HOUSE OF COMMONS

Public Accounts Committee

Oral evidence: Low emission cars, HC 943

Thursday 11 March 2021

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Watch the meeting

Members present: Meg Hillier (Chair); Gareth Bacon; Olivia Blake; Sir Geoffrey Clifton-Brown; Barry Gardiner; Mr Richard Holden; Craig Mackinlay; James Wild.

Gareth Davies, Comptroller and Auditor General, Peter Gray, Director, National Audit Office, and Marius Gallaher, Alternate Treasury Officer of Accounts, HM Treasury, were in attendance.

Questions 1-55

Witnesses

I: Sarah Munby, Permanent Secretary, Department for Business, Energy and Industrial Strategy, Bernadette Kelly CB, Permanent Secretary, Department for Transport, and Richard Bruce, Director (job share), Energy, Technology and Innovation, Department for Transport.

HOUSE OF COMMONS

Report by the Comptroller and Auditor General

Reducing carbon emissions from cars (HC 1204)

Examination of witnesses

Witnesses:, Sarah Munby, Bernadette Kelly and Richard Bruce.

Chair: Welcome to the Public Accounts Committee on Thursday 11 March 2021. This hearing is part of a series of sessions looking at the Government's environmental targets, and today we are looking at efforts to encourage people to switch from petrol and diesel vehicles to low-emission alternatives.

The Government have said that they will prohibit the sale of new petrol or diesel vehicles by 2035, and the production of them by 2030. As of March last year—a year ago—over £1.7 billion had been allocated to subsidies designed to encourage greater uptake of ultra-low or zero-emission vehicles, but we are very keen today to talk about the infrastructure, the batteries, the charging points and all the challenges that will need to be overcome in order to reach this target in the next nine years. Critically, of course, we know that cars are a major contributor to carbon emissions in the UK, so the importance of the work is clear, but the National Audit Office Report that has been informing our inquiry today has highlighted some of these challenges.

I would like to warmly welcome our witnesses today. We have Sarah Munby, the permanent secretary at the Department for Business, Energy and Industrial Strategy; Bernadette Kelly, the permanent secretary at the Department for Transport; and Richard Bruce, who is the director for energy, technology and innovation at the Department for Transport. Welcome to you all. Mr Bruce, I think it is your first time in front of us, so a very warm welcome. We are a very friendly bunch, as I am sure your permanent secretary will have told you.

Before we kick off into the main session, I would like to bring James Wild in to ask a question of Ms Munby. Mr Wild, over to you.

Q1 **James Wild:** Thanks very much, Chair. In the Budget, the Chancellor announced £6,000 grants for non-essential retail, and £18,000 for hospitality, leisure and accommodation, which were welcome. Are you able to update us on when local authorities will have guidance on those grants, their applicability, and when they will be able to be paid out?

Sarah Munby: That grant scheme is replacing the current local authority grant scheme which runs up until the end of this month, so both the guidance and then the payments will come towards the latter half of this month, in time for payments to start being made as the previous grant scheme gets phased out.

Q2 **James Wild:** One of the issues that my local authority and others have is

that they will need to set up the systems to enable the prompt payment of the grants. May I urge that the guidance be made available as soon as possible, so that they can make the technical changes to software and things that are needed, so that businesses are not waiting for the support that has been announced?

Sarah Munby: Absolutely. The fact that the scheme builds on the existing frameworks and set-ups that local authorities have in place already will help make that happen, but absolutely we need to do our part in getting the guidance out promptly.

Q3 **Mr Holden:** Sorry to go to you again, Ms Munby, but I have a broader question about the EU withdrawal agreement. Battery manufacture and so on was talked about as one of the key late issues in that. How has that affected battery production in the UK? Nissan is a major local employer to me and much of the north-east—it is a real economic driver. How do you think it will impact them and other battery manufacturers going forwards?

Sarah Munby: The key issue that we made sure was properly represented in the negotiations with the EU was rules of origin, which are about how much of the car you have to make in either the UK or the EU in order to qualify for zero tariffs.

Particularly in the case of battery electric vehicles, we secured in the negotiation a phase-in period, to allow more time for car manufacturers to onshore greater amounts of battery production to ensure that they could meet those targets for their electric vehicles. I am sure you have seen Nissan's very welcome announcement in response to that deal that, first, they are committed to the plant and, secondly, they are actually planning to onshore greater amounts of battery production for more models in order to work through those rules of origin arrangements. I think that is good news, actually, for the Nissan plant and local workers.

Q4 **Mr Holden:** Is six years enough? As you can imagine, there has been a lot of concern locally about the timeframe. Are you convinced that six years is enough for this period, or would you have preferred longer? Would the car manufacturers have preferred longer?

Sarah Munby: Of course everybody would always like less restrictions and more time, but we think this is a manageable transition, and that is why it has been welcomed by the automotive industry.

Q5 **Chair:** Rachel Hopkins, the Member for Luton South, has raised this issue in relation to Vauxhall, which has raised concerns with her about making sure that there are no tariffs on batteries. She has again raised their concern that there need to be the right opportunities to manufacture batteries. In terms of the investment, which we are coming on to in more detail a little later, and the infrastructure for batteries and the particular point that Mr Holden has raised, are you really confident that you will get it all lined up together in time—not just the rules, but the manufacture and the volume of manufacture necessary to support the targets for zero-emission vehicles?

Sarah Munby: I suspect we will talk about this in more detail later in the hearing. The headline message is that the Government are 100% committed to securing greater gigafactory—battery factory—capacity for the UK. That is why an initial £500 million has been put behind both R&D and capital grants to support the growth of gigafactories. Our teams are working incredibly hard to make that happen. I am happy to talk about that in more detail later.

Chair: We will come on to various elements in more detail. We will move into the main session now. I ask Gareth Bacon to kick off.

Q6 **Gareth Bacon:** Thank you, Chair. The first question is probably aimed jointly at Ms Munby and Ms Kelly. Government strategies to increase the number of zero-emission cars on the road date back to 2011. In November 2020, targets were set very high indeed, so there will be no more diesel and petrol cars sold after 2030, with the idea that zero-emission requirements would be applicable to all new cars from 2035. What were those targets based on?

Bernadette Kelly: It is correct—you are quite right—that these are ambitious targets. That is obviously very much part of the Government's wider ambition in relation to net zero. The position around the targets that we have set now, which is the phasing out of all new petrol and diesel cars by 2030 and all new cars and vans to be zero-emission by 2035, reflected a number of things, actually. Initially, advice from the Climate Change Committee was a key factor in determining how we set the targets. There was then extensive consultation with stakeholders, manufacturers and others. On the basis of that, we arrived at the targets as representing a proper balance between ambition to drive towards net zero on our roads, and achievability and deliverability. I don't know if Mr Bruce would like to say any more about that, but that was the essence of how we got to the targets.

Richard Bruce: I think the key point to remember is that transport is the biggest emitting sector, and 90% of transport emissions are from road transport. At the moment at which the Government set a target of net zero for the overall economy, you have to decarbonise transport; you have to decarbonise road transport rapidly. I think these targets are consistent with that profile effectively, but they are deliverable, albeit stretching.

Q7 **Gareth Bacon:** Okay. Deliverable, albeit stretching, is something that we will examine over the next hour or two. In terms of Government intervention over that period of time, as the Chair said in her opening remarks, a total of £1.7 billion has been spent intervening in the market to try to stimulate this, and it has taken that time to get the sales of ultra-low emission vehicles up—I think the last figure was 8%. That was during the pandemic when the sale of vehicles generally had dropped by about a third, and we got up to 8% of those that were sold. That is not a massive step change, is it?

Bernadette Kelly: If you look at the trajectory, what we are starting to see quite clearly now in sales figures is the acceleration of uptake starting

to happen very quickly, which is what we would expect. You are quite right—

Q8 **Gareth Bacon:** Could I just push back on you slightly there? I don't mean to interrupt you, because it does sound rude. I do apologise, but it has taken us 10 years to get to 8% and in the next nine years the Government target is to get to 100%, which is an exponential step rate, so what is going to change between now and then to make that happen?

Bernadette Kelly: I was going to address exactly that point. If you look at the curve, it is not an incremental process and we have never expected that that is how this would go. This is not that kind of process. Back in our 2013 strategy on this, we set an expectation at that point that zero-emission new vehicle sales would be around 3% to 7% at this point, so that was the range that we were expecting in 2013. The NAO Report as you rightly say quotes a figure of 8%. We think if you look at more up-to-date information that figure is now growing rapidly. SMMT figures, which DfT-verified figures typically track very closely, for the total number for the whole of 2020—I think the NAO Report figure takes us to September 2020—is just under 11% now. All of the data that we are seeing on sales suggest that this number is really now starting to take off.

We are starting to see much more rapid take-up because the conditions that are needed to support take-up are increasingly there now. We will talk about charging infrastructure, I know, and we could talk a lot about the progress. With the progress that we are making now on charging infrastructure, and the progress being made by manufacturers in making these vehicles much cheaper and much more accessible and attractive, you could start to see these factors now coming together in a much more rapid uptake. There possibly was some market distortion as the NAO has identified, last year, due to Covid, but if you look at absolute sales as well as sales as a proportion of the market, we are now starting to see a really very significant shift in the numbers of people choosing to buy zero and low-emission vehicles.

Q9 **Gareth Bacon:** To focus on one point about the figure on take-up, are those figures publicly available? If so, where are they published?

Bernadette Kelly: Richard, would you like to say a little bit more about the data and what we use? I am conscious of quoting figures that are not in the NAO Report, because they are a little bit more up to date and also, as I say, not fully verified yet; but Richard can say a bit more about that.

Richard Bruce: DfT publishes statistics—we have to check the authenticity of them, so there is a slight lag—and the SMMT publishes statistics on registrations every single month, including a cumulative one. The SMMT figure for 2020, as Bernadette says, is just under 11%. The figure for 2019 was 3%, so 2020 was very much a breakthrough year. That was entirely to be expected, because the policy is around creating the environment for the vehicles to sell in decent numbers but, ultimately, manufacturers have to make and market the vehicles, and want to sell the vehicles, so 2020 is a very special year, because it was the year that the

regulations on carbon dioxide emissions tightened across all of Europe, including the UK, which meant that they were bringing more vehicles to market. That is why there has been a big step change.

Q10 **Gareth Bacon:** Much of the Government intervention over the past decade has been focused on bringing down the purchase price. There are other arguments, of course, about the lifetime cost of the vehicle—the running costs are likely to be much lower than with petrol and diesel. I did a little back-of-fag-packet research coming into this meeting, to try to find the 10 cheapest low-emission vehicles. The cheapest one that I could find brand-new was £25,000, with a range of 175 miles. Compare that with petrol and diesel equivalents—there is no equivalence. I put to you that that is one of the major obstacles that will have to be overcome to achieve the step change, but what others do you see?

Bernadette Kelly: On your first point, we have done a bit of research too before coming to this hearing, and we identified 13 electric vehicles now with a price point starting below £30,000. That included, from memory, a couple at around about the £20,000 or £21,000 mark—admittedly small vehicles with relatively modest range. That moved through into much more regular family cars, I guess, with much more significant range. More of those—13, I think—now have a range of over 200 miles.

Almost daily, we see announcements by manufacturers choosing to move into the zero-emission battery electric vehicle car market and to make their investments in the UK. We are now starting to see that critical mass of volume to enable the prices to be driven down even after, in the future, as production lines become more significant.

Yes, there absolutely is, as the NAO Report says, still a price point difference between petrol and diesel cars and zero-emission or ultra-low emission vehicles, but that price gap is closing rapidly. We expect that to continue to happen. I just make that general point—but I forget what the end of your question was.

Q11 **Gareth Bacon:** It was about what barriers need to be overcome. The price point is one, and I would suggest to you that it is significant at this point. There is the efficiency of electric vehicles as well, and the range, which is quite problematic. Less than 200 miles is not a great deal, especially when it will take you at least 45 minutes to charge a vehicle, unless it is on a rapid charger. I used to drive to and from Manchester a lot, which is about 250 miles from where I live. I could not get there in an electric vehicle; I would have to stop for an hour, if I could find a charging point, whereas at the moment it would take me five minutes to fuel my car. Those are some difficulties, but there must be others. What other difficulties do you see that we need to overcome?

Bernadette Kelly: We do a lot of research on this to ensure that we understand what the barriers are. Indeed, all our interventions and the way in which those interventions have changed over time have been very much driven by the results of that research. The No. 1 factor has been

price, which is why plug-in car grants and vehicle grants have been the centre of our interventions to date.

No. 2 is, typically, range anxiety. That is why now we are stepping up investment in charging infrastructure and, in particular, in public and rapid charging infrastructure. I am sure we can say more about that.

There are other factors for people, such as the acceptability of electric vehicles and how attractive they are to consumers. Richard, again, you might be able to say a little more about that. You will find that Richard has encyclopaedic knowledge of many of these things, so forgive me if I ask him to respond in detail on a number of points.

Richard Bruce: First, on the range point, which is quite interesting, 99% of all journeys are under 100 miles. There is a proportion of journeys that are over 100 miles, but even EVs with a range of under 100 miles are suitable for huge numbers of journeys. At the moment, as battery prices are coming down, manufacturers are using that to maintain the prices of vehicles but offer more range. It will be interesting to see at what point that stops happening.

I suspect that something in the 200 to 250-mile range will be normal for people, and then you will have differentiation of products around whether you want to buy a particularly long-range vehicle. It happens now with Teslas and other EVs coming to the market. With Tesla's barriers, price is the obvious one, but there has also been a barrier to consumer acceptance. There has been a degree of scepticism about this technology for a number of years, and some of the press is negative about it. That has had to be overcome, which has now happened. Some of the myths around EVs—around speed, range, price and feasibility—are being dispelled.

On charging times, the fastest chargers from a few years ago charged at 50 kW, so it could take you 20 minutes to get to 80% in an EV, but the power of those chargers is going up all the time. It is going up to 100 kW and 150 kW, and some are doing 200 kW, so the ability to add usable range when you are doing longer journeys will cease to be an issue, because people rarely drive 200 miles without wanting a break at least—it might be 20 minutes—so the scenario where you don't stop and have to drive 200 miles on the trot is quite slim.

Q12 **Gareth Bacon:** To push back on that, the problem is finding a charging point that can give you 80% charge in 20 minutes. I would suggest that another barrier that needs to be overcome is the availability of the infrastructure to support this. What do you say to that?

Bernadette Kelly: I agree, and that is why we are investing now more heavily. The £2.8 billion announced in the spending review includes £1.3 billion on charging infrastructure, because we recognise that there is still a need. Public investment stimulates the market, because, ultimately, we hope that much of this investment will come from the private sector.

To be clear on Richard's point, there are a lot of myths, and already significant progress has been made on infrastructure. We have 3,900 rapid chargepoints now in the UK. We calculate that no driver on a motorway or an A road is more than 25 minutes from a chargepoint. We have 20,800 public chargepoints. A recent study suggested that the UK has more chargepoints per 100 km on its major roads than any other country in Europe, so we are making progress, but we need to make more.

That is why we have committed to spending £950 million via Project Rapid, which will ensure that we have at least six rapid chargepoints in every motorway service area in England, and we hope to have up to 12 on larger sites, with 6,000 in place by 2035. Yes, there is a challenge here, but a lot of progress has been made. The interventions and the investment that we are making are aimed at accelerating the progress that we are able to make in providing the rapid charging and public charging facilities people need to have in order to purchase these cars.

Q13 **Gareth Bacon:** I agree with that point entirely, but do you think that the Government's budget on infrastructure is in line with the pace of the change in habits that will be required in order for more people to buy more electric vehicles? The difference between 8% and 100% in nine years is very extensive. Unless there is sufficient infrastructure, I do not think they are going to get to 100%. Do you think the Government are intervening at the right level in order to put the infrastructure in?

Bernadette Kelly: What we are trying to do is pitch our intervention at exactly that level, which is rapid progress, but which also provides good return and value for public investment. Much of this is also about stimulating more rapid private investment in infrastructure as well. It is a dynamic situation, and it is hard to be exact. We are trying to shape an evolving market and an evolving technology, both of which are moving very quickly.

Richard Bruce: The key point is that Government isn't rolling out chargepoints. Obviously, the chargers that are on the network now will be —*[Inaudible]*—offer. Some 80% of those have gone there without any Government money at all. So the role of Government is to spot when there are market failures and clear problems, and there definitely is an issue with motorway service stations. We have to recognise that and unblock it. But there are literally billions of pounds of private money looking at charging infrastructure—and the advantage of the clarity on the phase-out dates is giving that market complete certainty on the size of its market in the years ahead, which makes it highly investable.

On the private rate of investment in rapid chargers, they are now going at 100 every 30 days across the UK, which is a great rate. Our role, I think, is to look where there are blockages and unblock them. That is what the rapid fund is for.

Q14 **Gareth Bacon:** I want to move on and focus on a chart in the National Audit Office Report that shows the number of low-emission vehicles per 100,000 population—a measure that we are all getting very used to these

days. It shows quite a big disparity up and down the United Kingdom in terms of take-up. The highest take-up is in southern England; the north-west of England follows. We are seeing the lowest take-up in the north-east, Wales and Northern Ireland. What is the Government doing to tackle the regional imbalance of take-up?

Bernadette Kelly: Again, we recognise the point that the NAO and you have made that the take-up and roll-out of this is variable across the UK. Again, this is because it is as much a market that we are trying to stimulate as a public investment. Most, if not all, of our interventions have been UK-wide, so the Government's approach has been location-neutral in terms of investment.

What we do see is that take-up has been faster in some places than others, as you say. If you look at the charging infrastructure, that is a significant factor in this, and the roll-out has been variable. Obviously, it has depended in part on local authority investment and support and on drawdown of public funding. That has been a little slow to get going and, again, has been variable in different parts of the country, which, again, will have an impact on people's willingness to purchase cars.

I think what we are seeing is that early take-up has been greatest in places where there is the greatest density of traffic and where there are more chargepoints and affluence. People have been at the point where the price point has been quite high as well. What we would expect to see is that, as the broader conditions of lower-priced cars and more accessible charging everywhere start to be rolled out, you will start to see some of those regional variations go away as well.

Some of our early investment, such as the £40 million that we put into Go Ultra Low, was targeted at particular places: £35 million went to Bristol, London, Milton Keynes and Nottingham, and a further £5 million went to Dundee, Oxford, York and the north-east. That was to ensure that local authorities were helping to provide the broader conditions to support take-up and roll-out as well. But, yes, I think the regional variations are a concern at the moment. We want to ensure that our further investment is helping to promote an environment in which electric vehicles, low-emission and zero-emission vehicles are accessible to everyone in all parts of the country.

Q15 **Gareth Bacon:** That is obviously a fine objective, but looking at the statistics that the NAO has published, take-up in the north-east of England is running at less than 25% of that in large parts of southern England. While I completely take your point that some areas of the north-east may be more depressed economically than those in the south, where there may be greater affluence, there is clearly a massive disparity there, and there is everything in between up and down the UK. So is the Government looking to intervene in a different way to pull things level?

Bernadette Kelly: I do not think we have got a specific objective in our interventions. What we are seeking to do is make interventions, make investment and make support available on a UK-wide basis, whether that

is to consumers or to local authorities or other providers to invest in charging. What we will want to do—particularly through this next phase, where we are also investing more in support for local authorities to provide more, larger and more rapid charging in local areas—is work with all those areas to understand what the obstacles are and how we can work with authorities to ensure that they can provide the right sorts of charging infrastructure in all parts of the country. So this is an area where we want to continue to provide advice, support and assistance for local authorities in ensuring, as I say, that an environment exists to make zero-emission cars accessible to everyone.

Q16 **Gareth Bacon:** But going back to the fairly stark figures, we are at 8% now, which is our best year ever, and we need to get to 100% in nine years. Do you accept that there is a danger that certain parts of the country could get left behind? Even if we achieve this massive increase in the take-up of electric vehicles, with the north-east of England currently running at 192 in 100,000 and areas of southern or central southern England at 804 in 100,000, there is a huge disparity, isn't there? So if we are going to see this massive take-up, are we not in danger of creating a country of haves and have-nots, if I can put it that way?

Bernadette Kelly: I think it is very early to start making those assumptions. What we have already explored in the context of the speed of take-up of electric vehicles is that this is a very, very rapidly moving situation. As Richard indicated, the figure was 3% last year and 11% this year, in terms of purchase. So I think it's entirely possible. What we will want to hope happens, and support happening, through our interventions is that there will be a fairly rapid opportunity to catch up through the next year or two as we invest more and the private sector invests more in charging infrastructure and as manufacturers invest more in battery technologies, which brings the price of these cars down. So I don't think there is any reason to assume that the variations we see now are going to be hard-baked or hardwired into the progress that we are going to see in the next two, three or four years. Indeed, I would expect, probably, the opposite to happen.

Richard Bruce: I just want to add a health warning on the data on the distribution of new car sales. Half of all new car sales are for fleets, and it will be where the business is registered. Even for private sales, the vehicle will be registered where the lease is, not where the owner might actually be. So it's quite hard to draw many strong conclusions from the distribution stuff. Also, it doesn't reflect necessarily the second-hand market and where those vehicles are currently being used, going forward.

We are in such early days in this industry. We have moved from literally a handful of vehicles being on sale to far more now. It may be that, if you had a distributional map of the types of vehicle that people buy regionally and how much they pay for them, there isn't an EV offer in every segment, for every type of car, at the moment. That is changing very, very quickly, but this technology has had only 10 years of being on sale, versus over 100 for the internal combustion engine, so the market is quite immature. So I think it's probably too early to say that there is a genuine

regional disparity here, because we haven't got a level playing field across the country.

Q17 **Gareth Bacon:** I take the point entirely about the immaturity of the market and the technology and the fact that it will change massively. The comparison that I always make is to mobile phones, which, when I went to university 25-plus years ago, hardly anyone had, but now everyone has mini computers in their pockets. So things will change very rapidly, and I think that's the point.

The reason why I keep pushing this, though, is that the target the Government have set is right on the horizon right now. There's an awful lot of assumptions baked into this that changes can happen very, very rapidly, but, at the moment, we are very much in the foothills, and I'm pushing on how quickly we are going to get there.

On the £1 billion or £1.7 billion that has been spent in an attempt to kick-start the market—I don't know which witness would be best placed to answer this—do we think that that has made a difference or that the market would have done this anyway?

Bernadette Kelly: I am bound to say that we do think it has made a difference. What we have done is invested funding in the things that we knew were an obstacle to the development of this market. It's a kind of classic market-failure analysis. We knew price was an issue, so we have invested in plug-in car grants. We knew charging was an issue, so we have invested in stimulating the market for chargepoints.

The counterfactual is, what would have happened if we hadn't done anything? What evidence from other countries tells us is that where they do not, for example, have things like plug-in car grants, their progress has been very much slower. In terms of those countries that are doing slightly better than us—I say "slightly" because it's not a huge margin—what you see in France and Germany is that they have plug-in car grant equivalents that are set at considerably higher levels than the UK's.

So I think that if you look at the evidence of market failure and at what is happening in other countries, there is a fairly robust argument in terms of the things that we have done and the things that we have invested in. We have talked mostly about charging infrastructure and plug-in car grants so far, but I think regulatory change has also been a major factor in this, as has the investment in R&D and support for manufacturing, which has made the UK an attractive place for vehicle manufacturers, and battery technology advances are also being supported through that. So it is the full suite of interventions around all of those things, addressing a market failure, or ensuring that a market emerges and grows much more rapidly than would otherwise have been the case. I think the evidence is pretty strong that suggests that these are the right interventions and that the reason we are now making the very rapid progress we are is because the Government have done those things.

Sarah Munby: We have talked about the interventions that we are making and why we set the target. I just want to land the point that the

target is also an intervention in and of itself. One of the most powerful things that Government can do in this space is set a clear expectation for the market, because you are trying to get manufacturers to make a series of decisions, you are trying to make private investors in charging infrastructure make a series of decisions, and you are trying to make car purchasers, particularly fleet car purchasers, make a series of decisions.

Simply by setting the target, you massively increase the pace of change, because everybody knows what they are aiming for. You do not say, "What are all the interventions, and how does that fit together with the target?" The target is an intervention. We think that having set that target will help this exponential curve to move even faster.

Richard Bruce: We need to look holistically at this as well. This is about creating the ecosystem for the UK to thrive in this transition. If you speak to the executives of Nissan who were around at the time they decided where to build Nissan Leaf, the fact that the UK had a very comprehensive offer on supporting plug-in vehicles was a key factor in the decision to build a battery plant in the UK and to build the Leaf here.

We have getting on for half a million plug-in cars on the UK's roads. We have one of the best infrastructures in Europe. We have electric cars being built in Sunderland. We have electric Minis being built by BMW. We have hybrids being built by Toyota. UK manufacturers are committing to go electric as well, so the ecosystem is, I think, reasonably sure relative to other countries. That means that when we kick up the part of the S curve that we are now starting to, we are well positioned to capitalise on that.

Gareth Bacon: I am conscious of time, and other Members wanting to come in, so I am going to draw to a close at this point.

Chair: Thank you very much, Mr Bacon. We can bring you back in later, if necessary.

Q18 **Mr Holden:** I should put on the record the fact that I was a special adviser at the Department for Transport and worked with the permanent secretary there until a few years ago.

Mr Bruce, I wanted to pick up on one of the points that you made around the number of journeys. About 95% of my journeys are short, but every week I have two journeys that are 300 miles, to and from County Durham and Westminster. The entire basis of the purchase of my car was around those long journeys, because the short journeys are irrelevant if I cannot do the long ones. To what extent are you factoring in the actual percentage of miles done rather than just the percentage of journeys in your calculations?

Richard Bruce: I would not want to create the impression that we do not care about people doing longer journeys. All I am saying is that there is a point at which people feel comfortable buying an EV. They will look at the long journey that they do, and at the point at which they feel that they can comfortably do that journey with an EV, just as you are considering, which will be a combination of the price of the vehicle, its range and the

available infrastructure, they will feel able to buy it. So as battery ranges go up and the infrastructure offer gets significantly better for those longer journeys, more and more people will feel confident to be able to take the journey.

Q19 **Mr Holden:** That is exactly the point that I am making. The 99% number that is being used is a distraction because, exactly to your point, it is all about the longest journeys that people make. If we focus on that, it has to be the key thing.

There is one very quick point that I want to ask about motorhomes. In my constituency, we have one of the big manufacturers of motorhomes in the UK, and we were hammered with an 800% tax increase in terms of environmental taxation on new motorhomes. That obviously has a huge knock-on effect in other areas. For example, if there is a massive increase in motorhome tax, people do flights. It is that sort of thing. I just want to make sure that all those smaller areas are being considered by the Government in terms of planning for the EV roll-out of vehicles. Can you reassure me of that, Ms Munby?

Sarah Munby: It is probably for the DfT to talk about the broader elements of vehicle support here, but we have schemes for taxis, buses, etc. I do not personally know the specific answer around motorhomes. Other witnesses might.

Q20 **Mr Holden:** I just want to make sure that this point is being considered. Bernadette Kelly, can reassure me on that point?

Chair: If you do not know, Ms Kelly, you can always write to us.

Bernadette Kelly: I would say that I am not close to the detail on the taxation of motorhomes.

Q21 **Chair:** Can you find out and write to us?

Bernadette Kelly: Yes.

Mr Holden: Thank you, Chair. I know it is a small sector, but it is very important to North West Durham.

Chair: North West Durham always gets its fair share of airtime in this Committee. Thank you, Mr Holden—I am sure it is appreciated there. I call Craig Mackinlay.

Q22 **Craig Mackinlay:** My first question is to Bernadette Kelly, for a consideration of where the second-hand car market is going to go. I put on the record that I am chair of the all-party parliamentary group for fair fuel for UK motorists and UK hauliers—an abstract interest of relevance to this. Where do you think the internal combustion engine car market will go in 2029, when we are on the cusp of this? I have struggled thinking about whether it will be a massive year of sales because people think they should get one while they last, or whether there will be a massive diminution in the value of ICE-type vehicles between now and 2030. Do you have any thoughts on that?

Bernadette Kelly: I might ask Mr Bruce to say a few words about that. You are right that, clearly, the second-hand car market is an important part of this whole environment. We will expect to see, for example, a growing second-hand car market in electric vehicles as take-up increases over time. That will be a positive factor in ensuring more rapid take-up and the accessibility and price point of those vehicles. Inevitably, our regulatory target to phase out petrol and diesel cars will have an impact on the value of those vehicles over time, including in the second-hand car market. Richard, do you want to say a little more? We are conscious that this is a complex dynamic in how the petrol and diesel market and zero/low-emission markets will interact.

Richard Bruce: The first point to make is that the announcement last year was about the sale of new vehicles. There is no talk about banning the use of internal combustion engines anywhere, especially if they are clean, as most modern vehicles are. I expect that there will be classic cars that people want to keep buying, using and trading. Where people have a particular use case, where they want very long range and very fast refuelling, they may want to hang on to internal combustion engine cars, but with the natural lifespan of a car, the fleet turns over roughly every 10 or so years. It is very hard to predict what will happen, and whether cars will become cult classics that people want to hang on to or will rapidly lose value. It is probably too early to say, to be perfectly honest.

Q23 **Craig Mackinlay:** Mr Bruce, we have not had a massive take-up of zero-emission vehicles, compared with some other countries—it has been better than in some, but not as good as in others. I know what my own barriers are, but what do you think are the general barriers to people taking the plunge into electric? Is it that they are a bit unsure, that the range is not good enough, that the battery technology is not as good as the ICE in terms of range, that people are worried about charging, or is it price? What do you think, in total, is the barrier that people have?

Richard Bruce: The international comparison point is quite interesting because if you look at the stand-out country on this, Norway—

Craig Mackinlay: I was going to mention Norway.

Richard Bruce: Yes. Being one of the richest per capita countries in the world is quite helpful in this. They have a very punitive tax regime on internal combustion engine cars. The penetration of plug-in vehicles is incredibly high, at 70% of new car sales, and what that demonstrates is—

Q24 **Chair:** Repeat that figure on the percentage of cars in Norway, Mr Bruce, because you were just a bit fuzzy.

Richard Bruce: It is around 70%—I think it is 74%.

Q25 **Chair:** I am looking at appendix 3 of the National Audit Office Report, which shows that it is 49.1% of new registered cars in Norway, which is pretty impressive. I am just wondering where you get that 70% figure from, so we can pin it down.

Richard Bruce: That might have been one month, because it changes. It

is quite a dynamic, volatile thing. That might have been the record level they had for a month. That it is very, very high is the point, I suppose.

Chair: Okay, that is fine. It is just that when we have a figure, we like to pin it down.

Richard Bruce: I am happy to clarify that and get back to the Committee if that is helpful.

Q26 **Craig Mackinlay:** I suppose the question, Mr Bruce, is why Norway has done so well. What are they doing that has really encouraged people? I think that is the nub of it.

Richard Bruce: They have doubled the price of the internal combustion engine car. A diesel Golf in Norway is more expensive than a plug-in Golf in Norway, and you get free access to bus lanes, free access to ferries and a very good charging infrastructure, so people have bought plug-in vehicles. That is with a limited number of vehicles on sale. I think that demonstrates that there are not that many genuine practical barriers to high adoption. A lot of the barriers are around price and perception. When people think about buying their vehicles, there is the infrastructure they want to see and there is the infrastructure that they are going to use, and those are actually two quite different things. They want to see lots and lots of highly visible charge points out there. In practical terms, cars spend 95% of their time doing absolutely nothing. Most people will buy a plug-in vehicle and leave it to charge overnight, and then they will use it. They will need the public infrastructure when they make a long journey. There is a perception issue, and there is a normalisation issue, which is now rapidly being overcome.

Bernadette Kelly: The work that we do through our Go Ultra Low campaign is really focused on both understanding and constantly assessing what impact those factors are having on people's choices. We constantly review normalisation, which is how far people see electric vehicles as the normal choice; purchase consideration, including the impact of price; and acceptance—how acceptable a technology option it is for people. We constantly monitor and evaluate those things to ensure that we understand what some of the barriers are.

Q27 **Craig Mackinlay:** Can we go back to Norway? I think Norway is fascinating. People are being nudged, through price and tax, away from ICE cars. That is one of the Government's big sticks. They have expanded their charging network. I am probably answering my own question, but is there a high density in and around Oslo and a lower density in and around some of the less-populated regions? That is question No. 1. I think I probably know the answer to that.

Question No. 2 is whether, given that the barrier to buying a new long-range, go-where-you-like ICE is now pricing a lot of people out of the market, we are seeing the second-hand car market of old ICE vehicles going up in Norway? Do you find that families have one EV for their local runabout and their older ICE vehicle for longer-distance family travel between towns? Norway has a low-density population, but it is a big

place.

Richard Bruce: I confess that I am not an expert on the second-hand Norwegian car market. However, I am quite happy to do some digging and write to the Committee on that, because it would be quite interesting., On your first point about the uptake of vehicles and geographical spread, I suspect that that may have been true initially, in the early days of EV availability, but now that there are far more models available with far longer ranges, it is changing quite quickly. Tesla has really moved the bar there, and Tesla has sold an awful lot of cars in Norway—cars that have a very decent long range. I am not an expert on what that has done to the ICE market in Norway, but I am happy to have a look.

Sarah Munby: May I come in with one point on Norway that I think is quite important? It is very simple. Norway does not have a car manufacturing industry, so the context in Norway, apart from the fact that we have 10 times as many cars here, is that they are not seeking to do what the UK is, which is both to change the cars that people drive and change the cars that we produce. They are solely going for the cars that people drive, which means that they do not have to worry about people switching to cheap imported electric cars and seriously damaging their domestic car making industry if they move too quickly. Their context is fundamentally different on that front.

Q28 **Craig Mackinlay:** I am just thinking whether, on a cold night in Norway, of which there are many, I would rely on the published data of 300 miles that a Tesla will do, or whether I would rather get in my diesel car, with an extra can of fuel in the back, just in case. However, let us just put that aside for the moment.

I am hearing a lot about electric vehicles, but very little about hydrogen. What sort of nudge techniques are the Government using to push manufacturers into hydrogen? At the end of the day, the Government have only so much money and can do only so much nudging. It will require vast technological changes and investment by the manufacturers. What is happening on the hydrogen front? I will hopefully discuss later some of my concerns about batteries, but hydrogen is in a different place.

Bernadette Kelly: I will say a few words—headlines—and then I'll ask Richard to say a little more. First, we see hydrogen as having a really important part to play in reducing emissions from transport generally. We think this is an important technology. We are investing in it in order to ensure that this technology progresses. Some £23 million in our hydrogen for transport programme has been spent on, among other things, supporting the production of hydrogen vehicles. Our approach to investment has been technology-neutral in global terms. What market and technology developments suggest is that the part that hydrogen will play will be more significant in heavier vehicles—HGVs, buses etc. What we are seeing now is very rapid movement in battery electric vehicles in the car market.

So we think it has an important part to play, but we think it will be in heavy-duty parts of the transport sector. Maritime, aviation, heavy goods vehicles and buses are all areas where we think hydrogen will, potentially, have a significant part to play in reducing emissions. Richard, do you want to say a bit more?

Richard Bruce: Yes. Hydrogen in cars has two key advantages over battery electric cars. One is a longer range. Certainly that was very true five or six years ago. Now there is very fast refuelling. The challenge for hydrogen technology in cars is that both those advantages are being eroded by improvements in battery technology. The fact that you can go 300 miles in a battery car simply was not true five or six years ago and will increasingly be true going forward. As I mentioned, as technology improves on recharging speed, bladder anxiety eventually becomes more important than range anxiety for long journeys. The ability to stop for 20 minutes will not be such a big deal. So two of its big advantages are being eroded and it has a disadvantage in efficiency terms, which is quite hard to address because generally you have to create the hydrogen from something, which takes energy, and then you lose in efficiency when you turn it back into electricity to turn the motors.

We are neutral in both our grants and our general approach. The plug-in grant has been available for fuel cell vehicles for a number of years. The fact that there are around 200 on UK roads versus almost half a million plug-in vehicles probably tells a story about the market appetite for the technology. We are watching what the manufacturers are doing. Their ability to ride three different horses for a long period of time in terms of internal combustion engine, battery and fuel cell is, I think, limited. Some of them, such as Volkswagen, have vocally said, "We are not going to back hydrogen because we think the future is with batteries." Tesla obviously is the same. Others, such as Toyota and some of the Korean manufacturers, are more favourable towards hydrogen and are still developing vehicles. It may be that it finds a niche in heavier car types that need fast refuelling—in SUVs, potentially. So it's where wisdom is over the marketplace, but if you were a betting person, I think you would bet on the majority of cars being battery going forward. That seems to be the trend.

Q29 **Craig Mackinlay:** That is very worrying to hear. It's a bit like the battle between VHS and Beta in the 1980s—if you are old enough. Going back to second hand, I am very concerned about the price disparity between electric vehicles and ICE, particularly in the second-hand market. It might be that in the mid-2030s people on lower incomes will not be able to afford a new battery vehicle. Even now they can't afford a brand-new ICE and they certainly will not be able to afford a new battery vehicle, but they might be able to afford a second-hand model. It is not uncommon. You will see on every forecourt in every town across the country a second-hand petrol or diesel car that will keep you going for a few years for £1,000. There will be a few costs and things will go wrong, but they are genuinely little modular bits that you can afford as you go forward.

The big expensive bit in second-hand EVs is the battery pack. I was doing a bit of research this morning for a Nissan Leaf, which is one of the

cheaper EVs. A battery pack is £5,000. For the Tesla, I think there are three modular packs that are £5,000 each. The older models of the Prius, which is the trailblazer in all this, are a little bit cheaper, but you are into multiple thousands of pounds in one lump when the main thing goes wrong. How are we going to cope with that? Any thoughts? This is major. I wouldn't want to be a lower-paid person who has just about managed to afford the car and then faces a massive fee because the battery has gone wrong.

Bernadette Kelly: You are right, of course, that the largest part of the cost of an EV is the battery. Battery technology is improving all the time and the costs of batteries are reducing all the time, but what manufacturers have largely been choosing to do to date is, as it were, invest in higher-quality batteries with longer ranges—because, obviously, range has also been a challenge. What you would expect to see in this market, now, is that as that battery technology continues to advance, as the scale of battery manufacture continues to accelerate, there will be opportunities for the cost of battery technology to reduce, as well as for the quality of, as it were, the technology to improve as well. I do not think it is at all a given. Indeed, the objective of our suite of policy interventions is to drive exactly that market development—i.e. a reduction in the cost of battery technology and battery cars over time. That is what we are starting to see, and that is what should accelerate as the volume of production and purchase increases. I can see that Sarah wants to come in.

Sarah Munby: While that is, on the one hand, a risk, on the other hand there is a benefit. If we think about our hypothetical consumer buying a second-hand electric car, the cost of running that car will be very significantly cheaper than the cost of running the petrol vehicle that they might otherwise have bought, so they will be seeing savings every single day into their pocket by being able to recharge that car more cheaply than it would have been to buy petrol. I just think we should see that picture in the round, as well as what you have talked about.

Bernadette Kelly: That is a very good point. I should say we calculate the running cost of a zero-emission vehicle as being from about 1p per mile compared with 10p per mile for a petrol/diesel car, so if you look at the whole-life cost disparity between an ICE and an electric vehicle it is not at all the same as the purchase price.

Richard Bruce: On your point about the battery pack, there were concerns early on with electric vehicles that degradation of batteries would be a significant issue. That hasn't actually transpired, and there are now literally millions of these vehicles on the roads around the world that are not suffering what people perceive to be a massive drop-off in range. There is a good anecdotal example of a Nissan Leaf taxi in Cornwall that did 100,000 miles in five years and had its full battery range still there. It was a worry, I think, in the early days of the marketplace. It is not necessarily a worry as much today.

I would also add that second-hand cars are often serviced outside main dealers and building up an ecosystem of people able to maintain EVs is a

challenge, but it is starting to happen and you will see second-hand markets, maintenance markets, bespoke to EVs, going forward. That is already starting to happen. So I think the main dealer and price thing—an engine for an internal combustion engine car now is probably quite a lot of money; if you got a quote I am sure you could get it fixed cheaper somewhere else—will happen for EVs naturally.

Q30 **Craig Mackinlay:** Finally, from me, Chair, before I come back a bit later on. Ms Kelly—a great observation about the running costs. That is before the Government try to make up £37 billion-worth of lost taxes in the future because of the ICE demise.

You raise a very good point there, Mr Bruce, about the charging network, and all of that: will it be sufficient, and fast enough, to reach Government's ambitions? You then mention skills, getting after-market repairs, and that type of thing. That will require a lot of skilling and a lot of people moving away from their traditional mechanics skills on normal engines, towards something very different. Do you think that type of training can be in place fast enough for what you hope is the rapid rise of electric vehicles, and the second-hand repairs that are going to be required?

Richard Bruce: Yes, I think so. There is a big focus on that at the Automotive Council, about skills generally but especially about equipping the UK with the skills for this transition. I am personally aware that a course has been running in Sunderland, I think, for a number of years, about maintaining EVs, not just in a sort of new car OEM factory but more about maintaining them generally. So it will naturally happen, I think, because that will be the focus of the auto sector going forward.

Craig Mackinlay: Thank you.

Chair: Thank you very much. James Wild, over to you.

Q31 **James Wild:** Can we move on to talk about the charging infrastructure, which we have touched on a little bit? There has been significant growth in the last decade due in large part to Government interventions. How can you be confident that the infrastructure will meet the expected number of cars over the next 10 years?

Bernadette Kelly: Again, I come back to points we have been rehearsing to some degree already in this hearing. This is a rapidly evolving market. What we are not trying to do in general—Project Rapid is an exception—is set hard and fast targets for the numbers and type of charging infrastructure that is required, because we expect private investment to come in and drive much of this. So what we are trying to do through the public investment we are making is achieve a sensible equilibrium point, where the investments we are making are stimulating the right responses in the market to provide charging infrastructure that is both sufficient and gives confidence to accelerated take-up.

That is why it is quite a difficult area in which to say, "The exact number needed is x by this time, and Government funding will support a particular

number of that." So it is a market, and we think the steps we are taking are driving the progress that is needed. We have had 783 new chargepoints created in the last 30 days, 124 of which were rapid. That tells you something about what is now happening in the market in terms of the speed and pace of roll-out of charging infrastructure. It is a rapidly evolving market. We are trying to focus our interventions on the area where most help is needed and where market failures might occur to ensure that those gaps in the market are addressed. We will obviously continue to review these policies as we roll them out, to ensure that we are setting this investment and our interventions at the right level.

Q32 **James Wild:** Absolutely, and setting the date is obviously a big signal to the market about the private sector investment that we want. Mr Bruce, in terms of the modelling, how many chargepoints do you think will be needed by 2030, 2035? I have seen estimates from Policy Exchange, for example, of about 400,000 public chargepoints. Is that an estimate that you would recognise?

Richard Bruce: I recognise it, but that does not necessarily mean that I agree with it. I think guessing the number of chargepoints required is something of a mug's game, because there are too many variables in play. If the battery prices drop suddenly, does that mean you need more or less chargers? If the range of vehicles goes up, do you need more or less public chargers? How will people respond to the technology, and how will that change over time?

We are trying to set a baseline level. The statement we made around the offer for rapid charging at motorway service stations is there to give reassurance to people that they will be able to make long journeys, and we recognise there is a pinchpoint there.

Overall, economy-wide numbers are not really for the Government to pick, because they are based on a metric that will be entirely wrong. The commission tried to do this a couple of years ago and the numbers were completely wrong. We are not in the business of saying, "We are rolling out x hundred thousand chargepoints by this date," because I think that would be wrong, and the vast majority are being done by the private sector, anyway.

Q33 **James Wild:** Yes, but you could have an estimate. Obviously the public sector should not be funding all of this, but it seems odd that the Government would set the target and set this date but not have an opinion on the number of chargepoints that might be required to ensure that people can access them.

Richard Bruce: We have no target for the number of petrol stations required—

Q34 **James Wild:** I didn't say "target"; I said "estimate". We know how many petrol stations we have, and if you are doing modelling—your part of Government does a lot of modelling—on the uptake of the vehicles and you set a legal date by which people will not be able to buy non-low emission-vehicles, it is curious that you do not have an estimate, or

range to say whether you think that is a reasonable estimate or not.

Richard Bruce: It depends on what type of chargepoint. We have done significant modelling on the requirement for rapid chargepoints on the strategic road network, but again we have to make assumptions about battery size, rate of uptake and battery cost, so it is not something we want to make public and say, "We are working towards a target." We have set the base level. We recognise that we certainly need more, and we also recognise that the offer is currently sub-optimal in terms of interoperability and ease of use. But the short-term target is six rapid chargepoints at every motorway service station by 2023, and that is why we have earmarked that funding to make that happen. Targets beyond that will be something of a moveable feast. It is definitely more than we have got now.

Q35 **James Wild:** Yes, I think we all agree on that one.

Where there is a role for the Government to drive investment is in areas like North West Norfolk and other rural parts of the country. Mr Bacon talked about the north-east. There is a danger of having notspots, as we do for mobile and broadband coverage, where the market does not deliver because the uptake is insufficient. How is your strategy going to avoid that?

Richard Bruce: The first point to make is that the vast majority of charging will happen at home overnight, and the majority of car owners have off-street parking, so most people will start their journeys at 100% if they are doing a longer journey. Clearly, for the public infrastructure they will need, they will need to access the strategic road network. That is why we are focusing on that as Government intervention, to ensure that there is a minimum standard. That is why we funded Highways England to make sure that you are never further than 20 miles on the SRN from a rapid chargepoint. That is why we are using Project Rapid funding to unlock that network for longer journeys.

The other public infrastructure provision will be a mix of what local authorities choose to do. Often, that will be commercial offers. You are seeing lots of tie-ups between chargepoint operators and supermarkets, car park owners and hotel owners—what we call destination charging. That will respond to fill in the gaps, I think.

So, you will have overnight charging as the mainstay; you will have the Government keeping a close eye on the long-distance charging on the strategic road network; and then you will have a commercial offer filling in the gaps in between.

Q36 **James Wild:** There have been a few mentions of Project Rapid. I am interested in the figure of six rapid chargepoints per motorway service station. Most motorway service stations I go to would probably have about a dozen fuel pumps, where you can fill up your car and be on your way in less than five minutes. Where does that figure of six come from?

Richard Bruce: It comes from our analysis as the baseline offer that we need to get there. There are two issues about motorway service stations.

One is that the existing commercial offer there has been constrained. The other is that because a lot of these are in remote locations, the electricity supply to them needs to be upgraded to cope with, eventually, 100% of all cars being plug-in. The short-term target is to get a minimum offer at all those MSAs. One of the key variables is that it is not like petrol, in the sense that you can't fill up your petrol car from your garage—in your house, as it were—whereas with an EV, you can. Lots of people will start their journeys at 100%. You can't necessarily read across from the number of petrol pumps to the number of rapid chargers.

Bernadette Kelly: It is worth adding that we have also indicated that it could be 10 to 12 at larger MSAs under Project Rapid. Six is not an upper limit. It depends on the size of the MSA.

Q37 **James Wild:** Yes. I am encouraged by Mr Bruce's confidence that everyone will remember to plug in and charge their car every evening religiously. Maybe he has some details on consumer behaviour to back that up.

Motorway service stations would be a logical place for the private sector to be investing. Why are you having to invest £950 million where I would expect the private sector to be putting the investment in?

Richard Bruce: It will be on a case-by-case basis, and it depends on each different location, to be honest. The issue there has been that you have had a single supplier at many of those MSAs for a period of years. Tesla has come along on some of them and put its own offer in place and the private sector has been constrained in its ability to go there. What we are trying to do is to unlock that private sector investment to make that happen faster than it might otherwise. As I said previously, you need the visible offer in order for consumers to feel that they can buy the vehicles with confidence. Some of those MSAs currently have one or maybe two chargepoints, which we don't think is enough.

Q38 **James Wild:** Let's come on to the point you were making about people doing home charging. How are you going to ensure that people without driveways, which is about a third of households, have access to charging points?

Bernadette Kelly: This is where you can see a shift in the focus of a lot of our investment. Historically, there has been significant funding for home charging, but the balance now is shifting very much towards funding for on-street and other publicly available local charging, as well as for Project Rapid.

We have already doubled investment, in the current year, for the on-street residential charge scheme, and we will be continuing that, doubling it up to £20 million for next year. We have committed £90 million in the spending review to support larger local charging schemes, with on-street and hubs as well, so we are now very much focusing on working with local authorities to support our faster roll-out of on-street and local charge points.

Q39 **James Wild:** Talking about the on-street residential scheme, why do you think the take-up has been so low? It is very unusual to have a 30% underspend in a programme. What are the factors behind that? How have you addressed them in the relaunch from last month?

Bernadette Kelly: There has been funding available, for some years now, for local authorities to support on-street and other, local charging. You are right; those programmes have tended to be underspent.

I think it is probably a combination of capacity at local authority level and appetite; while the market reach of EVs is very low, the incentive to create designated parking and charging spaces for EVs has not been great.

As we know, local authorities are very stretched, so perhaps this hasn't been as high a priority for them; they haven't necessarily had the capacity to focus on this in the same way. Again, I think we are starting to see that shift now, as more and more people purchase Evs, so I think it is a combination of capacity and appetite. We are now trying to provide both further funding and more funding for them to access, and also provide support and guidance for local authorities to help them to adopt best practice as they start to roll-out more on-street charging.

Richard Bruce: I'd add that in the hierarchy of commercial interest on charging, residential on-street has been lower than things like rapid charging and destination charging, but it is rapidly moving up, because, I think, of the market certainty that we've given with the phase-out date.

The situation has changed hugely from the first on-street residential scheme we did—back in 2013, I think. We offered to pay 35% of the cost of a residential charge point—it mirrored a very successful scheme from Amsterdam—and only two local authorities took it up, even though we were mitigating the vast majority of the costs. I think that was partly because of the few vehicles that were available, but also because they were worried about residential parking being a big issue locally. That is now changing; there is increasing consumer demand for these, and probably increasing requests to local authorities for them, so I don't expect us to have significant problems in spending this money this time around.

This is also a learning experience; we have been working with local authorities and learning from them—none of us were experts in this because it was all happening for the first time. However, it is changing rapidly, and we are seeing more commercial interest in this as a business model, so hopefully a corner has been turned on on-street charging.

Q40 **James Wild:** The £20 million, which was announced in February, is to fund an additional 4,000 charge points; that doesn't seem like a huge number. Will people have to drive around to try to find a charge point? I can't even always park outside my house, let alone be guaranteed to be able to park there if there was a charge point there. How will this work in practice?

Richard Bruce: There was also an announcement of £90 million for a local infrastructure fund, which is about finding the best model to satisfy the needs for local charging: is it rapid charging hubs locally, à la petrol stations? Is it concessions to long-term residential on-street charging? There are different models that we can use, and we need to work with local authorities to find the best way of doing it. One set of funding is about perpetuating an existing scheme; the other is about finding the best model for encouraging this roll-out.

Q41 **James Wild:** Ms Kelly, are you giving funding to local authorities to give them the expertise to bid in for this £20 million? We have had evidence from the British Parking Association, which has a lot of local authority members, that points to a lack of in-house expertise as a big barrier for the ones that haven't bid. With the towns fund and other grant schemes, there has been capacity funding for local authorities to help them bid. What, tangibly, will be different this time around?

Bernadette Kelly: I am not sure that we are doing direct capacity funding, though Richard may want to correct me on that, but we have been working with local authorities, through the Energy Saving Trust, to enable them to understand better how to accelerate and how to access some of this funding. We have been providing support and guidance through—I think—the Energy Saving Trust. I don't think it is capacity funding directly. Richard, I don't know if you want to correct me on that.

Richard Bruce: The EST provides free advice to local authorities on how to roll out local chargers. We obviously funded the 4/8 Go Ultra Low Cities and we are using those as exemplars, to spread their best practice across local authorities from their experience of what they learned. Milton Keynes put in a whole load of chargepoints and changed the parking policy to encourage their use. That is learning that we can spread across local authorities. We are doing quite a lot in this area.

Q42 **James Wild:** How confident are you that you won't be coming back to this Committee to explain that once again there has been a big underspend—a 30% underspend is huge—because local authorities haven't got the capacity, or the sense of demand, to get into this?

Bernadette Kelly: Our figures are now showing again a rapid acceleration in take-up of funding available. I don't know if we have got the latest figures on the current financial year, Richard, or if we would want to share them if they are not verified at this stage. The trend is a strong one, though.

Q43 **James Wild:** I think I read a report recently about potential pilots of changes to planning law to enable people to lay cables from their house into the street, across the pavement. Is that something you are actively exploring?

Richard Bruce: We have consulted on changes to planning regulations to make the fitment of a chargepoint compulsory in the building of new homes. I am personally not aware of changes to planning laws around

laying cables, but I can look into that and get back to the Committee if that is helpful.

Q44 **James Wild:** Yes. I think it is something I read in *The Times*; I couldn't find it ahead of this session. But I will come back to you on that.

On the consumer experience, I know that you launched a consultation last month. Again, I think there is quite a lot of activity; it seems the Government are ramping up their own things. On interoperability and the use of apps, it is frustrating enough having to use multiple parking apps, let alone the idea of having to use charging apps. Are you looking to legislate to mandate that, or are you looking for a voluntary approach, and if so, how can you ensure that it will be comprehensive?

Richard Bruce: The answer is yes. We have just launched a consultation. It is clear that the current offer is sub-optimal; people don't want to be carrying around seven different smartcards to guarantee that they can put energy into their car. You don't carry around seven different petrol cards to ensure you can put petrol or diesel into your car.

We talked to the industry about the best way of doing that, but we have got the power to regulate and I think it's highly likely that we will regulate. The question is: what will we regulate to do? The obvious answer is something akin to bank card access. Certainly, you don't want people having to download an app and join a subscription scheme to be a barrier to people buying EVs, because it's not fair.

A lot of this reflects the early market for charging infrastructure. The early movers were trying—totally understandably—to create a business model along the lines of gym membership schemes, where you sign up to the subscription service and you access their infrastructure. That is all changing now, I think. There's a lot of business and consolidation in that industry, so I would expect there to be clarity on what the minimum offer has to be. But it has to be that you don't have to join a club and have an app to access the chargepoints going forward.

Q45 **James Wild:** Reliability is obviously important here. There are quite a lot of constituents who have raised issues about chargepoints not working. You have talked in the consultation about 99% reliability. Again, how would that be enforced and would there be penalties for failure to hit that target?

Richard Bruce: Again, we are consulting on it. We have the powers to enforce it if you wanted to, recognising that it would be quite difficult. It clearly is an issue for consumers. That partly reflects some of the legacy infrastructure that is out there, which was deployed quite early on in the market for EVs. It's now ageing. That reflects on the business models chosen and it is a particular issue, I think, at motorway service stations, where effectively you haven't got a lot of choice about what you can use. We are consulting on it and we do have the tools to enforce, if you so wished.

Q46 **James Wild:** Obviously a big issue for consumers is the cost. Figure 12 of

the Report highlights the significant difference in charging at home compared to using a public chargepoint; it's potentially up to 78% cheaper to do it at home. You said that that is where you expect most people to do it, but if people have forgotten and have to charge at a public chargepoint, what are the Government doing to try to reduce that differential? Do they consider that that truly reflects a competitive offer?

Richard Bruce: There are two angles to that. One is the price for rapid charging, where what we're consulting on is transparency, so that we're really clear about what you're paying for and what the cost is—and that is the same across all chargepoints. I think competition will then drive down those costs. Obviously, it is a business and they're looking to recover the infrastructure costs, which are higher for rapid chargers. I suspect rapid charging will always be more expensive than charging overnight at home. I expect those prices to come down and that to become a fiercely competitive marketplace. The other aspect is the price of on-street charging overnight, which I would expect to be cheaper than rapid charging, but there is potentially a risk that it is more expensive than charging at home overnight.

I think the reasons for optimism on that are the influx of private capital in that area in due course, but also, as the energy system gets used to the potential of electric vehicles, there is lots of innovation that can happen to potentially benefit consumers in terms of the price they pay for electricity. You can imagine a world where consumers are signed up to a tariff where, for example, they allow the chargepoint company to turn off charging in what we call demand side response, which is about having value that could result in a reduction in the cost of electricity. They could even use the electric vehicle as an energy store to put energy back into the grid, and that would have value as well. I expect there to be lots of options for consumers to have cheaper electricity, either charging at home or on the street.

Q47 **James Wild:** I have a couple of questions for Ms Munby now about the impact on the electricity network of all of these vehicles and charging points, since the report talks about a potential 20% increase in demand. What impact do you expect the growth of the electric vehicle market to have on the network and its ability to cope?

Sarah Munby: In terms of overall number, you have given the key stat, but I think there is a bit of really important context to that, which is that we don't make a special kind of electricity for electric vehicles. We make electricity for all sorts of things. We talk in the energy White Paper about an overall doubling of demand for electricity out to 2050—so that 20% is one slice of an increase in demand. In many ways that makes the upgrading problem harder, not easier—just to make that clear.

There are a couple of different elements. One is making sure that we have got the ability to generate the energy. We have mechanisms like the capacity market and contracts for difference to make sure we've got the right sources of energy at the right time. The second is the actual network itself. I can go into more detail on this if you would like, but the very short

answer is that the transmission network operators and the distribution network operators are responsible for upgrading the network, and they do that in line with the RIIO-2 controls set by Ofgem, which give them enough space to invest in those upgrades.

Just to give you a sense of scale, for the transmission network Ofgem are currently talking about a £30 billion level of funding for network upgrades, plus potentially an initial £10 billion depending on how quickly things move. That is over the next five years. Fundamentally we have a structure of network operators, we have a mechanism for allowing them to invest, and that is the mechanism that we will use to ensure that the network is upgraded in line with the demands of both electric vehicles and the other things that we will be asking for more electricity for.

Q48 **James Wild:** Do you have a sense of how that estimate of investment feeds through in terms of consumer bills?

Sarah Munby: In the energy White Paper we talk about a 2% increase in energy bills as being the net effect of lots of things happening in the energy system, some of which push costs up. Others, like energy efficiency measures, push costs down, of course. For 2030 we've published that estimate of 2%. It's worth saying that as part of that, the Government will be investing £6.7 billion in supporting people who need to reduce their bill costs in particular. So, yes, there is a small effect, but we are not expecting the result of what we are talking about today to be significant bill increases for the typical consumer.

Q49 **James Wild:** The final one from me is to all the witnesses. Do you all currently have electric vehicles?

Richard Bruce: I do.

Sarah Munby: I don't.

Bernadette Kelly: I don't.

James Wild: I don't either.

Chair: I like my bicycle—zero emission, if not electric. Thank you very much, Mr Wild. Let's now go back to Craig Mackinlay MP.

Q50 **Craig Mackinlay:** Let's get back to what this is all about—the real brass tacks. We are trying as a country to be fairly world leading. China and India are not really taking too much notice of CO_2 output with their massive increase in fossil fuel, particularly coal-powered stations. But let's put all that aside. Britain is trying to lead the way on this. The other issue, of course, is particulates in towns, so we have two issues here. The particulates in towns are very relevant to high-density towns and cities, such as London, Bristol and others. The CO_2 is arguably relevant to all of this.

Mr Bruce, has your Department put together—and I have asked Ministers for this—a cradle-to-grave analysis of what we are trying to achieve here? Let me just go through what I see as the processes on getting a

brand-new Nissan Leaf or Tesla on to one of our roads. You have the metals production and the plastics production, and a massive CO_2 and water use to make those metals and plastics, no matter whether you are making an ICE-powered car or a battery-powered car. As we expand battery-powered car production, we have repurposing of all the existing car factories that we know and love. We have repurposing of petrol stations, repurposing of car repair garages, new equipment to be bought and a shift of skills. We have the batteries themselves.

We have touched on the advancement of battery technology, but broadly we are into the realms of nickel, cobalt and lithium. Nickel is primarily mined in Indonesia, Russia, the Philippines and Colombia. Many of those factories in the Philippines, and particularly in Colombia, have been closed because they are environmentally appalling, with massive sulphur dioxide outputs. Cobalt is broadly mined in the Democratic Republic of the Congo, and there are reports about child labour in its mining. Chile, Argentina and Australia are the primary sources of lithium, and there are also reports of some questionable environmental practices in Chile.

All of this has to be dug out with massively energy-intensive, probably diesel-powered diggers and earth movers. That is without then transporting all this stuff to the battery manufacturing plants, which may or may not be in the UK. We have discussed broadly the charging infrastructure that will be required, which will be a massive increase in energy production—hopefully by renewables, but it will mean digging up a lot of roads and laying copper cables. The copper is probably mined in Zambia or elsewhere. It then has to be transported by a heavy, oil-powered ship to get it to the UK.

Then you have the actual generation. We may be importing it, which Britain does a lot of, through cables from the continent, through the interconnectors. A lot of it is produced with fossil fuels. Let's just have a bit of a reality check here. Have you done a cradle-to-grave analysis of the CO_2 effect of this policy? I haven't even mentioned getting rid of these batteries, which are very difficult to recycle. We have very few facilities in the UK. It requires massive CO_2 use in the factories to recycle these things. Have we done the cradle-to-grave analysis of this policy compared with an ICE policy?

Richard Bruce: The answer to the question is yes, certainly on CO_2, and there are literally hundreds of such studies around the world. The vast majority consistently show that battery electric vehicles are cleaner, in CO_2 terms, than their internal combustion engine counterparts. It is important to say that an EV does not get rid of all the external costs of a car, be that in manufacture or in use—it is worth recognising that—as well as things like congestion and that sort of stuff. What it does do is significantly mitigate the carbon impact across the lifecycle. Our estimate was around 30% to 40% of the emissions, but battery vehicles are consistently shown to be lower, in lifecycle and CO_2 terms, than internal combustion engine cars.

It is right to say that they have a far greater proportion of emissions in the manufacturing phase than in their use phase, where they can be very low,

and clearly the carbon associated with battery production depends very much on where the batteries are built. If they are built in the UK, with a constantly decarbonised energy grid, that would be better than a country with a lot of coal-fired power stations. That is changing quite quickly. On CO_2, the answer is pretty clear. Lots of NGOs have done studies and have said the same thing. Basically, in lifecycle terms, EVs are better.

It is completely right to flag up the consequences of manufacturing those vehicles, and to flag up where some of the material that goes into them comes from. Manufacturers are very focused on that. They are looking at developing batteries and electric motors that do not use rare earths—Tesla is doing that, and I am aware that Renault has done it as well—and are looking at different battery chemistries. It is in their business interests not to be sourcing products from volatile areas with supply chains that they cannot rely on, or to be encouraging poor working practices. They are very focused on that, and we are very focused on it, too. We completely acknowledge that there is an issue here.

As I said previously, the fact that we are only 10 years into this development means that a lot is going to change. Although lithium currently comes from a variety of places around the world, the market for it is definitely going to expand in the years ahead. There is a lot of lithium in Cornwall, and companies are looking at using that lithium to make batteries. Yes, we have done lifecycle analysis; yes, battery electric vehicles are clearly better than their internal combustion engine counterparts; yes, we are conscious of the external costs of this on the manufacturer. It is also important to think about the counterfactual here, which is that the hydrocarbon industry is going around the world tapping into liquid fuels, often under the sea, transporting them around the world, burning them off and flaring them. It is a better system. It is not perfect, but it will get better over time I think.

Q51 **Craig Mackinlay:** Mr Bruce, I get it when you look at the standalone car. You manufacture the car, you are hopefully using renewable energy to charge the battery, and then there is an end-of-life disposal of all the bits and components. Do those analyses factor in all the extra CO_2 in the mining, the recycling costs, the ships that bring copper from states a long way away to lay the cables, or the diggers that dig up the roads? I am not entirely convinced that any of those analyses are taking the full CO_2 effect of these things.

Richard Bruce: I think they are—I will check. Lifecycle analysis is a thing—an industry in itself—and there are standard ways of doing it: carbon is apportioned to various parts of that lifecycle, which is itself audited, I think. They are thinking about transportation costs, and about the CO_2 impacts of mining and of manufacture and assembly. It is in there. I am not sure that it includes the charging infrastructure—I can check—but certainly, the manufacture, use and disposal of EVs is considered in lifecycle analysis.

You can think about where you want to constrain the analysis. It could be what they call well-to-wheel, or it could be the whole lifecycle of

manufacture, use and disposal. There is different analysis. It is very sensitive to assumptions. Some analysis, which got lots of headlines, used some fairly spurious assumptions, to be honest. Consistently, the trustworthy ones have all confirmed that EVs are better in CO_2 terms.

Q52 **Craig Mackinlay:** You can understand the reason for my question. We are embarking upon a revolution in our own personal transport. That has to be based on the right principles—I am very concerned about that. In simple terms, we carry around hundreds of kilojoules of energy in our fuel tanks, in either petrol or diesel, and we will have to replace that—because you do not get energy for nothing—either with batteries, with all the bits and pieces that I have described, or perhaps with hydrogen fuel cells, which I think have much better things associated with them. There are very few child labour costs, hopefully, in making a hydrogen fuel cell. So you can understand that we have to embark on the right path now. That is my concern. I really want to see the analysis that we are doing the right thing, because of the particulates issue.

Think of a diesel engine 20 years ago. It is very different from a diesel engine today. We have AdBlue. We have catalytic converters, and more fuel-efficient engines. We are now on Euro 6. Have we not just terminated any future technological change in the internal combustion engine, so what we have today is as good as it is going to get? Are we not committing London and other big cities to a slightly dirtier diesel engine than we might have seen had technology just taken its course, as it has done very effectively over the last 100 years of engine manufacture?

Richard Bruce: Lots of points there. Let's start with the kilojoules of energy point because that is quite interesting. One of the key advantages of a battery electric vehicle, compared with a combustion engine one, and actually a hydrogen fuel cell one, is that it is much more efficient. An internal combustion engine is maybe 20% to 30% efficient, versus potentially 70% to 80% efficient for an EV, so you need far less energy in whatever form to move a mile in an EV than you do a mile in an internal combustion engine car, which is wasting quite a lot of energy in heat, noise and other things.

In terms of the other external impacts of vehicles, it is worth clocking that every hydrogen fuel cell car has a battery pack with lithium in it. It has an electric motor with rare earths in it because it is based on an electric vehicle. The only difference is the size of the energy store and what they are using for that. You have a carbon fibre tank full of pressurised hydrogen or you have more lithium-ion batteries, but fundamentally it is still an EV. It is not like fuel cell vehicles do not have any rare earths or lithium-ions in them.

Also, in order to ensure that your CO_2 is better, you have to make sure that your hydrogen comes from green sources, which means electrolysis. Hydrogen on its own can come from lots of other things. It can have very high CO_2 emissions—worse than diesel. Most of the analysis definitely shows that, on CO_2, EVs are clearly better.

The other external impact is in terms of particulates and NOx. Basically, burning hydrocarbon fuels almost by definition creates compounds that are injurious to human health. Particulates are a known carcinogen, and EVs produce less particulates than internal combustion engine cars. At the tailpipe, they produce none. Lots of particulates come from tyre wear, road wear and brake pad wear. You get far less brake pad wear in an EV because it regenerates its battery when it brakes, rather than using brake pads. The 100,000 mile taxi I mentioned in Cornwall was still on its first set of brake pads after 100,000 miles, so there are less particulates from EVs.

I think the basic point is that, yes, there are other environmental impacts, but all the analysis shows that they are better. Zero tailpipe emissions are a really big goal. What that means is that I think it is in the interests of policymakers generally—it is recognised, because most developed economies are following the same path—to pursue zero emission as the goal in all road transport, because you will get less tailpipe emissions. You will get zero tailpipe emissions. You will also get far less noise, and noise is the unspoken pollutant. It will be utterly transformative for our towns and cities not to have internal combustion engines going around.

Q53 **Craig Mackinlay:** You didn't really address the point that we have now frozen technology in time, but there we are. May I pick up a couple of points that I think were raised earlier by you, Ms Kelly? Rapid charging has been discussed as a sort of panacea. You will be able to go to a fuel station of the future and get 80% charged in 20 minutes while you have a cup of coffee and a convenience break on a long journey. Surely rapid charging is high energy, and that destroys the long life of batteries, just as at home. Fast charging is not an efficient way of deep cycling any type of battery, so those huge costs of £5,000 for the fairly cheap Nissan Leaf are going to be advanced more rapidly by this fast-charging method.

Let me put another one in. This will require some sort of intervention from BEIS, I believe. Charging, especially fast charging, as I say, makes heat. Many businesses are not allowed by their insurance policies to charge indoors overnight. If there is a fire, they will not be covered. I do not know quite how we are going to manage that in an insurance market.

No. 3 is public charging. We have discussed that people fortunate enough to have a home with a driveway can install a charger and can trickle charge it nicely overnight, possibly using a cheaper energy deal at a decent cycling rate that will make sure that their battery lasts a long time. Public charging will be required by lots of people who live in cities who do not have the benefit of a driveway. Public charging is likely to be more expensive per kilowatt-hour than domestic charging, where the person has managed to do a better deal. Are we not condemning those who do not have the benefit of a driveway to a higher per-units motive power charge than the wealthy? I am worried that we are actually going to inbuild inequalities if people have to rely on public charging. There are a few important issues.

Bernadette Kelly: I will start, but as ever I will pass on to Richard, who is demonstrating that he does indeed have the encyclopaedic knowledge that I signalled at the beginning of the hearing. I think Richard will particularly be able to answer the question on the impact on battery life of rapid charging, so I will ask him to take that.

On your point about the price differential between public charging and home charging, in a sense I think we have discussed that in this hearing. I absolutely recognise that the differential is there. What we expect and are seeking to ensure happens is that, as this market develops and becomes more competitive, we will see some of those prices for public and rapid charging shift too. A competitive market will drive better-value public charging, which will reduce that differential to a degree. It may not eliminate it, so to some extent there will be some inequality in that, but it will diminish that, I think.

The insurance point is quite tricky. I do not know whether Sarah is able to answer that. Richard, do you want to answer on the impact of rapid charging on battery life?

Richard Bruce: I am happy to come in on that. I think this is one of those areas that, a bit like battery degradation, people are very concerned about. I do not think there is definitive evidence on this. Manufacturers have invested heavily in managing rapid charging, so you now have cooling systems in battery packs and in rapid chargers themselves, to manage that risk. I have not seen substantive evidence that rapid charging consistently damages the longevity of battery packs. There are taxi firms running only EVs, and they are rapid charging two or three times a day, and they have been quite happy with the longevity of the battery packs. I think there was some early evidence. There was a particular issue in Arizona, but that was about very high temperatures, where it was around 40°C, and they had battery pack degradation there. Generally, globally, I do not think there is an issue.

On the insurance point, that is the first time I have heard that—

Sarah Munby: I am happy to come in on the insurance point. I hope you will forgive me for giving a general answer, but I think the general answer is the answer to the specific, which is that we have one of the world's most sophisticated insurance markets—you can buy specialist insurance for windsurfing—so I have absolutely no doubt that our brilliant insurance market will be able to provide insurance for people to charge indoors overnight. I am completely confident in that.

Q54 **Chair:** You say you are confident. Have you actually had any discussions with the insurance market?

Sarah Munby: I personally have not got into this issue. In general, we would expect the insurance market to provide products that people need without a requirement for a great deal of Government intervention. It is not something that is a top priority. I could follow up on whether somebody in the Department has had that discussion. However, right now,

it is not in our top five issues, simply because we really do think that the market solves these problems really well.

Richard Bruce: I am happy to take that away and investigate it. There are bus depots charging EV buses and van depots charging EV vans now, and I have not heard about this being an issue previously, but I am happy to investigate it and get back to the Committee.

Q55 **Craig Mackinlay:** Thank you for that. The trouble is that this is all counterfactual—"If we take one path, we will go there." I want to be absolutely convinced, and I remain unconvinced, that the path we are taking will lead to a CO_2 reduction across this planet. I am worried that we cover ourselves with virtue—at a huge cost to the taxpayer—by offshoring a lot of this CO_2 problem. Our domestic CO_2 output that we measure does not really include it all, because we have bought the bits and pieces from around the world, where we no longer make them in the UK, or even bought energy abroad through interconnectors instead of producing it in the UK. I need to make sure, in my mind, that this pathway we are on is actually having the outcome that we want. I am very concerned that we are stopping any further technological change of the ICE, and that will be to the detriment of London over the next 10 years—I have no doubt at all—because the engine in 2030 will be in a very different place.

Chair: Can we have a question?

Richard Bruce: Shall I respond on that point? The car manufacturers are very cognisant of the fact that the location of where they assemble their batteries has a clear bearing on the overall carbon impact of the vehicles, which is why you will see that the Tesla Gigafactory in Nevada is covered in solar panels. It is why BMW located the plant for their i3 where they could get 100% renewables. It is why Volkswagen are sourcing 100% renewables for the battery packs to go into their ID.3. We can be assured that, in use, they are definitely a lot better, and we can also be assured that manufacturers have clocked this. We cannot account for the carbon policies of China, but all the lifecycle analysis shows that it is better—if you take an average energy mix for all of Europe, for example. I think we can be confident that it will be better. We can be confident that tailpipe emissions will be basically zero, and that will be a lot better for health, because that is also a massive, massive issue.

Bernadette Kelly: Can I just add something to answer the point about whether we are freezing in aspic all technology changes to date? I don't think that it true. We have regulatory instruments to ensure that we continue to drive lower carbon emissions from ICE vehicles as well. We will be setting out a Green Paper later this year, I think, on the post-EU regime for carbon emissions. Obviously, in January 2020 we brought the fleet standard down from 130g/km to 95g/km. There are clearly choices about how we change those standards in future. Similarly, on other vehicles, like buses, we are not abandoning regulatory instruments to drive progress elsewhere, so I don't think that is a valid concern.

Sarah Munby: Could I come in on the point about, effectively, importing dirty electricity? It is really important to say that if you stay locked into an internal combustion model, it is very hard to ever meet your net zero target. We do not think that model would be compatible with meeting net zero—just to be clear—however much you continue to make incremental improvements to the efficiency of diesel engines, for example.

Specifically on the point about importing energy via interconnectors, I do not have the 2020 number to hand, but for 2019 92% of the energy that we used in Britain was generated here, so only 8% came in through the interconnectors. We obviously also export energy through interconnectors. The cleanness of our domestic energy system is by far the main driver of whether we are using green electricity in this country. Yes, that is a small issue at the margin, but it really is marginal in the grand scheme of the comparison between a petrol-based ecosystem and a battery-based ecosystem.

Chair: I thank our witnesses very much indeed for their time. This is a really important area. The Government have a stiff target—nine years to achieve this change—and I think we have highlighted some of the challenges, which, obviously, you are aware of. We are keen to keep a close eye on this, so I am sure that our report will reflect that and the fact that we will be wanting regular updates from you when we cannot get that through the information you already provide. We will be doing a close analysis of the data that is available.

Thank you very much indeed. The transcript from this session will be up on the website uncorrected in the next couple of days, and our report, we hope, will be out in the next few weeks.