

Business, Energy and Industrial Strategy Committee

Oral evidence: Electric vehicles: developing the market and infrastructure, HC 383

Tuesday 22 May 2018

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Members present: Rachel Reeves (Chair); Vernon Coaker; Drew Hendry; Stephen Kerr; Peter Kyle; Albert Owen; Mark Pawsey; Antoinette Sandbach; Anna Turley.

Questions 280 - 365

Witnesses

I: Gareth Dunsmore, Electric Vehicle Director, Nissan Europe; Ian Robertson, Member of the Board of Management, BMW AG, BMW; Mike Kerslake, Technical Manager, BYD UK; Tony Walker, Managing Director, Toyota Motor Europe.

Examination of Witnesses

Witnesses: Gareth Dunsmore, Ian Robertson, Mike Kerslake and Tony Walker.

Q280 **Chair:** Thank you very much to the four of you for coming to give evidence today. This is our penultimate evidence session on electric vehicles before we hear evidence from Ministers, so we are very grateful to you for sparing the time this morning. We have a number of questions and there will be a minute's silence at 11.30, which we will observe; we will get under way and if we are still going at 11.30 we will take a moment to pause then.

Q281 **Anna Turley:** Good morning, everyone. Thank you very much for joining us. I would like to start with a generic, overall question. What are the biggest challenges for the production of electric vehicles in the UK for your sector?

Ian Robertson: I am Ian Robertson from BMW. First, this is probably the most significant change for the auto industry in its history of 100 years or so. As a result, you have multiple factors. One is the technology. The technology is developing fast right now, but would probably still be classed as being in its infancy. That is battery technology, motor technology, artificial intelligence within the vehicle and, ultimately, of course, there is this overlay of autonomous driving in there as well, which is another element for the industry.

Just as important, though, is the fact that experience from a consumer is also 100 years old, and that is not only how you drive a car but how you enjoy motoring, what is required in order to facilitate that and what the value of your car is going to be after three, six or nine years. Therefore, the consumer is probably at a certain point. I often use the phrase that a lot of people are sitting on the sidelines saying, "Is this ready for me? Is the technology at a level that I find acceptable? Are there incentives in place?" Therefore, we have a very gradual take-up of electric vehicles.

To put that into perspective, plus/minus around the world, a million or so electric vehicles were sold last year in plus/minus 100 million sales. That is despite what I would say is significant investment going into the whole field, both on the supply side and, to an extent, on the demand side. We will talk a lot about demand, I am sure, during the morning.

Tony Walker: Tony Walker from Toyota. First, I would like to say of course we are making substantial numbers of electrified vehicles in the UK. At Toyota, at Burnaston, we are making self-charging hybrid electric vehicles; 70% of the Auris production is there. At our Deeside engine plant, we are making the modified internal combustion engine that goes in self-charging hybrid electric vehicles and 70% of the production there is for that type of engine. I should also say the majority of those engines are exported to be put in cars made in Turkey, but many of which then come back.



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At Toyota, we are investing in the full range of electrified vehicles. Hybrid electric vehicles started with the Prius more than 20 years ago, and we have continued to develop that technology. We are now on the fourth generation of the hybrid powertrain, with a much smaller and lighter battery, with higher power density in the motors, the battery and in the control system as well. We think all types of electrified vehicles have a place going forward: the self-charging hybrid electric vehicles we have now, plug-in hybrid electric vehicles, battery electric vehicles and hydrogen fuel cell electric vehicles. Toyota is working to bring all those to the market. Already we have hydrogen vehicles in small numbers in the UK.

Q282 Anna Turley: That is very helpful background, but just going back to my question, the key thing for us really is about the challenges and what the barriers are for you. Is there anything you can tell us about whether you will be going further or whether you could be going faster? What are the obstacles you currently face?

Tony Walker: I want to say again that we are making some in the UK already. If you are talking about making vehicles and powertrains in the UK, assembling vehicles is not so difficult, to be honest. Vehicle plants we can do in the UK, but the powertrain component is very difficult. It is a huge challenge to change over from a production base that makes many internal combustion engines to be able to make batteries and electric motors in this country. In terms of the volume in this country, the vehicle plants in this country are not enough to require that sort of investment, so the majority would have to be exported, which means we would have to compete against countries that are already far ahead, in particular China. It is very difficult. I am not a battery expert, but my understanding is that already it is a bit late for the first generation of batteries, so we are looking at what we could compete for the next generation.

In summary, it is a big challenge for the powertrain components, and there is not enough volume in this country from the vehicle plants. The majority of production would have to be exported and we would have to compete. We are not a low-cost country and it would be a big challenge.

Gareth Dunsmore: Gareth Dunsmore from Nissan Europe. I run the electric vehicles team. Maybe we are not a low-cost country, but I certainly think we are a high-skill country. The Nissan Leaf now has its fourth generation of battery technology in the product, three of which have been manufactured in Sunderland at our plant there. What we have learned through that is, yes, there are challenges. One of those challenges is the scale of it, but as countries like Norway, Holland, Austria and Portugal all start to see rapid electrification, that is helping our manufacturing base produce these vehicles and produce them at more and more competitive levels. We produce the Leaf itself on the same line as a Qashqai, so in terms of the manufacturing of an electric vehicle there is not really the challenge there. Upstream, for sure, challenging



our supply chain and making sure we are getting the right cost improvements is definitely something that has improved greatly. For instance, we are giving longer range with our fourth generation of battery, but at a similar price to the first vehicle that we introduced. All of that evolution and that technological knowhow and scale is helping keep the cost low as we deliver the customers more.

To broaden that out in terms of barriers from a customer perspective, certainly the first barrier is perception and education on what is possible with an electric vehicle. I guess most of us here grew up in Britain and my experience of an electric vehicle when I was young was a milkfloat. Unfortunately, when we go out there and ask our customers who have not taken that step to electrification, it is because of lots of falsehoods. We need to work quite hard and we are working quite hard at Nissan to make sure we are continuing to educate our network and our customer base of the benefits of electrification. Behind that, of course, from a manufacturing perspective, as I said, the supply chain and continuing to reduce the battery cost.

In the long term, as we are looking here to 2040, for sure more evolutions of battery investment will be needed and we will have to see what comes from that, but we are ready to meet those challenges.

Mike Kerslake: Mike Kerslake from BYD UK. Our perspective is probably rather different. The parent company, the Chinese-based BYD, is a little over 20 years old. It started as a battery developer, so it does not really have a vested interest or legacy investment in non-battery electric vehicles, so we are very keen to move forward as rapidly as we can.

In terms of barriers, we have already established much bigger production volumes in China than much of the rest of the world. With a very strong home market behind us, we are in a good place to bring those technologies into other countries. Our preferred path in the UK has been through partnerships with UK companies. Our focus is the heavy duty vehicle sector much more than the car sector. Maybe at some point in the future we can look at that, but the focus in the near to medium term is buses and then expansion into other industrial, heavy duty vehicles rather than the private car sector.

We have already established volume in China building those vehicles and our route to market at the moment in the UK is our partnership with Alexander Dennis in Falkirk, to assemble buses for us, and we have opened an assembly plant in Hungary, which will be focused on most of the rest of Europe. We may be building chassis there to bring to the UK under the Alexander Dennis partnership.

In terms of barriers on the manufacturing side, it is probably finding the right partners to work with in the UK. It would be a substantial step to start manufacturing in the UK as an independent business, but we have found it a really helpful route, working with Alexander Dennis, to give us a way of getting into a market that they know much better than we do



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and to use their local labour to, in fact, probably contribute more than 50% of the total labour to the product.

Q283 **Chair:** I wonder how easy it is going to be to ramp up the production, not just for the UK in 2040 but for the other markets, perhaps, Gareth, that you have mentioned this morning. How big a challenge will it be for you at Nissan to produce more electric vehicles and phase out the others?

Gareth Dunsmore: That is a very good question. The first thing is about understanding and trying to predict what will happen to the different markets. Not everyone will move at the same speed, which for a global business creates significant challenges, but also opportunities. We have a footprint in the US, Japan and here in the UK, in Sunderland, of building batteries and building the Nissan Leaf and, indeed, we build the E-NV200, our electric van, in Spain. That gives us a certain amount of flexibility: as one market steps ahead we can shift and move focus towards selling in those markets.

We have now had eight years of experience of manufacturing electric vehicles and that gives us a lot of ability to flex and to grow. We do not see the demand being a limit on what we can produce. As markets grow, we certainly want to be able to step up to meet that demand and to start introducing a broader range of electric vehicles as well to meet that demand. Not everyone is going to want a C-segment mass-produced electric vehicle, electric van or family vehicle. We need to go beyond there to look after other customers' needs as well.

Q284 **Chair:** In terms of your role in stimulating demand for electric vehicles—we will come on to the role of others in stimulating that demand—do you see it, Gareth, as being mainly about ensuring that there is a wide range of vehicles so people have the choice that they want?

Gareth Dunsmore: No, it is much more holistic than that. We really look at it as an ecosystem. I mentioned education a minute ago. We over-invest, from an advertising perspective and a training perspective, in our network and in our field forces on electric vehicles, because we believe it is the right decision and the future of mobility here in Europe. The first part is investment in education and training.

The second part is about delivering a consistent focus on supporting customers with their charging needs, whether that is the €50 million we have invested in highway infrastructure across Europe, much of which has been put in here, or whether it is supporting customers with charging at home. A vast majority of our customers—about 80%—charge overnight rather than as they are moving around, because their daily driving distance is way below that which our electric vehicles can support them with. It is also going beyond, to try to look at the broader impact of producing electric vehicles and the reuse of the batteries that are in the vehicles and setting up second life battery facilities, so we can put batteries into people's homes or into business. Really trying to look at the broader picture is our focus.



Q285 **Chair:** We will come on to some of those issues. I will come to others in a minute, but, Gareth, you mentioned the targets of Norway and, as a Select Committee, we went to Oslo back in April to look at what is happening there. Obviously, their targets are more ambitious, as are the targets in the Netherlands, Austria and other countries that you mentioned. Do you think that the target here of 2040 is the right target, or do you think a different one, more similar to some of those other countries you mentioned, would be more appropriate?

Gareth Dunsmore: First, it is not our job as a manufacturer to set the targets, but we are there to listen and to respond to those, and we are absolutely ready to respond to those. All I would say to help the question is that in Norway, at 2025, we are already a long way to being able to achieve that. In fact, nearly 50% of Nissan's volume in that market is electric versus an industry average of 20%. We are ready to ramp up and meet demand, but what we need is a clear pathway to that. Norway has always been very good at setting out this vision and setting out the steps on infrastructure, on incentives, hard and soft—monetary and those that make customers feel the move to electrification is easier—and it has been very open and transparent with us. Whatever the target is—and here we are discussing 2040—as long as there is a pathway to that we are ready to work with you to deliver it.

Q286 **Chair:** Where would you say we are within the pack? Are we at the head of the pack or are we laggards? Where are we? Obviously everyone talks about Norway—they are the most ambitious with 2025—but where do we sit?

Gareth Dunsmore: I am British, so maybe I will give a slightly rose-tinted-spectacles view on this. I live now outside; I am still employed by Nissan Great Britain. When I look at all of the countries across Europe, clearly everyone references Norway as being ahead and it is too easy to just focus on them. The likes of the Netherlands are certainly at the forefront of driving towards this. We sit, perhaps, for me, a step below that tier, partly because of the proposed target of 2040 but also partly because the choice needed in a very sophisticated mobility market here is broader, and there are not that many choices here that satisfy our customers in the UK. That is one of the things that competition will change. We perhaps sit in that second tier with the likes of Germany and, for me, that gives us a massive opportunity in Britain to step up and to start leading the way in the future. Whether we take that is part of what this road map will help decide.

Q287 **Chair:** That is helpful. You said something about milestones as we move towards 2040 or whatever that target is of phasing out. Do you think we need clearer milestones—that we need to get to a certain proportion by 2025 or 2030—to help the industry get there?

Gareth Dunsmore: As an industry, and speaking more broadly, we would always welcome clarity, and clear milestones of what is going to happen through to the transition in 2040 can be of use. There is no point



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waiting until 2039 and there suddenly being a dramatic impact. I do believe if we have a staged transition towards that, we will have the ability to generate commerce and generate business in a positive way rather than it being a challenge for the industry.

On the other side, we have to bring customers with us. We cannot be looking at this with a stick approach. This has to be putting in place the right incentives, the right infrastructure and the right vehicle choice, as manufacturers, to help customers make a choice to move to what we believe is a better form of mobility for the future.

Q288 Chair: Can I ask you, Tony, if the 2040 target was tightened to limit new car sales to those that can travel at least 50 miles using only electric power, for example, how would that affect your UK activities? There is a debate going on in Westminster Hall at the moment about job losses in the automotive sector and it is something that we are very mindful of. We want to be at the cutting edge of new technologies, but unlike Norway we have a big car manufacturing sector that Governments of all colours have always wanted to support. You are a big car manufacturer in this country; how would a change in those targets affect your business?

Tony Walker: The self-charging hybrid vehicles that we make are not able to achieve 50 miles continuous as an electric vehicle in zero-emission mode. To achieve that, you would have to use the technology that we have in a plug-in hybrid, which is a more expensive battery. We believe that would be a big challenge for affordability of the product. This is not a sales pitch, but you can now buy a Yaris Hybrid from £16,500, which is extremely competitive. Toyota has invested heavily in the UK to produce hybrid vehicles and hybrid engines, so that criterion would make the vehicles we make in the UK currently unsaleable in the UK. Between now and then, there will, of course, be further generations of engine and vehicle. For us to win investment in those coming generations, which would be necessary for the factories to continue in production, would be very difficult in a country that decided that those vehicles and engines would become unsaleable.

Q289 Chair: The issue for you is not so much when the target is—whether it is 2040 or earlier—but what that target includes.

Tony Walker: Yes. It should be technology-neutral. Self-driving hybrid electric vehicles are contributing to very low levels of emissions today and will continue to play a part, as part of a total vehicle mix and, in particular, contributing to affordability.

Q290 Chair: Okay, but you do not want to see that 2040 target being tightened so it is only zero emissions.

Tony Walker: That is right.

Q291 Chair: In terms of the target itself, 2040, do you think that is the right target, or do you think that should be brought sooner or pushed back?



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Tony Walker: It is a challenging target. Toyota has a 2050 target, as it happens, for 90% reduction of emissions versus 2010 levels, on a global base. The timing is not so much the issue. For us, the issue we would be raising is not timing. The issue we would be raising is that the targets should be such that hybrid electric vehicles can continue to be a part of the mix.

Q292 **Chair:** I am aware that others want to come in, so I will just ask Ian and Mike what they think of the 2040 target and whether you think there need to be interim steps.

Ian Robertson: From our own experience, we produced the first battery electric vehicle in 2013. We sold 100,000 electric cars last year in total sales of around 2.5 million, so we have a pretty good understanding of how our customers are responding to it. At the moment, that involves some nine models. By 2025, there will be 25 models, half of which will be full battery electric and the other half will be plug-in hybrids. As Tony said, you need a mix of vehicles here and a mix of technologies to achieve a result.

If you look at the analysis that says that the majority of customers do not travel more than 25 kilometres in and 25 kilometres out every day, then you can take a 50-kilometre range as probably the answer to the majority, 90-plus per cent, of all journeys on zero emissions. As a manufacturer, we are heavily invested in all these future technologies, but at the same time, because of the changes at a different pace all around the world, we need the flexibility too. Our structures will have vehicles capable of combustion engines, plug-in hybrids and battery electrics all on the same structure, because the answer to that is we do not know which countries and which customers will move at the same pace.

To answer your question, a zero-emission environment in 2040 for the majority of customers is probably a reachable target, but it is against the backdrop of those customers who need to have a 500-mile drive today having the ability to do so. Rather than taking a certain technology step that says we will have no combustion engines, let us go for the target, which is the one I think we all agree with, which is a very low-emission environment and, for the majority of customers, a zero-emission environment.

Q293 **Chair:** What do you think about the 2040 target?

Ian Robertson: It is possible.

Q294 **Chair:** Do you think it could be brought forward?

Ian Robertson: It would be difficult to bring that forward, given the technology road map. It is a seven-year cycle, so you are only a cycle away from cars that will be sold in 2030, which are being designed today.



Mike Kerslake: BYD is not active in the car and van sector at the moment in the UK, so I do not want to say too much about that. I would say, though, that the heavy duty sector needs to be factored in and, within that, recognition that some parts of the heavy duty sector are very ripe for going zero emissions, particularly city buses; other parts are really challenging, such as long-haul trucks. We need, perhaps, a little broadening of the boundaries in a sensible, progressive way.

Q295 **Mark Pawsey:** Tony, you introduced us to a term I do not think we have heard before, which is the “self-charging electric”. We understand exactly what you mean, but that does not do a great deal in terms of the overall emissions picture. It means you can control emissions in the urban environment, but we are still going to be generating emissions elsewhere. Do you think that when we look back on this era, maybe in 30 or 40 years’ time, we will see the hybrid as a short-term fix to get us to do something? Is the long-term future not really in fully battery electric?

Tony Walker: No. People talk about hybrid as though it is a so-called “transitional” technology. We do not think so. We think it was a breakthrough technology and it is continuing to evolve and hybrids are very low-emission.

Q296 **Mark Pawsey:** But is there not an inherent problem with them, which is that you have two powertrains in the one vehicle? You have the internal combustion engine and the battery driving the wheels, so why is it not just a transitional phase? Why are we not going to ditch that technology and, as battery technology moves forward, find that it will then become a thing of the past?

Tony Walker: Because, as far as we know today, battery is going to continue to be expensive. By having a low-cost battery and a petrol engine that works together with the electric motors, we end up with a cost-effective and low-emission vehicle that is affordable, convenient, avoids anxieties and that should remain a part of the mix. We do expect that the majority of the mix will be battery electric, we do expect there will be fuel cell, we do expect there will be plug-in hybrids, but those all come at a price.

Q297 **Mark Pawsey:** Mr Dunsmore, if Mr Walker is right, why are you not doing the same thing?

Gareth Dunsmore: In Europe at the moment, when we launched the Nissan Leaf we really wanted to take a step forward. It is a step forward towards something we passionately believe in, which is zero-emissions mobility, and the other technologies away from fuel cell vehicles are technologies that still produce emissions, as you very eloquently explained. There is a difference.

If we look at Nissan’s global footprint, we do have series hybrid vehicles on sale and there is really good customer acceptance of them. One thing they do, from talking to the customers who have chosen our series hybrid over a battery electric vehicle, is act as an easier first step for them to



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take, so I can understand that being a part of the suite of technologies to move us through towards what we hope will be a zero-emissions mobility future.

Q298 **Mark Pawsey:** Do you see self-charging electrics just as a stopgap?

Gareth Dunsmore: I would not put it quite that way. It is a fantastic technology that helps people move a step further away from what they have been driving for 100 years. If you think of that, we are not 100 years old, but we all have a heritage of driving petrol and diesel vehicles. A hybrid vehicle certainly helps many customers take that first step towards a more environmentally friendly way of mobility and introduces them to the benefits of that. Single-mindedly, I am focused on selling zero-emissions vehicles within Nissan here in Europe and we do not put the other vehicles on sale at this moment.

Q299 **Mark Pawsey:** Mr Robertson, you offer both, so what is your prediction for the future?

Ian Robertson: If you look at the sales here in the UK, we sold roughly 15,000 electric vehicles last year. Around 1,000 were full battery electric and 14,000 were plug-in hybrids. Those plug-in hybrids today have a range of somewhere between 35 and 45 kilometres.

Q300 **Mark Pawsey:** What do you think the mix will be in 20 or 40 years' time?

Ian Robertson: There are a number of factors here. Tony explained the competitiveness of a battery vehicle and the need for a broad spread. We have an i3, which is a full battery electric vehicle, designed from the ground up to do exactly that, but it has a price point as a result, and of course that is outside of some of the price elasticity that customers could aspire to. We are a premium manufacturer with relatively more expensive cars than others. For us, the plug-in hybrid technology, rather than the other hybrid technology, is the step that we are going into right now. The majority of our cars, as we develop them now, will have this plug-in hybrid technology, and there will be these other ones, which are the full battery electric ones. It is difficult to say for how long that transition takes place and, ultimately, I still think there is a role for those vehicles to play in a much lower emission environment.

Q301 **Mark Pawsey:** Would you be arguing that the self-charging electric will be taking a smaller share of the market in 20 years' time than would be the case today?

Ian Robertson: We are not manufacturing self-charging vehicles any more. We have gone through that phase and are in the plug-in phase. Part of our philosophy with the customer is that we also want them to get used to plugging them in. That then, of course, brings with it all the new challenges of infrastructure, which they have to become accustomed to and comfortable with in order to take the step.



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Q302 **Peter Kyle:** Just to quickly follow up on that, Ian Robertson, you said that the road map and the cycle in the British market meant that the 2040 target is achievable. Is the cycle and road map different in Britain than it is in Norway and some of the other countries that have more advanced targets?

Ian Robertson: No. First, the car development cycle is roughly the same around the world. It currently sits at seven years, it might be six years, but it is of that sort of order. You have visited Norway. You have a very extensive demand-side motivation going on there, but there is consistency. As a result, they are sitting, at the moment, at about 25% battery electric and another 25% of plug-in hybrids, and our sales there are representative of that.

Q303 **Peter Kyle:** What you are suggesting is that policy follows the manufacturers' cycle. It does not follow what is in the best interests of the British market, what consumer desire is or what is best for the environment, which is driving this from a policy perspective.

Ian Robertson: What I am saying is there is supply-side and demand-side motivation. We are responsible for the supply side and, to an extent, part of the demand side, from a marketing point of view, but those things need to be in balance.

The Netherlands was mentioned; the Netherlands supported plug-in hybrids until January of last year, and a very large proportion of the Dutch sales were plug-in hybrids. That ceased in January last year and the market collapsed. It was much too early to take away a demand-side incentive there. As a result, the Dutch market has slipped backwards substantially and, by the way, gone largely into full combustion engines.

Q304 **Peter Kyle:** What is driving my questioning is the fact that one of the other noticeable things about Norway, which does come up for very obvious reasons, is that there is no manufacturing sector in Norway. The question is: is it the manufacturing sector that is holding back the transition itself?

Ian Robertson: I would say not. As an industry and as BMW, we are fully committed in the investment and the new model architectures that give the ability for a customer to choose whether they want full electric, plug-in hybrid or combustion engine. We sell cars consistently around the world, i.e. we design cars for the world; we do not design cars for the UK market as opposed to the European market and so on. Around the world that is the consistent picture we see.

Q305 **Peter Kyle:** You are not marketing them equally though, are you?

Ian Robertson: Absolutely.

Q306 **Peter Kyle:** You are spending the same investment on each model.

Ian Robertson: If you look at when we were launching the i3, it was around the time of the London Olympics and, as one of the other



speakers said, we were disproportionate in our investment in the i3 marketing, as we were in America and in China. There are other factors that come into play. Some countries are more in tune with this than others.

Q307 Peter Kyle: Tony Walker, as we move towards the Road to Zero strategy, what commitment would you like to see in there, other than the headline target?

Tony Walker: Do you mean as in terms of what government policy should be applied?

Peter Kyle: Exactly.

Tony Walker: There are various policies available. Fleet average emissions is a policy that is often adopted in countries; that could be a possible target. Another possible target is percentage of sales. Another possible target is electrified option in every model. There are those sorts of targets.

We raised before the idea of it being time-based or urban cycle-based. There are technical difficulties with doing that, because the full hybrid that operates as an electric vehicle—and I do have to distinguish that it is different from mild hybrid; it is a 650-volt hybrid that operates as an electric vehicle—can operate, the majority of the time, in urban environments in zero-emission mode. The problem is long periods of continuous.

Q308 Peter Kyle: This is a question to all of you, whichever one of you feels you would like to answer it. As with many different areas of policy-making, it does not fit within one particular Department. For EV policy, you have BEIS, DfT, OLEV, MHCLG and the Treasury. Do any of you have a sense or an experience that shows that either Government are joined up on this or that there are barriers to this because of the fact that different Departments are not communicating with each other?

Mike Kerslake: The bit where perhaps there is an opportunity to improve connection is the air quality aspect as opposed to the carbon-saving aspect. There is also a thing around energy supply diversity, which it helps enable, but connecting the carbon strategy, which is the zero, with an air quality strategy is an opportunity to perhaps tighten up some links.

Gareth Dunsmore: One area to focus on from a positive perspective is where we have got it right in Britain. There is the Go Ultra Low activity in the four cities across the UK, where we have put in investment, from a government perspective, and the cities have taken that on to build a holistic ecosystem of activity, whether it is charging infrastructure, education centres like the one in Milton Keynes, or bus lane travel, to try to incentivise people in those cities to move towards electrification. That needs to be repeated and we can continue to use that best practice. For sure, there are always learnings. Put those learnings into place and



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continue with those. If we can get to a space where, wherever you park, whenever you are just leaving your car and it is not doing anything, you start to see charging infrastructure around you, it starts to be normalised, then the discussion in 2040 of whether it is a challenge to move to electrification and technology that might be needed might be a moot point, because customer demand will start to take over, because the chicken-and-egg issue of infrastructure versus the product and whether to move disappears.

Q309 Peter Kyle: You have mentioned that twice now and that is my experience. As a Committee, we went to Milton Keynes to the Electric Vehicle Experience Centre and we drove a variety of cars. I have to say I was a bit sceptical about the i3 when I first saw it, but then, as the Committee will attest, afterwards I had the zeal of a convert. If I lose the next election, I am going to be a salesperson.

My point has always been that the customer experience, when you do experience it, is transformative and you no longer ask questions about charging points and range anxiety. You experience the benefits that go beyond the limitations of a combustion vehicle. It surprises me that you, as an industry, are not speaking with the same sense of exhilaration that people I know who have experienced the cars have.

Ian Robertson: You raise a very good point. One thing about the i3 is that, year over year, the sales go up.

Peter Kyle: I was not inviting you to do an advert; I have done that for you.

Ian Robertson: It would suggest that more people are becoming comfortable with the proposition.

Q310 Peter Kyle: My point is that consumers are going to overtake your ambition for your own product.

Ian Robertson: If they are, that is great and, as I said, we have taken a decision, from the strategy point of view, that the cars will be capable of each of those.

The infrastructure is quite an interesting one. We did some early experiments in Japan, where customers would drive their car to the limit of where there were charging facilities. As a company, we invested in some charging facilities on some of the outer areas of Tokyo. They were virtually not used, but the customers drove further because they felt more comfortable that, should they need to, they could.

One of the things that we have designed, as a company, in recent years—and it is not a primary part of our business—is a lamppost. We took a lamppost, which is a 30-foot piece of steel, we put LED lamps on the top of it and a charging point in the bottom of it. The cost of that lamppost is somewhere around, depending on how sophisticated you want it to be, €1,000 to €2,000, so it is not that expensive. The LED saving on



electricity is almost sufficient that you have enough electricity left over, and you could charge relatively inexpensively at the bottom. I am with one of the other speakers here who said, from a government point of view, it would be good in town planning and it would be good in the development of new houses to put some of the infrastructure into the regulations, so that when streets are put up in future they have charging infrastructure; when houses are built in the future, they have charging points in them. That makes the difference.

There are, of course, restrictions in big urban areas, because a lot of people live in high-rise apartments. If they are lucky enough to have a parking space, it is extremely limited, and so on. We have to think through those things, but the whole essence of making the customer feel more comfortable and enjoy the things that they experience is part of this journey. At the moment, the large proportion of customers are not quite ready to join the next step. How long that takes is a rather open-ended question. Demand-side measures can improve it, but, as I mentioned with the consistency of the Netherlands, as soon as it goes away then the demand goes away, so we are in a collective discussion here, in my view.

Tony Walker: Another thing the Government are doing right is keeping technology neutrality between electric charging and hydrogen charging infrastructure. There are only nine hydrogen charging points so far, but there is a road map to 65, though not yet financial commitment, but we very much appreciate that.

The other point is we are excited. We are planning to bring many battery electric vehicles to market and we are planning to have further hydrogen fuel cell electric vehicles. The point we are raising is that every car, from the biggest to the smallest, costing £10,000 or £250,000, has to be able to do 50 miles continuous, which we think is not wise. It is a bit reckless, to be honest, and it will price the ordinary customer out of the market. All you are saying is that somehow you know that battery costs will come down, but we do not. How come you know that and we do not? It is too academic and not so practical on battery cost, to be honest.

Q311 **Drew Hendry:** Perhaps this question is not one for Gareth's rose-tinted spectacles, but how does the investment environment in the UK compare with opportunities internationally?

Gareth Dunsmore: We have just launched a new brand in the UK called Nissan Energy Solar. The reason we have launched Nissan Solar here in the UK, where you can buy solar panels and a second life battery in your home to store that renewable energy, is because there is a market. There is a place to invest here and a positivity about Britain that can still generate wealth over the mid-term, so we are very focused on the UK. Obviously, we have our plant in Sunderland, we are building more electric vehicles than ever before up in Sunderland and will continue to do so, to meet not just British demand for electric vehicles but European demand.



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Of course, other markets in Europe are interesting as well. We build our electric van in our factory in Barcelona, but the batteries for that come from here in the UK. There is a big positivity there and it is not rose-tinted spectacles; it is business facts of what we can do and the innovation that we can deliver here.

Indeed, on the lamppost charging that was discussed, we are starting to talk to a company here in Britain that puts conversions in on lampposts for £350. The pace of change starts to take over and a lot of it can be driven out of Britain. You have institutions as well like the Faraday Institute; there are people who are trying to move this forward, but they need the right support. They need not just investment but the right structure to go forward and the right consistency of measures to have confidence that it is worth going into.

Q312 Drew Hendry: The specific question was about how it compares.

Ian Robertson: One of the challenges here is the volume of the UK industry versus the volume of maybe continental Europe, China or the United States. There is a lot of discussion about batteries being made here. Cell manufacturing, which is the core of it, is a very high-volume business; you are talking about millions of cells per day and per week coming out. Europe is somewhat lagging; I do not specifically say the UK, but Europe is lagging here. Most of the battery cells at the moment are coming from south-east Asia; they are either coming from Korea or from southern China.

Therefore, we are at a point in time where there are opportunities on that front, but they will be determined, of course, by the amount of volume that can be taken from a factory that probably has a relatively short life, because the technology is changing too. The investment to make a decision has to be on a very high volume, early build rather than one that could take 10 or 15 years, because solid states could be available in that period and solid states would transform.

Q313 Drew Hendry: Basically, what you are saying is that the opportunities in the UK are roughly equal to the rest of Europe; is that right?

Ian Robertson: There are opportunities in the UK, but from a volume point of view there are more cars being produced on mainland Europe.

Q314 Drew Hendry: The question is, in terms of that investment opportunity, what the comparisons are.

Tony Walker: The UK is a good place to make cars and vehicles and we have advantages: our labour relations are very good and our labour flexibility is very good. We have historically been viewed as a very stable country politically; that is another discussion. We have a great record of skills, developing skills and embracing new skills. Those sorts of things are plus points. We have a good reputation elsewhere. I have studied competitiveness and the relationship between universities and business is good. We are good at creating innovation. We have some trouble



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sometimes getting from the university into commercialisation, and that is where the Faraday Challenge and the Advanced Propulsion Centre, which is joint industry and Government funded, have been set up, to try to bridge that so-called “valley of death” from the university to commercialisation. We have a lot of things going for us, but as Ian said, the very big point is that we do not have a big enough market, so the production side of the UK’s automotive industry is totally reliant on exports.

Q315 Drew Hendry: We will come to the market in a second, but I want to make sure we hear from Mike. I was specifically asking about the comparison. I have heard quite a lot about the environment here and how positive it can be, but it was really the comparison. I do not think I have heard much of that. Maybe Mike can help.

Mike Kerslake: There are three elements. There is selling vehicles into the market, which is really foundationally important in order to move manufacturing into the territory. There is the R&D environment, which we see as the first step towards a manufacturing base, so we have put more focus on exploring R&D links with UK technology developers than exploring moving our manufacturing capability from China to Europe. I say Europe, not necessarily the UK, because, like the other speakers, we see Europe as a region, at the moment including the UK.

Strong R&D links are really helpful. We are just about to embark on an Innovate UK-funded partnership with some UK companies and we have done some small jobs before that, which were unfunded, externally. With those things in place, it sets a much more fertile environment for then starting to look at moving manufacturing here.

The first step on the manufacturing side is the kind of thing we have done with Alexander Dennis of finding a partner company that already provides the ability to do some of the things we want to do. The big step beyond that might be things like battery manufacturing. That is some way out yet. The battery manufacturing strategy is a global thing and that is constantly under review, but we would need to see a much bigger European battery market, for the reasons stated earlier, in order to set up a battery plant here.

Q316 Drew Hendry: Thank you for that. This is quite a meaty subject and we could ask long questions on this, but let me ask you two quick ones, seeking a quick answer, if we can. Has there been anything that has caused you to consider holding back investment in UK facilities?

Ian Robertson: There is a broader question on this. We have investments here in Rolls-Royce and Mini and we have our very large engine factory in the Midlands supplying engines to BMW plants in many parts of the world. The current political situation is something that is clearly on everyone’s agenda.

Q317 Drew Hendry: Are you talking about Brexit?



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Ian Robertson: Correct. For us, we were at a point in the investment cycle where we had made decisions that then have this seven-year horizon, but clearly as we get into the next phases of investment we need to understand what the political relationship with Europe is going to be. To answer your question, as of right now, there is nothing on the political front that has stopped us doing something.

Having said all that, we manufacture in 14 countries around the world in 30 manufacturing plants. We always—and I think this is quite healthy—put new work to compete between several of our own plants. Therefore, as we go forward and particularly with the change of technology we are seeing, what happens in various countries around the world from the technological adoption also becomes part of elements of our investment decisions.

Q318 **Drew Hendry:** Does anybody else want to answer that one, about anything holding you back?

Mike Kerslake: We have been very successful in the bus market with our Alexander Dennis relationship. We have talked to other UK companies about somewhat similar relationships and have not gone forward with anything. That has really been because of a lack of visible market growth in electric vehicles in those other sectors.

Tony Walker: We have made investment decisions in the very recent past and are investing heavily now to start production of a new car at Burnaston, but I would like to confirm what Ian said. For the long-term future investment decisions, free and frictionless trade and also, for this subject, being able to sell what we make in this country will be critical issues.

I would also like to add that I still chair part of the Automotive Council. We are responsible for competitiveness. We published a competitiveness report. Those things that I said were positive are the factors in that competitiveness report in which we are relatively strong compared with both a global basket and a European basket. If I did not say that properly earlier, I am sorry. Those are our relative strengths. I can tell you the relative weaknesses from that report another time.

Q319 **Drew Hendry:** Finally, because we need to move on, how important are national incentives to purchase electric vehicles and in the installation of electric charging infrastructure in your decisions in terms of where to invest in production? May we have a single sentence, if you could, please?

Gareth Dunsmore: If you look at a country like Spain, which starts and stops with incentives, it is very challenging, from a production perspective, to manage the build and the flow of vehicles into that country. It is an absolutely critical pathway through to 2040. We need clarity on what those incentives will be for private individuals and for businesses as well.



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Ian Robertson: I agree wholeheartedly with that. Norway has the most comprehensive incentives. Guess what? They have the highest penetration of electric vehicles in the world right now.

Q320 **Drew Hendry:** Would you both agree, Mike and Tony?

Tony Walker: Yes.

Mike Kerslake: Yes.

Q321 **Mark Pawsey:** Gentlemen, as manufacturers, you are very important, but your industry also consists of the supply chain. We are interested in what opportunities exist within the supply chain, but there is an automotive sector target of getting local content from 44% to 50%. Is that achievable? Is the supply chain flexible enough? Are there particular components within the supply chain that UK manufacturers should be focusing on?

Ian Robertson: First, there is somewhat of a misunderstanding here. The definition of 44% is based on the postal code of the last supplier into a particular manufacturing site for production of cars. If you look at the local content that is behind that, which could be coming from plants primarily in Europe but also from the rest of the world, the figure of local content by WTO standards drops to around 20%. Therefore, the stretch to 50% is an extremely challenging one. Nothing is impossible in this world, but that is a very difficult one.

If I look back on the last few decades in this country, you have seen the resurgence of car manufacturing here, primarily being driven by overseas investors—the likes of us, Toyota, Nissan and maybe BYD. What we have not seen is a similar development in the R&D and supply structure, so many of the things that this country used to do are no longer done here. There are some exceptions, but even those OEMs bring a lot of their components in from a European or global supply base.

The change in technology and a change in position of the vehicle does bring some chances and it does bring some chances to continue the growth of the industry here, when there will be new components or new types of components being required. That is something that the Automotive Council is very engaged in. That is something where the improvement in the existing volume of local parts can go up, but to go right back to your question, getting to 50% is going to be extremely challenging.

Q322 **Mark Pawsey:** Are there particular components that we should focus on and are the UK-based component suppliers sufficiently flexible? Are they able to adapt to the changing manufacturing environment?

Ian Robertson: No. From the definition of “UK component manufacturing” you would tend to say that the majority of them are international with local plants here and therefore their R&D is something either being done in Japan, Germany, France or America. Back to the



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components that are now required in a new energy vehicle, yes, there are some chances there.

- Q323 **Mark Pawsey:** Tony, you said that on batteries we are already rather late. If we put batteries to one side, are there other components where we could see an advantage and opportunity?

Tony Walker: I agree with Ian's comments. It is very challenging, and I would agree with his figures: that the 43% is, in reality, nearer 20%. I did not know the postcode, but anyway it is the invoice location, which has a postcode on it. It is a huge, huge challenge.

Another point is, for a company like us, there are a lot of common parts in cars. Toyota has nine plants throughout Europe. If you are going to have the same part in a car made in Turkey and a car made in the UK, it is a big challenge to make it in the UK and have the logistics cost to Turkey versus make it in Turkey and have the logistics cost to the UK. We have to be extremely productive and we are productive.

I am not sure whether you are asking the right people. Do you not need to ask the big suppliers? Do you not need to ask the first-tier suppliers? Do you not need to ask Bosch and Valeo? I am not criticising anybody, but, as Ian was saying, as I understand it, when they do make the decision to come to the UK—and you should ask them, really—they often find that the second and third-tier suppliers that we have here are not up to their standard, so they bring their own second and third tier. That may be a good thing, because it would still be employing British people, but we cannot be naive about the capability of the so-called British supply base, to be honest.

- Q324 **Mark Pawsey:** Gareth, do you have same view? You have strong and close relationships with your suppliers. The supply chain is integrated. What is your assessment of the reality?

Gareth Dunsmore: We do. Apologies, Mr Pawsey, because it is a little bit out of the area of my expertise, but what I would focus on is the opportunities that the supply base has around the broader ecosystem of electric vehicles. That could be the production of the next generation of charging infrastructure, which is going to accelerate much more quickly than a seven-year vehicle cycle and gives British businesses the chance of moving from university R&D through to commercial production.

Looking at the connectivity of electric vehicles, our vehicles have been connected since 2010 and future electric vehicles will be as well, and the supply chain for what that provides you is perhaps where British business can focus more on stepping ahead and making that transition through to the long term, to 2040, rather than in the short term.

- Q325 **Mark Pawsey:** Mike, as your business sets up a plant, will you be able to source many of the components in the UK or will you be bringing them in from other sources, as other companies?



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Mike Kerslake: We are in a similar situation. Again, the focus is on the heavy duty sector rather than the light duty sector, so it is a very established tier-one global supply network for key components. BYD is a little unusual in that we are more vertically integrated than a lot of companies. We make the batteries, we make the power electronics, we make the electric machines and, for the Chinese market, we make a lot of the rest of the vehicle.

For the UK, those key core components are still made in China by our own company, so I do not think there would be an appetite to move very much on that, other than where there are innovation opportunities. This is where the R&D thing starts to play. We see the UK as being a very strong and fertile R&D environment and that opens the possibility that, as Ian was suggesting, on new, innovative component requirements that did not exist in the pre-electric era, that is the place where we could start to grow the UK manufacturing industry.

To move in and start making, say, axels—conventional technology components—when you have companies such as ZF in Germany with such a strong presence in the sectors we sell into is going to be really hard.

Q326 **Vernon Coaker:** It has been very interesting this morning. The acceptance is that we are going to an electric vehicle environment, whatever that means. It is how we get from here to the agreed policy position of where we want to end up. As Tony knows, I know Toyota well in Burnaston and the huge impact it has had there. Vehicle manufacturing in the UK contributes £77.5 billion turnover, it employs 169,000 people directly and 814,000 people indirectly through the supply chains that Mark Pawsey was just talking about.

To each of you, what planning are you doing for how we are going to move from where we are? How is your company going to survive that? Is it a threat to it? What about the investment decisions, the profits and the jobs? Do you see what I mean? This is quite a big deal. If I am a worker in Toyota in the East Midlands, or I am at BMW or BYD or Nissan, I would think, "This is great; what about my job?" What is happening with respect to the transition and the planning and where people are with all this?

Ian Robertson: It is a very good question. One of the things I said earlier is that we don't have clarity in our crystal ball of a forecast either. So we are building into all our factories the ability to make the three types: conventional; plug-in hybrids; and full-battery electrics. If a particular demand occurs, we would start to switch the volume accordingly.

If you went back two decades, most of the car plants anywhere in the world made a model of a certain derivative and that was what they made until the next model came along. We now have to have more flexibility to respond to a changing demand curve, which will be more advanced in one country and less advanced in another, with more or less consumers



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and so on. In order to protect the investments we have around the world—we still take that as a very serious issue—we have to build flexibility in, and that flexibility has to be real flexibility rather than what could be assumed flexibility. It has to work on a day-by-day, customer-by-customer basis.

Tony Walker: At the high level, we welcome the change. We are moving from being just a car-maker to becoming a mobility services provider. All the things that somebody else mentioned such as autonomous vehicles and ride-sharing have become part of Toyota's portfolio. Bringing it down to production and the guy on the shop floor, it completely boils down to us being competitive and doing the day job as we have always done. I am from the production side. It boils down to us, as always, producing the quality of what we produce today so that, as the new investment decisions come along, we can be in there for those investment decisions, doing it with high productivity, with good skills and with smooth labour relations. It boils down to all those sorts of things. What I say to the guys on the shop floor is, "Let us keep doing the day job together."

The next point is that we have to compete with other plants in Toyota around the world and, as future investment decisions come up, we will try to demonstrate that we are the place to be the source to make some of these new, apparently 10 battery electric vehicles by the mid-2020s or whatever. That is what I would say to the guys on the shop floor. We are doing fine in the UK on most things.

Gareth Dunsmore: It is not just about manufacturing but also our dealer network, our dealer partners and our R&D teams. Certainly, from an R&D perspective, the investment in autonomous vehicles and electrification, electrical engineers and software engineers is growing and is only going to grow over the next few years. We have our centre in Cranfield in Britain.

From a manufacturing perspective, just to reiterate, we build the Leaf on the same line as the Qashqai. As the Leaf grows—Ian said that earlier as well for Toyota—we have that flexibility to produce on the same line, produced by the same guys and girls that are incredibly efficient, and that is why they recently won the production of the 40 kWh Nissan Leaf, which we are producing now in Sunderland.

The final point that is sometimes missed is our dealer network—our partners; they are small businesses and big businesses all across the UK that not only need to be trained and supported with this move but also need to be supported with finding new business opportunities. Electrification and shared mobility can provide them with those opportunities, but it is an area where we need to invest and support them with the transition as well.

Ian Robertson: The issue of the dealers is an urgent one because you are going to deal with a product here that is extremely dangerous if you do not have the skill set. Dealing with high voltage can be fatal, and very



quickly. What is required in all of our manufacturing ultimately ends up with cars in the consumers' hands and the majority of the workforce in that dealer environment has to come up to a new level.

Q327 **Chair:** If you have a number of people working in a dealership, what proportion of people there would be able to service?

Ian Robertson: I am speaking on behalf of BMW and Mini. All our dealers have the capability of dealing with electrification because we sold 15,000 of them in the UK last year. But you will find that within that dealership there will be a skilled, qualified technician who will focus on those particular cars that come in. Over time, that needs to really step up.

Q328 **Chair:** That is one person out of how many, on average?

Ian Robertson: In a dealership that can be up to 100 people. There might be two, three or four of them that know how to deal with these things. You will also find, though, that most dealerships will have to have a regular skills assessment. So upskilling becomes a much more significant issue—something that has not often happened in the past. As a company, we will be pushing very hard for national accreditation, rather than just BMW accreditation, because this is where you will see a totally different skill set in an environment that, 10 years down the road, will see a mix of vehicles that has never existed before.

Q329 **Vernon Coaker:** Mike, may I try to merge a couple of the questions that I have together, and come back to the skills point? BYD is a brilliant name, by the way—Build Your Dreams. I fancy driving around a car called Build Your Dreams.

Just leaving that aside, the serious point here is for you, Mike. BYD are the biggest electric manufacturer globally. Should the three big manufacturers—massive, well-respected companies—that we have here be frightened of you? Are you coming for their market? How are they going to respond to that? Should the Government regulate how that works, or should you just let the market rip and let them respond to your competition that is coming in terms of the electric vehicles? Do you see what I mean? Should the Government interfere in that, because they are worried about transition, they are worried about workers, worried about the effect in different regions, etc, or are you coming and these guys need to respond, and actually the market works because they are frightened of what you are going to do to them and it will drive competitiveness?

Mike Kerslake: Historically, policies that are based on fear of competitors coming in have not been successful. A more positive approach would be to make this a fertile place for us to move more of our capabilities. As mentioned, our first step is starting with R&D but that sets the foundations for moving manufacturing here.

Q330 **Vernon Coaker:** You are the biggest supplier to UK buses now. You are



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clearly going to expand and develop. That is what your Chinese parent company will be saying to you. Is this an example of the market working? If this is where it is going, you are supplying electric vehicles and you have the technicians, the skill base and all of that.

Mike Kerslake: Yes, it is a good example. The way it has worked really well in the UK is in our partnership with Alexander Dennis, where most of the labour actually takes place, so our vehicles are probably more than 50% British-built, at least in terms of labour content. That has worked really well. We have at the very least preserved those jobs in Scotland but also given Alexander Dennis electric products in a product portfolio, and that is a potential launch-pad for the global expansion of their business. That is the way it ought to work, in my view.

I am a Brit and I want British industry to do well, but we cannot ignore the fact that the Chinese market and Chinese manufacturing has moved way ahead in terms of the electric vehicle and battery production. We cannot ignore that. We need to work with it rather than protect against it.

Q331 **Chair:** Mike, can I ask for your perspective as someone who works for a Chinese company? China has a target that 10% of all cars sold in China in 2019 will be zero-emission vehicles, rising to 12% in 2020. How do the Chinese Government or Chinese manufacturers regard the British 2040 target? They seem to be more ambitious, perhaps in part because of some of the challenges they have with air pollution, although that is a big challenge here and there is an Urgent Question about it in Parliament today. How do they see our targets?

Mike Kerslake: I probably cannot answer on that specific point because I do not know. What I would say, though, is that strategically there has been huge growth in the Chinese market and that cannot go on growing at the rate it has been growing. We would therefore be looking to other world markets to see growth curves that, in time, will lag behind the Chinese one but will perhaps be able to grow to similar uptake percentages in the fullness of time.

Q332 **Chair:** Does China think that it will be able to dominate the car manufacturing sector in a way that it has not done with the internal combustion engine, with the change in technology?

Mike Kerslake: I do not have any inside information on that. It seems a plausible hypothesis.

Q333 **Antoinette Sandbach:** Apart from China, which is doing very well in the commercial sector, which other countries would you say are leading the way internationally, specifically in relation to electric vehicles or low-emission or zero-emission commercial vehicles? We could bring hydrogen into that as well.

Mike Kerslake: My perspective is very UK-based so my knowledge of other global markets is a little limited. Our biggest other territory outside of China would be North America. We have had a manufacturing plant



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there. In the UK we are following a broadly similar curve but they were there perhaps eight years before us. I would probably pick out North America as being the slightly more mature market than the UK in the commercial vehicles sector. I probably could not give you a useful answer beyond that.

Q334 Antoinette Sandbach: Why have you chosen to focus on buses and not on other commercial vehicles?

Mike Kerslake: Market-readiness and, to a degree, the level of incentivisation that is there. In the UK, we have sold about as many electric buses as the rest of Europe put together and we have only really been here for two years. The rest of Europe has probably had 10 years or something. It has been a really positive growth curve for us, so that has been the justification for linking up with UK-based companies for the manufacturing side.

It is an easier market than some of the other commercial heavy duty sectors because of the drive cycle of the vehicle. It does not do as many miles per day as a long-haul truck by any means. The energy storage is therefore much more practical and the air quality benefits are concentrated in city centres where buses tend to operate. It is a sweet spot in the heavy duty sector to electrify urban buses. As I say, the UK has been the strongest market. A lot of that is London. There is currently an open OLEV funding opportunity for ultra-low emission buses, which will hopefully stimulate the rest of the UK significantly. In terms of confirmed sales so far, it has been dominated by London and, of course, TfL have more tools to control what types of vehicles are purchased than other cities.

Q335 Antoinette Sandbach: Can I ask the other car manufacturers whether you are looking at the commercial sector and why you do not seem to be focusing on the commercial sector? I am particularly interested in what Toyota said about hydrogen charging.

Gareth Dunsmore: From a last-mile delivery perspective, we are perhaps bigger, if we put electrification or diesel technology aside, in the small-van market rather than the bigger trucks. In that area, we have been producing the e-NV200 van for over four years now and the biggest market opportunity we have had is in the UK. Just behind that is Austria. There are some small strange opportunities that we have found in Vienna but the real reason for the growth in the UK is the growth in general of last-mile deliveries because everyone is moving now towards online shopping. As the Amazon generation comes through, that is a really powerful tool to say to these businesses not only, "Do you want to be able to access these cities in the future?" and, "Do you want to protect yourself from any city-based legislation that comes on top of longer-term government legislation?" but also, "Do you want to present yourselves to your customers as a sustainable business?" We have found that that has worked very strongly in the UK and that will continue to grow. As I say,



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the batteries in that vehicle are manufactured here in the UK. Austria is more about overall presenting itself.

Antoinette Sandbach: The batteries for that vehicle are manufactured here. You spoke about the fourth generation battery going into the Leaf. In terms of technology changes in the battery, how significant is that from first generation to fourth?

Gareth Dunsmore: You see that significant step in the van itself, because we never put the interim steps into the van but we are now putting the 40 kWh battery into that van. What you are getting is a real last-mile delivery range of over 200 km for a van when it is fully loaded. Sorry, I have lived in Europe too much; I mean 160 miles. Apologies for that. That is the tipping point.

Q336 **Antoinette Sandbach:** So that market does not need any government intervention; there are good reasons for that to forge ahead.

Gareth Dunsmore: It is no different in terms of perception, though. Whilst there are businesses that are willing to take that step, if you are a business and you are looking to invest, at the end of the day that investment will be in jobs for your staff and in new technologies. It is a new technology that they need to invest in, not just in the van but also in the charging infrastructure. Having the clarity of investment and structure for businesses as well as private individuals is just as important. Again, in countries where they do not have incentives for electric vans, the market is zero. There is more that we can do here as well.

Q337 **Antoinette Sandbach:** I wonder if Toyota can comment on commercial vehicles and whether you are looking at hydrogen in relation to larger vehicles.

Tony Walker: Absolutely. One of the advantages of hydrogen is that it can be used for those heavy applications. Certainly hydrogen buses are coming and are here. Hydrogen can also be used in large trucks as well. I am not an expert on trucks, sorry. If you want me to take the question away, I would have to do so. I will take the question away on trucks but I cannot answer.

Mike Kerslake: Your panel reflects companies that are active in the electric vehicle market in the UK but there is actually very little going on in the truck sector. People like Mercedes have electric vehicles. Dennis Eagle has just launched an electric refuse collection vehicle. There are things going on but it is not reflected by this panel particularly.

Q338 **Antoinette Sandbach:** Is it equally important for the UK Government to look at hydrogen infrastructure as opposed to electric infrastructure?

Ian Robertson: That is an interesting question. As a company, we have a joint development programme with Toyota on fuel cells as well. Fuel cells, of course, have a lot of advantages in that you produce zero emission and you can refuel it relatively quickly, in roughly the same time



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that you can refuel a gasoline or diesel engine. The challenge, of course, is infrastructure. It is as difficult as electrification—maybe even more difficult—because you are looking at hydrogen being produced in the first place and then ultimately stored both at a fuelling station and in the vehicle. We continue to invest in fuel cell technology but we are more heavily focused on the battery technology right now.

Q339 Antoinette Sandbach: If the UK does not develop battery manufacturing, will that affect our place in electric vehicle manufacturing going forward in the future?

Ian Robertson: The cell manufacturing is a different question to battery manufacturing. The cells are, as I say, going to be made in factories that produce millions of cells. The power electronics and the assembly of those cells into a structure that you would call a battery pack is an important part of car manufacturing here in the UK. It is a volume-driven issue.

Q340 Antoinette Sandbach: Obviously, the Government have the Faraday battery challenge out there. Does that go far enough for the UK? Is it enough for us to become a world leader, or is it a bit of a damp squib?

Ian Robertson: There is some very interesting R&D, or academic R&D, into batteries going on here in the UK from some of the universities that have a key focus on it. That should be nurtured. It is not just the car industry; it is the domestic appliance industry and the cell phone industry. There are some very good examples in the likes of Arm Holdings, which design the chips that go into all the Apple products. Batteries have been around for as long as cars have been around, but it is only in the last couple of years that they have really started to take a big step forward. You only have to look at raw materials, and the price of the raw materials is now increasing dramatically. Of course, the challenge there, and the opportunity there, is what the next generation of particularly solid state batteries is going to be. It has not been done yet. R&D, in this regard, is really fertile ground right now.

Q341 Antoinette Sandbach: If the Government are putting taxpayers' money into that, do you think the Government should have a stake in the IP?

Ian Robertson: There are many pros and cons of that discussion. The auto industry is one of the strongest IP environments of any industry. We are all producing several thousand patents every year. It probably becomes quite difficult for Governments to be a part of that.

Q342 Antoinette Sandbach: Why?

Ian Robertson: It just is not done that way.

Q343 Antoinette Sandbach: I appreciate it is not done, but do you think, if taxpayers' money is going into this R&D and there is a breakthrough, it would actually give payback to UK plc for its investment?

Ian Robertson: That is more of a political question than an industrial one.



Q344 **Antoinette Sandbach:** Very well. I do not know if the other panellists want to come in on whether they agree with the comments about the university sector and the amount of research that is going on there and whether the Faraday Challenge is enough to support that research, or whether we should be doing more.

Gareth Dunsmore: Something that can help is the way we have worked with not just the British Government but Governments across Europe and private industry on charging infrastructure in collaboration, all investing not to have a stake in it—Nissan does not have a stake in the charging infrastructure that it invested in in the UK—but to facilitate the growth of electrification. We stand by our products, we are proud of what we manufacture and we believe it will grow from there. That type of approach is the way we look at it. If that flows on to more R&D moving to university-based or collaborative work between universities and our technical centres like the one we have in Cranfield, that can be beneficial to electrification and the British economy. Learning from what we have done in the past, it seems to be quite successful so far.

Tony Walker: Without something like the Faraday Challenge, how will the supply base be part of this? We have R&D centres in different places. Toyota is not particularly engaged with APC or the Faraday Challenge but other OEMs are. That is dependent on the locations where those OEMs are doing their R&D, and some of them are doing it in this country. Without that, it could be a big challenge.

The other thing to say is about the transition for vehicle production plants. We are just taking components and assembling them. We can set up relatively simply to do electric vehicles or petrol vehicles or whatever, but for the internal combustion engine plants, in which 30,000 people are directly employed—2.5 million were made last year—it is a huge thing to change over. The production equipment required is completely different, and those are huge costs. I honestly do not know how that will go and whether it is enough. I am not absolutely sure what is addressing that.

I am answering a question you did not ask. Nobody knows if the Faraday Challenge is enough. Without that, there will be nothing for the supply base. The next subject is: what about the production plants for the powertrain side, not the vehicle side?

Q345 **Antoinette Sandbach:** Is it your assessment that Brexit is jeopardising that potential investment? If you need to do a massive investment to switch over that production capability, what is your assessment about the impact of Brexit on that?

Tony Walker: We are just at the moment that we are at right now. We are believing that something will become clearer this year. As I said before, the majority of the internal combustion engines made in this country are exported. If those cannot move freely, yes, of course there will be some impact. There must be.



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Ian Robertson: As a UK industry, we have made our position very clear. Of course we want to avoid any tariffs. However, just as importantly—maybe even more importantly—we want the free flow of goods without borders that can hinder our just-in-time logistics. All of us sitting on this side of the table in a customs environment have trusted-trader status and we ship a lot of components all around the world every single day, so we know how to do it, but the first-tier, second-tier, third and fourth-tier suppliers, some of which have never done any customs paperwork, will be in a much more challenging position. The seamless flow of goods without any of the bureaucracy of a customs border, whether it is quick movement through or a slower movement through, is one of the keys for us in this industry.

Q346 **Chair:** Ian, I have a question not on the issue of Brexit but on batteries. For the Mini, you are making the battery in Germany rather than in the UK. Why are you doing that and what would it take for the UK to win that sort of work?

Ian Robertson: That is our competence centre. All of our batteries are being made there in Bavaria right now. It is purely a volume issue. Just like we talked about dealers having the skills to make batteries, we have concentrated them in one place right now. Over time, as volume increases, that is something that can be revisited. We took the decision that we would ship the batteries in from our European plants into the Oxford plant for manufacture into cars.

Q347 **Stephen Kerr:** On end-of-life disposal, you have an obligation under the EU directive as manufacturers to take cars back. What particular challenges are there for end-of-life disposal for EVs versus petrol and diesel?

Ian Robertson: It is more of an opportunity in many respects. This is something that, as an industry, we put a lot of focus on in the last few years. There are plenty of companies out there right now using i3 batteries, for example, that they buy from us. We supply them a battery pack and it does not go into a car; it goes into a personal storage device. In Vattenfall's new farm that they have somewhere north of Cardiff, it is a storage facility for wind farms.

Batteries have a guarantee to a point in time where afterwards, beyond the car, there are plenty of things you can do with a storage facility as the efficiency of it deteriorates but it remains very usable in a domestic. Once this market develops, there are lots of opportunities in the second and third use, more in the personal storage area for your own house or your own business.

Q348 **Stephen Kerr:** So you can see a thriving second-life battery market.

Ian Robertson: Yes, absolutely. As the value of the precious materials inside it continues to go up, the value of that battery pack goes up as well. What we do not want to see is the battery pack becoming more valuable than the car, but let us see how this develops.



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Stephen Kerr: It is a possibility though, is it not?

Gareth Dunsmore: The range of those options goes all the way down from renewable energy production in Britain to portable battery storage for your iPhone, iPad or whatever else it might be. These batteries are incredibly flexible. It is about how we then apply ourselves to sell them in those different ways to repurpose them and to support different industries and to link those into other industries such as the solar industry for personal homes or businesses wanting to become more sustainable. We are now putting in over 200 Leaf batteries into the Amsterdam Arena to not only be an off-grid solution in case of a power outage but actually to be an energy storage for the wind farms off the coast of Holland. That flexibility is vast.

Q349 **Stephen Kerr:** So it is about repurposing as opposed to disposal, because currently there is only one plant in the whole of Europe for the disposal of batteries.

Mike Kerslake: It is about repurposing, absolutely.

Ian Robertson: It is a very large cost within the overall manufacture of a vehicle today. As we move forward, it is still likely to be a very large cost. Therefore, beyond the use of a car or the life of a car, this particular component—and it is relatively easy to repurpose it—has a good value. Ultimately, it can be broken down.

Q350 **Stephen Kerr:** So there is no need for any UK investment in disposal plants.

Ian Robertson: The market will develop alongside the growth in the car industry here.

Q351 **Stephen Kerr:** Which market?

Ian Robertson: Repurposing and the second use.

Stephen Kerr: Second use, but not the disposal.

Mike Kerslake: I take a slightly different view because the risk is that if we sit and wait, there is quite a lot of uncertainty about the rate at which those markets would grow—both the end-of-life recycling and for second-life reuse. The business case for those markets is rather uncertain. In that environment, if we are strategically wanting to grow our electric vehicle fleet rapidly, it is going to be difficult for people to have confidence to invest in, for example, a large-scale battery recycling facility when it is unclear whether the value of those batteries would be better found by putting them into stationary energy storage, which could be a really good growing market, particularly with things like wind power, which fluctuates, and all those sorts of things. There is a really good opportunity there, and there will be a need for recycling for those batteries that are beyond useful reuse.

Q352 **Stephen Kerr:** You are not advocating a wait-and-see approach.



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Mike Kerslake: We need to be a bit more active in seeking to stimulate those markets.

Q353 **Stephen Kerr:** When you say “we”, you mean you, the manufacturer.

Mike Kerslake: I really mean the UK Government. We have just embarked on a vehicle-to-grid project, which is funded by Innovate UK. Part of the reason for that being funded by Innovate UK is that the market for vehicle-to-grid energy services is very immature and you cannot really put a value against it. We do not want to take the commercial risk to launch into a technology demonstration project with significant investment on our side but with very little certainty about the value of the per kWh capability and what the market would actually produce.

Q354 **Stephen Kerr:** You think the UK Government need to intervene. Ian was making gestures to suggest he might think otherwise.

Ian Robertson: When you look at the growth of personal storage from an electrification point of view, we have seen an industry grow from being grid-based to one that is much more local again now—we have come full circle—with solar panels or wind farms or whatever, where there is a growing natural requirement for batteries. The car industry is a good source of them, as I mentioned. We are selling new batteries made in our facility to the likes of the power companies, to the likes of Deutsche Post and so on. What we have not seen right now is many of the used batteries because the cars are not that old yet. However, there will come a point where the useful life of that battery still has a good few years ahead of it and there is a demand that is already beginning to be talked about.

Q355 **Stephen Kerr:** Do the Government need to do anything in that case? There is demand and there is supply.

Ian Robertson: The only thing I would say, Stephen—there was an earlier question about it—is that it could be part of a joined-up discussion within government policy. If there is a discussion on storage at a local level, then this would be one of the sources that could encourage that. Government policy here could have a positive overarching industry benefit.

Gareth Dunsmore: It is also about timing. This is a 2040 road map and absolutely within that horizon are estimates of around 20 to 25 years for the life of a battery in a vehicle and then the life of a battery in someone’s home, for example. Mike’s point is absolutely fair that recycling at some point is part of that story. It is just about making sure that we do not force or drive businesses to do that at the wrong point in time when you do not have the scale of batteries coming back because repurposing is absolutely the first step.

Q356 **Stephen Kerr:** Tony, do you have anything different to say?



Tony Walker: No. I only want to add that hydrogen is also a storage medium, and we could talk about a hydrogen society and all sorts of things, but I have no extra points.

Q357 **Stephen Kerr:** Can I have a quick question on the national charging infrastructure: central planning or left to market?

Mike Kerslake: The commercial vehicle sector or heavy duty sector is a different player because at the moment most of our near to medium-term opportunities are in return-to-base fleets. The operator would need to invest in a depot-based charging infrastructure in order to enable the electrification project. It looks after itself to that extent.

Q358 **Stephen Kerr:** That is market-driven.

Mike Kerslake: Yes. The harder bit is for vehicles that are not return-to-base. This would be long-haul trucks and so on, where it is much more challenging anyway.

Q359 **Stephen Kerr:** Will the market create that infrastructure or will there have to be central planning, for want of a better terminology?

Mike Kerslake: There will be a degree of central planning. It is a market that is much less mature than the car market and we are building a national infrastructure for charging stations. It would be an extension of that kind of strategy.

Gareth Dunsmore: Central planning is absolutely vital but with the road map of allowing market forces to take over when they can make it profitable for themselves.

Q360 **Stephen Kerr:** What element is central planning?

Gareth Dunsmore: Having a road map of both highway infrastructure, house legislation and office legislation to try to support businesses and to facilitate businesses and economies of scale to take over, invest in the infrastructure that is needed and to generate money off it and to support new business opportunities.

Tony Walker: In the early days, the number of users is very low, so the power companies will not be able to operate that charging structure profitably. I am not talking about home and business; I am talking about the public charging structure. The market will not produce that result because there are so few users. However, of course, over time, the numbers of users will go up and it will become market-possible. The market requires a profit in return for investment. With very low users and the ramp up, that will not be there.

Q361 **Stephen Kerr:** There are businesses, of course, that are making a business out of what you have just said.

Ian Robertson: Central planning is essential. It comes with other things as well, like common plug structures. If you went back to when electricity companies were so numerous you could not count them, they all had a



different plug. It was not very helpful. Between the car-makers right now, we have some different plugs as well. Having some consistency here, which can be constructed from a government point of view, is important. The high-speed charging infrastructure is something in which not only has government a meaningful role to play but government is also, behind the scenes, important from a grid point of view because these are very large consumptions of energy and need careful planning, and that horizon tends to be within a government decision-making process.

Gareth Dunsmore: You can charge a Leaf and a BMW i3 at home with the same plug. When you go on to a highway station, with a rapid charge, you charge off the same charging station as well. It is just the plug that comes off—

Q362 **Stephen Kerr:** Gareth, are you saying that the market will eventually take care of all these concerns and create a consumer-friendly interface?

Gareth Dunsmore: The market is capable.

Ian Robertson: The charging infrastructure has been sold in London. The company that ran that was also running the Paris infrastructure. For the first year or so, they could not charge a Nissan and could not charge a BMW. There is a role for Government to make the rules of engagement clear here, in order to prevent the risks that we do not benefit at this stage from the lower usage because we do not have the flexibility on board.

Gareth Dunsmore: On the other side, we invested in the same network in the UK collaboratively together, with European funding, and that is where this balance of a guideline and a direction is fine. However, the market forces must be able to take over or we will not generate new business opportunity.

Ian Robertson: It is not a primary business for Nissan and it is not a primary business for BMW, but we chose to nurture it at this phase in the programme.

Q363 **Stephen Kerr:** It is a very interesting discussion. Let us have a word on vehicle-to-grid technology. Why will motorists want to do vehicle-to-grid technology? There is some suggestion that that is the last thing they will want to do: to empty their batteries and risk an emergency problem.

Gareth Dunsmore: Mike has talked a little bit about the trials that he is starting with Innovate UK, which Nissan is a part of as well. In Denmark, it is already a commercial opportunity. It exists and people are doing it. The customers that choose to want to get involved in this are much more fleets; 50% of the UK market is fleet driven, where you have a more stable usage pattern of the vehicle. The first ever customer that chose it is a 9 to 5 utility company; they plug in at 5 and they only need it to be charged by 9 the next morning. There is a period of time when it is not draining the battery but it is using the battery to balance the grid. We absolutely need to do a trial in the UK to understand the commercial and



value propositions for the energy companies, for the manufacturer and for the customer, most importantly, to see if private customers would then take that, which we absolutely believe that they would do.

Q364 **Stephen Kerr:** Does it not drain the battery?

Gareth Dunsmore: It uses the battery but it also puts energy into the battery as well as taking it away. It is going up and down rather than draining. Draining the battery is not where the value is for the energy companies or the customer.

Ian Robertson: The technology is more than capable of deciding when the battery can be part of a network and deciding when the customer is likely to be coming out and using it because, generally, most of us sleep at night and therefore there is a point in time at which it can be part of a storage facility for wider use.

Q365 **Stephen Kerr:** Are private motorists going to think the same way, though?

Gareth Dunsmore: This is one of the great things about Innovate UK projects: it is 50% private, 50% fleet-driven. We will see the value exchange for those private customers. Think of a two-car household and a particular customer that is doing school runs or driving to work and back and leaving their car overnight. There is a good period of time where that car does not need to charge; it is only topping up the battery for a few hours. All the rest of those hours, they can make money out of it. That is what we need to test and learn for the UK environment. Will that be an opportunity for it? We believe it will.

Ian Robertson: The key thing there, Gareth, is “can make money out of”; that generally gets people’s attention.

Stephen Kerr: That tends to drive the commercialisation of the technology.

Mike Kerslake: One of the things that may come out of that is a change—and, again, I am talking about the commercial vehicles sector—in the models by which the batteries are owned and managed. Perhaps the vehicle owner does not own the battery but it is leased from an energy resources company of some sort who also gets value from the vehicle-to-grid capability. There is quite a potential change in the way it works.

Stephen Kerr: There are lots of possibilities.

Chair: Thank you very much. Thank you to all of you for coming to give evidence today. It was incredibly informative and we have learnt a lot. This has been a huge input to our inquiry. Thank you to all of you for sparing the time.