles.

I think it's much more complicated than that because I think there's nobody making enough. There's really three companies at the forefront of that, Renault, Nissan and Tesla. There are a few other companies that are making some cars but not that many yet. They're hedging their bets and they're being a bit careful. You know, car companies are run by people who love petrol engines. That's what they went into that for. They love the noise and the spectacle, the smoke and all that stuff.

Ben: You've said many interesting things already. So, I could take this in lots of directions. First though, maybe we should just establish, is it a logical way to go sustainably, for electric over petrol. Obviously, diesel, at one point they were saying how great diesels were. Or, are you moving the issue to where you create the energy? I know that you can use solar and so-forth to power it, but that's my first question where we should start.

Robert: The thing that really holds my interest - I think it's very important to point out that I've never been that interested in cars. I now work with a brilliant automotive journalist, Johnny Smith, he knows about cars. He knows the history of the companies, why these cars were developed, what happened to that one, why this one was successful. I don't know anything about that. But what really interests me is the knock-on effects of what electric cars have done. And that is happening much, much faster than the adoption of the actual vehicles.

So, what an electric car is, is a battery and computer on wheels. It's not a car as we know them now. If they're going to be a success in the history of the human race, they're going to completely change the ownership model and the use model that we have now.

One of the key things – and this is not a made-up fact from Greenpeace or some weird, hippy, cyclist activist, it's from the manufacturers and all the governments around the world – 90% of all the cars that are on the road are not in use for 90% of the time.

It's just as well because if they were, we'd be doomed. But there's this colossal investment that we've all made in machines that we use for between 6 and 10% of the life of the vehicle. It's a massive, ridiculous and unsustainable waste.

Through electric cars, the idea that you've got a computer on wheels means that changing that car to a car that can drive itself – not necessarily all the time but some of the time – completely transforms the model.

These are theories that I've heard discussed in enormous depth at many conferences in the last two or three years, particularly in the last two years, that once you see the potential of that model, then that is a game changer.

It's very obvious that it's not going to happen overnight. It's going to happen generationally. It's going to be, I think, 20 years before we see a lot of people that don't own cars, that could own cars. I'm talking of people in developed countries with a middle-class income that would now buy a car. In the future, they just won't dream of it.

Again, the manufacturers get this. They know this. They know that they're not going to be able to sell you a car. They're going to sell you a service. They're going to sell you miles or kilometres to travel. They won't sell models, they'll sell mobility. That's one of the catchphrases.

I think that's very interesting because what it instantly means is there are fewer cars. We don't need as many cars as we have now. We would all be able to use cars for exactly the same amount of time as we do now, but we wouldn't own one and we wouldn't have one parked on the street outside our house. We wouldn't have to worry where we charge it because you won't charge it. It will be charged when it turns up at your house because it will have charged itself.

Ben: That's quite interesting. Obviously, we're a podcast about housing mainly. So, this episode is slightly tenuous but I've always wanted to chat ...

Robert: Well, there are very strong links. I'd love to talk about my house because that's a very important part of the thing. But anyway, go on.

Ben: I was going to ask about should we be setting ourselves up for charging capacity? I know, for example, I've had to buy a hybrid car because perhaps the electric cars and the charging points and everything that it entails is just not in my budget range at the moment. Everything's going into the house.

But should I be planning for the future? Hearing this, I imagine we're talking a few decades into the future but we might not need this charging station at the house.

Robert: I think for certainly the next ten years, you do. If you've got an electric car and you've got somewhere off the street to park it and you can charge it at home, then it really makes a lot of sense because it would be crazy to buy an electric car and then go, 'I'm waiting for what Mr Llewellyn says is going to happen. I'm just not going to charge my car. I'm going to wait until it charges itself.' You've got quite a long wait.

The slight amendment I'd like to make to that is there will be autonomous cars on the road long before that. I've been in the fully autonomous Nissan Leaf. When you go in it, you go 'alright, fair enough. This stuff works.'

I drove all the way through central London, motorways, roundabouts, traffic lights, pedestrian crossings, cyclists, kids running along the side of the street, and this car was way better than any driver I've ever seen. It knew stuff way before a human being could even see it. It was slowing down when you're going, 'why is it slowing down? Ah, there's someone about to cross the road up there. B\*\*\*\*y hell, I didn't see them.' Really extraordinary.

That's version one of the technology. So, that stuff is going to happen whether we like it or not. And as always with disruptive technologies, there's loads of downsides to it. Because what do the between 900 million and a billion people do, depending on whose statistics you look at, who earn their living driving a vehicle at the moment?

Trucks without question will be automated in the next five years. There will be fully autonomous trucks with no drivers that are doing set routes. There are experiments for that already happening in Holland, in Denmark, Germany and America. There's already delivery trucks driving along roads with no drivers. Much, much safer than with drivers. And they can work for much longer hours. So, they're more efficient, they use less fuel, they drive more efficiently, blah, blah, blah. All that stuff, because if the companies that are running them see, 'oh my god, we're saving money having this', they will adopt it very, very rapidly.

That stuff is all very important, but the other key thing which will happen much, much sooner and is already happening now is your house and your car, if you're lucky enough to have a house where you can park a car outside and you can plug it in, you can run your house off your car and you can run your car off your house. That goes both ways. That technology has been developed in the last five years and is just starting to be rolled out.

There are already offices in the UK that run their office from solar panels on the roof and the cars in the carpark. They don't use any grid electricity. They save hundreds of thousands of pounds a year and they can still drive home at the end of the night.

That technology throws the whole energy paradigm that we're used to into a fruit loop. What the hell do we do then? It messes up the system that we're comfortable with, that we're used to, that is in fact massively inefficient and expensive and we have to subsidise all of the fossil fuel plants to a colossal amount of money to keep them running.

All those things are normal, therefore invisible. In very much the same way as buying petrol is normal and the process of getting that petrol to that filling station forecourt is completely invisible. We don't know what it is, we don't know how much energy is required to supply that. And when you do find out, you get very depressed because it is truly, catastrophically colossal.

One of the key things I think that's very important that Elon Musk said, quite a few years ago, 'of course we'd have enough electricity to charge all the electric cars we want if we stopped refining oil.' It really caught people's attention, going, 'what's he talking about, refining oil?' Oil refining uses mind-numbing amounts of electricity. They have to have their own power stations to run oil refineries.

Ben: We never see this as well.

Robert: You never see it. It's part of our infrastructure. It's invisible to us. People who work in oil refineries, they know how much they use.

This is one of the weird positions I'm in. I made a television series called How Do They Do It? And one of those episodes was how do we make petrol. I hadn't got a clue. I just thought you get some oil and you put it through a sieve. That's what I thought. I didn't know.

We've got three really big oil refineries in the UK and the one I was in was in Pembrokeshire. Amazing place. Incredible efficiencies. They've refined and refined and refined refineries. But they still use a huge amount of electricity. The engineer there told me they use the same amount of electricity in a year as Coventry and Leicester. Don't know why he chose those two cities, but those two combined, the one oil refinery consumes that much.

That obviously produces billions of gallons of petrol, diesel, jet fuel, plastics, pharmaceuticals, all that stuff, but it uses a lot of electricity. And it's something we never, never think about.

So, the whole energy structure of the country is going to take decades to untangle, but the things that will untangle it, that will make it messy, are things like, as I have at my house, solar panels on the roof and a battery on the wall of the house. Now, I haven't used any electricity during daylight hours since I've had that installed. Not one watt, for two and a half months, of any electricity from the mains during peak daylight hours. I use some at night for charging cars.

My cost savings from doing that, I think, are irrelevant because that's not the point. I mean, they have been enormous. My electricity bill has dropped by about 85%. And it won't be that much over the whole year. Obviously it's the summer now, but it'll be about 70% over the year.

Now, one house with a 70% less demand on the grid means nothing. 10,000 houses with that means very little. In the local area you might notice. A million houses and you can close down two fossil burning power plants. And what we're looking at is the possibility that if we adopt localised production and energy storage, solar panels and batteries in houses, and electric cars, we would require less electricity generated. A counter to the recent claims that have been in the press where we'd need ten times more. We'd be using it more intelligently and we'd be using it more regularly, rather than sudden peaks and massive troughs that we have now.

Ben: It doesn't help as well, when you have, for example, the election over in The States and you think, wow. In many ways, we're going backwards. At a time when perhaps we felt we were getting a bit of momentum, we've gone miles back the other way. One step forwards, five steps back.

Robert: Yes, except for you're looking at a very isolated president with a very small minority support in the United States, and an enormous ground-swell of ground-level activism and activity going on in all the cities in America.

Virtually every mayor of every major city has signed up to the Paris Accord, despite Trumpypants.

Up to this point, all the really amazing breakthroughs and technologies that are in the field of renewable energy, of energy storage, of electric transportation, have essentially all come out of particularly California. It's come out of the software industry, the computer industry, not the automotive industry or the energy industry.

But those things are hugely disruptive. You see industrial scale solar plants, solar reflectors heating molten salt, running 24 hours a day with no intermittency, on the scale of a large nuclear or coal burning plant in terms of their generating capacity. They use no fuel. The initial installation is hugely expensive, as it is for coal and nuclear, but once they're up and running, the maths has come through. People go, 'oh, I see, it's cheaper. We're generating 3.2 gigawatts from this power plant with no fuel costs, no waste management, no storage, no transportation.' Once you see the spreadsheets of that, corporate leaders see that and go, 'oh, I get it.'

It's very, very interesting. One of the guys I interviewed last year was from Pacific Edison – the American power company that does the west coast of America; a huge, multinational, multi-billion pound corporation that has loads of coal burning plants, nuclear plants, gas plants generating electricity. They had some peak management issues in an area outside Los Angeles where the peaks were overloading the grid and they wanted a quick solution. What did they choose? They chose, as he said, very accurately and very succinctly, the cheapest option, which was batteries. That's what they put in. That was Tesla's first multi-megawatt sized grid battery backup.

So, the technology is already here and it's already being implemented in Trump's America. Which is going to be awkward for him, but they just don't tell him.

I actually think, genuinely now, those people who know stuff, they just go, 'don't tell the President. He's watching Fox News. He's fine.'

Ben: I think you're right that we've just got to keep on going. Hopefully things will right themselves.

Robert: Well, the rest of the world is adopting it at breakneck pace. What they're doing in China is mindboggling. They installed more solar panels in China this year – and we're only in August – than Germany has installed ever in its history. And Germany is the solar country of the world. Every house has solar panels on it. A wind turbine goes into operation every hour, 24 hours a day in China.

So, there's stuff happening around the world.

This country is the biggest off-shore wind generating country in the world. We don't know that. People who live on the coast know it because they see the wind turbines out at sea. But we generate more off-shore wind than anyone else in the world, including

Denmark, which is mad because it's Denmark that's installing them here. We've got more wind than anyone else in Europe. We have 40% of the entire amount of wind in Europe around the British Isles, which we should be very proud of.

Ben: I think part of the issue has been this, we get electricity, we don't know where it comes from. So, anything that you can see – you can see a wind turbine, you can see a solar panel – it's, 'I don't want that there.' That has been a resistance but it's stupid because, of course, this is coming from somewhere and it is damaging, as we've already discussed, in a major way.

Robert: Yes, it is that. Also, I really make the economic argument more than the environmental one, although I very firmly believe the environmental one is very, very important.

I have children, I'd quite like to have grandchildren. I have encouraged my daughter to give me some grandchildren but she said that's an inappropriate comment for a father to make at her age. She's actually 21 now. She wants to finish university. I said, 'don't waste your time on education. Make me a grandchild.' She said it was the most forceful piece of contraceptive advice she's ever had, is what she told me.

But I think the economic argument is the one that is now starting to win. And it's not just you put solar panels up, they produce electricity in the daytime and then you use it, and then you can't use it so you need gas. All those arguments, they're valid but they're becoming less valid. I think the really crucial thing is the economic argument that's behind the scenes. So, the way electricity is bought and sold. Who owns it, who produces it, who consumes it, and how those people communicate.

Even the big energy companies in this country are really pushing for things like local production, local ownership and local ability to sell electricity.

I'm always producing more than I need in my house and because I've got batteries, I can use more of it. But even now, I'll still be exporting some to the grid. I should be paid for that and there are times when I could sell that for a lot of money, we all could. Because the other thing that we don't know as consumers is the price of electricity fluctuates from literally, you get paid to use electricity, to fantastically expensive. Way more than we ever pay for it. By many thousands of percent.

There are days of the year where at peak times, electricity would cost something around £50 pounds a kilowatt hour, when we normally pay 14, 15, 16 pence, because of the strain on the grid because we've had to turn on every single old power plant and the companies that run those charge a fortune to do it. We're importing from Denmark, we're importing from Holland and France.

We don't know about that. If we had the ability not to use electricity when it was that expensive, but possibly to sell it – and that's going to take economic and legal changes but the current government are looking at that very seriously. They know that this technology is coming, they know it's here, they know it's going to be implemented, they know they have to adapt the current commercial setup to cope with that.

So, it's very disruptive. I think it's a very disruptive technology that is coming very much faster than people think. I think those things will be adopted very quickly. And when other countries adopt them successfully – and at the moment we're talking Scandinavian countries, Denmark, Holland, Germany – and the economics of those arguments start to become clear, then you go, 'ah, we should be doing what they're doing.'

The likes of Trump, I just think he's historically irrelevant. He's horrendous at the moment for us to live through, but historically, he'll just be a wart on the history of humanity.

Ben: Let's round off this interview then because it's interesting how broad it's gone. I thought we were going to have a chat about cars, but actually this has in some ways been more about production of energy and ...

Robert: Production and ownership.

Ben: Yes. You've convinced me that we will end up, probably, going down this line.

So, what would it mean in the short term? If we talk buying cars, what are you doing? What have you got in terms of cars and how are you using them?

Robert: I'm a terrible example. I always say I'm not green. People say, 'oh, you and all your green stuff' and I always say, 'I'm as green as the Aga that's in my kitchen.'

We bought a house thirty years ago that had an Aga in, and I was not that bothered but my wife was thrilled to bits. When we refurbished the house fifteen years ago, there's a photograph that

my son took with me stood next to the Aga with a sledgehammer when we were knocking rooms, saying 'please let me get rid of this.' But I lost the argument.

So, I'm not green, but I only have electric cars, we use solar panels on the house. The house is extraordinarily well insulated and has very good windows. This is because we did a lot of work on it. It was effectively a shack when we moved into it. So, it's a very cheap house to heat, it's quite a cheap house to run. It's now become a ridiculously cheap house to run because we don't really pay for electricity, other than the wretched Aga, which is off at the moment. It's off for nine months of the year because I'm a brute.

I do that, but I think the key thing that I've learnt from doing this is I built the house before I understood anything, and before solar panels became affordable. They were very expensive a few years ago. They've dropped in price, I think it's 4,000% in the last 10 years. That's quite a big drop. So, they're very much cheaper to buy now.

If I'd had my brain in gear when we did the house up 15 years ago – I knew insulation was important, so we did that, but the extension we built on the house I would've designed and built differently. This is a thing I'm really passionate about, when people build new houses – not refurbish old ones but build new ones – the two keys things, it's a mono-pitched south facing roof and ground-source heat pumps.

When you're building a house on a new site – and there's some housing development five miles from me where I look at it and it breaks my heart. Loads of new houses, they've all got individual gas boilers, no solar panels, traditional pitched roofs that don't face south. No-one's thought about it at all. They're designed and built by morons. I'm going to be that radical.

If you're in the building industry and you build a house like that now, in 2017, you're an idiot because you could sell it for more. It doesn't cost more to build. That's been proven. Look at Swansea University's Building Technology website. They've built social housing at the cheapest possible cost per square metre and the house produces all – and I will repeat and underline it and it's in capital letters bold – **ALL** the energy it needs is produced by the house. The people who live in that house will have free heating and lighting for the life of the building.

That's in 2017. It can be done and it's incredibly frustrating that the building industry is so, so far behind. There are brilliant

technologies that are coming through, but that could easily be done. If you build a house with a roof that's already just solar panels, it produces way more electricity than that house could possibly consume. If you can store that in batteries, which are now becoming more and more affordable, and you build it into the house when it's built, you're not retrofitting, you're not trying to fit it in and bend the pipes around the corner that isn't designed for it and all the rest of the nonsense that we have to go through to retrofit houses, those houses will be exemplary, will be sought after, will be more valuable. Because you got, 'there's this house here. It's got a gas boiler, this is the bill each year, and this is its insulation rating. It's really bad. It's got a very high electricity bill' and all that stuff, and 'here's a house which looks the same and costs the same but it's free. When you've bought the house, all the energy it uses is free.' Where's the argument against that? [Nasally] 'I don't like solar panels on my roof.' Sorry, I'm just getting – 'you won't have solar panels on your roof because your roof will be solar panels and you won't even notice.'

I've got a very big either chip on my shoulder or furious passion in my back pocket about that.

Ben: This is quite interesting in many ways because you talked right at the beginning about falling into this. I do sense a real passion in what you've been doing over the past 15, 20 years.

Can you take me on where Fully Charged will go in the future? Is it more down the same route? You obviously do a huge range of different things, from Red Dwarf, we've talked about Scrapheap as well in the early days. Where do you see yourself going?

Robert: Oh god, I mean, I'd quite like to potter round in my garden a bit more.

Fully Charged was almost an idle experiment, five or six years ago. I was interested in the topic and I'd spent a long part of my career talking in meetings with television executives about various projects, some of which came off and happened, some which didn't. But I did find the process fairly frustrating and difficult.

When the ability to effectively make small TV shows on a very small budget and distribute them around the world, where the cost of distribution is zero with YouTube, Facebook and all the rest of it – from my point of view as a producer, it's a zero cost – but it's also got zero income so, you've got to balance these things up.

I've done a lot experimenting with how you distribute stuff like that and it's taken years, but it's gradually working. So, it now works. I employ four people full-time that work on the show. We're expanding very rapidly. We're expanding beyond just YouTube, but YouTube is the mainstay of it.

All the numbers and all the statistics are pointing very steeply upwards. There's a huge amount of new interest in the topic. For a long time, it did feel like a hyper-niche micro-topic, that there were some gentlemen of a certain age who were a bit like me going, [nasally] 'I'm very interested in the whole battery-vehicle revolution' – they don't all have nasal voices. That's just my prejudice. But there was certainly a kind of passionate EV minority who'd drive electric cars and would go to meetings and communicate with each other on forums and all that stuff.

That has now grown. I've actually met quite normal people who 1) aren't interested in cars; 2) don't know anything about the technology but they use them because they're cheaper. That's what'll happen. Once you've bought it, you then go, 'this is so much cheaper to use than the diesel we used to have or the petrol car we used to have.' You don't need to drive one for long to work that out. Drive it for a couple of hundred miles, you go, 'that cost a lot less to drive that couple of hundred miles than the petrol car we used to have.'

That's happening very quickly. The market is growing very rapidly and it will grow. But there are lots of teething problems and there are going to be lots of difficult things that happen that counteract it.

There are a lot of very well-funded – I'd call it propaganda, because I'm using a word from the seventies, now called fake news – but a lot of propaganda from the fossil industry, trying to hold back that development. In the same way they did with asbestos, tobacco, catalytic converters, leaded petrol. All those things that have been fought against really, brutally hard by the corporations behind them. But they always lose.

The oil companies know they're going to lose this in the long run because they can't possibly sustain what they do now. I do believe that we're at peak ICE. So, peak internal combustion engine. There's a colossal increase around the world of internal combustion engines, a tiny minority of electric cars. But all the indications are that the peak is about to drop. The diesel-gate scandal being a very good example of some of the disasters that will fall on companies that make internal combustion engines.

I've spoken to so many engineers and PR people in that industry. They know. They're not in any doubt about it. They know that the future is electric and that the integration of electric cars into the way we live is very much the key. And imagining the petrol car you have now just being replaced with an electric one, I think that is mistaken thinking. That isn't what's going to happen.

The arguments about is there enough lithium, if you talk to anybody in the automotive industry, there isn't enough steel or rubber or plastic to make enough cars – it doesn't matter what powers them – for the expanding middle-classes in India and China. There just isn't enough. We can't use the model we've been using.

In the West, we've done the damage already by having millions of petrol burning cars. The intelligent people from around the world who have seen that model and who have large cities that are choked with toxic fumes now are going, 'that system doesn't work. We're going to do something else.'

My argument is always you want to get around, so this is the list: you walk, you cycle, you use public transport, and then the fourth and least frequent is you use an autonomous electric car. It's down the list. And we have fewer cars, more friendly streets, less noise, no airborne pollution for our kids to breath.

It is so offensive when someone says, 'I like driving my diesel.' Well, yes. I'm glad you like driving your diesel but my child has walked in your tailpipe gasses and they're carcinogenic.

It's like smoking. I used to smoke. I used to chain it. I absolutely loved smoking and I gave up 25 years ago and I still resent the fact that I've given up. But it was a really stupid thing to do and it made the house stink.

Ben: The car that we did end up buying was definitely owned by a smoker before, a company car. That will linger with us.

I think we should round things off here. Lovely to catch up with you.

Robert: Sorry, yes. Cut me right down.

Ben: No, I'm not going to cut you right down, I'm afraid. This is long form. I just want to say, well done. Keep up the good work. This sort of thing is really, really important.