



# Science and Technology Committee

## Oral evidence: [Technologies for meeting clean growth emissions reduction targets](#), HC 1454

Tuesday 26 February 2019

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[Watch the meeting](#)

Members present: Norman Lamb (Chair); Bill Grant; Darren Jones; Stephen Metcalfe; Damien Moore; Graham Stringer.

Questions 92 - 229

### Witnesses

[I](#): Amanda Lyne, Chair, UK Hydrogen and Fuel Cell Association; Andy Eastlake, Managing Director, Low Carbon Vehicle Partnership; and Tanya Sinclair, Policy Director UK and Ireland, ChargePoint.

[II](#): David Weatherall, Head of Policy, Energy Saving Trust; Jenny Holland, Senior Public Affairs and Policy Specialist, UK Green Building Council; Sam French, Decarbonised Gas Alliance; and Graham Hazell, Consultant, Heat Pump Association.

Written evidence from witnesses:

- [UK Hydrogen and Fuel Cell Association](#)
- [ChargePoint](#)
- [Decarbonised Gas Alliance](#)



## Examination of witnesses

Witnesses: Amanda Lyne, Andy Eastlake and Tanya Sinclair.

Q92 **Chair:** Welcome, all of you. Thank you very much for attending. If any members—or, indeed, witnesses—have any interests to declare, now is the appropriate moment to declare them.

**Amanda Lyne:** I run a company that converts vehicles to run on hydrogen.

Q93 **Chair:** Thank you very much. I would be grateful if you introduced yourselves very quickly.

**Tanya Sinclair:** I am the UK and Ireland director of policy for ChargePoint, a manufacturer of hardware and software for electric vehicle charging.

**Andy Eastlake:** I am the managing director of the Low Carbon Vehicle Partnership, a public-private partnership, funded partly by the Department for Transport and partly through membership funding, to accelerate the uptake of lower-carbon vehicles and fuels.

**Amanda Lyne:** I am chair of the UK Hydrogen and Fuel Cell Association. We are an industry membership organisation covering everything from hydrogen energy to hydrogen in transport, fuel-cell technology and other hydrogen technologies to enable the energy transformation.

Q94 **Chair:** As I understand it, transport is the only sector where emissions have increased since 2012. How confident are you that that trend can be reversed? Do you feel that the Department for Transport is sufficiently committed to the decarbonisation of transport in this country? Who wants to start?

**Tanya Sinclair:** I will start.

**Chair:** Go on, Tanya.

**Tanya Sinclair:** I will take the latter part of the question first. Not only do we see a commitment from the Department for Transport and the Government more widely—there is a cross-Government effort to meet these targets—but we feel that the consistency of policy over the last decade has been really supportive in enabling the market to deliver low carbon, low emission vehicle solutions.

Q95 **Chair:** So why are emissions going up?

**Tanya Sinclair:** I cannot speak to that personally. At ChargePoint, as a manufacturer, we see that—

Q96 **Chair:** It rather undermines the sense that the policy is effective, does it not?



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**Tanya Sinclair:** The electric vehicle market is in its early stages. We are now seeing an increase in the pace of adoption of these vehicles, not only in passenger cars but in vans and other categories. We need to give the market time to establish itself.

Q97 **Chair:** Aren't the numbers of electric cars lower than anticipated?

**Tanya Sinclair:** The Government may have set targets and understood a market adoption curve, but perhaps we did not know exactly how the curve would take shape. Now the market is establishing itself. The rate of increase of adoption of the vehicles is going up. We are certainly seeing a very robust and strong business in the UK, which means that increasing numbers of electric vehicles are coming on stream.

Q98 **Chair:** You are broadly satisfied with the Department's efforts.

**Tanya Sinclair:** Yes.

Q99 **Chair:** What about you, Andy?

**Andy Eastlake:** I take a slightly different view. There is certainly a great deal of commitment in the "Road to Zero" strategy—the document that lays this out. To its credit, that covers a wide range of the potential technologies needed, but I would say that we have not articulated sufficiently the policies needed to deliver on that. While electric vehicle uptake is increasing, I concur that it is not increasing at the rate that we probably need to see to deliver the trajectory defined in "The Road to Zero".

We have a mixture of slightly counterintuitive policies from different areas. For example, the way in which company car taxation has been quite severely disrupted over the next couple of years has undermined some of the electric vehicle uptake that we want to see. Things like freezing fuel duty also send a mixed message about whether it is planned that conventional vehicles will be removed from the market in 2040, as has been articulated.

There is still a lot to do on the policy. We have a vision and a strategy, but delivering that—and delivering it in a very coherent way—needs further significant activity. Bringing the consumers and the public with us is one of the primary issues. I do not think that we have a technology problem. I think we have an adoption, uptake and acceptance challenge.

Q100 **Chair:** Is there an urgency to getting this sorted out?

**Andy Eastlake:** There is an urgency in the rhetoric and the strategic direction. I do not think that we have it—

Q101 **Chair:** What I am saying is, does there need to be an urgency in sorting out the policy?

**Andy Eastlake:** Absolutely. We need to take a more urgent approach to this, in terms of air quality and of decarbonisation. We have specific



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targets for 2020 that we are in danger of not meeting—and that is just a year away.

Q102 **Chair:** What do you think, Amanda?

**Amanda Lyne:** I would be with Andy—and even further the other way. My personal view is that we are not doing enough fast enough. The reliance on EVs and the technology for them maligns all the other areas where we are not delivering, whether it be heavy duty and other forms of transport or even long-range technologies.

The fundamental challenge Andy came to at the end is that at the moment we are heavily reliant on change of behaviour. That is a consumer driver requirement that will take many years to change. When I spend my time out in the real world, for commercial vehicle operators or whatever, EVs are largely a distraction.

Q103 **Chair:** A distraction as far as heavy goods vehicles are concerned.

**Amanda Lyne:** Yes. The major issue that I see in the “Road to Zero” strategy is that we have to resolve infrastructure issues. At the moment, whatever we have been able to do, we have done with the existing infrastructure. In the case of EVs, we all pay for that, because the distribution is paid for through Ofgem-agreed regulated businesses. The district network operators are facing a major challenge in how to present their investment cases. Are we forecasting big or small amounts? Is the take-up there? We are about to need to sign up to a lot of electricity supply investment. Certainly, if we ignore hydrogen technology at the moment, we will probably find that we are investing in things we may not have needed to invest in if we had been a bit more strategic in our thinking.

Q104 **Chair:** The Government’s long-term targets for decarbonising road transport have two focuses: sales of low emission vehicles and average tailpipe emissions. Are those the right metrics to drive emission reductions? If not, what metrics would be appropriate to indicate progress that we are making against these targets?

**Andy Eastlake:** The metrics certainly are not right for the very long term. We are really describing a mobility system, rather than a fleet of vehicles. We need to think about decarbonising mobility in a far more proactive way. There are a number of steps within that.

Q105 **Chair:** Do you need both short-term and long-term targets?

**Andy Eastlake:** We need short-term and long-term targets. A focus on trying to increase the uptake of electric vehicles is not a bad focus in the short term, but in the long term we probably do not want 40 million very large electric cars circulating on our roads in the same way as we have 40 million vehicles currently.

Tailpipe emissions are a very interesting point. We need to be far more enlightened about how we approach that. Tailpipe emissions are only part



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of the story, of course. We have some great thinking here about well-to-wheel emissions. Our buses are already assessed for grants on a well-to-wheel basis. We look at the fuel production, as well as the consumption on the vehicle. That is critical when we start talking about any of the fuels—hydrogen or electricity—that are zero emissions at the tailpipe. The way in which they are produced is critical in understanding the true impact.

Q106 **Chair:** The tailpipe is important as far as local pollution is concerned, but as far as climate change is concerned you need to look at the full picture.

**Andy Eastlake:** Actually, I think that we need to look beyond well-to-wheel emissions. We need to look at life-cycle analysis. There is significantly more embedded carbon and embedded energy in the production of an electric vehicle.

Q107 **Chair:** Particularly as far as the battery is concerned.

**Andy Eastlake:** Absolutely.

Q108 **Chair:** In whole-life-cycle terms, does the drive towards electric vehicles make sense?

**Andy Eastlake:** Yes, absolutely. There are two things that I would like to qualify. Electric vehicles encompass fuel-cell electric vehicles. They are electric driven. It is then a question of how you store the energy on board. We ought to be thinking about that differentiation when considering what the right solution is for the right vehicles.

As I mentioned at the start, what we probably do not want to do is create a market that is similar to our current market for vehicles, where an individual buys a vehicle that is capable of doing 500 miles on one refuelling. That would be a huge battery and unnecessarily burdensome on a life-cycle basis, albeit that there would be zero emissions at the tailpipe. We need to be thinking about that. That is already something to think about.

Q109 **Chair:** What do consumers do? On the face of it, if consumers are concerned about these issues, they will think that buying an electric car is a good thing. Are you saying that buying an electric car that has a long range with the battery is actually a bad thing?

**Andy Eastlake:** Not at all. What I am saying is that you want to buy the right car for the application. Buying a long-range electric car and then not using it significantly is a bad thing. You should buy the right car for the application. That is one of the steps we have to go through—to change our mindset in terms of the way in which we think about mobility, and the metrics that we use to assess the efficiency of that.

Q110 **Chair:** Is there a serious concern about particulates from the wearing of rubber on the tyres of electric cars, because of their weight, and the lifting of dust from the road? Are those serious issues we need to be concerned about?



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**Andy Eastlake:** From my perspective, particulate pollution is definitely a serious issue. We have addressed the issues with tailpipe particulate pollution very effectively, through the use of traps and after-treatment. As you are aware, at the moment there is a call for more evidence on resuspension and brake and tyre wear. I do not think that there is sufficient evidence on exactly what the emissions are.

Personally, I do not believe that any electric vehicles are any worse if they are used effectively, given the regenerative braking that they use. The more those vehicles use regenerative braking and the more efficient we can make them, the less brake wear we will see. The tyre manufacturers have done a great deal of work on tyre wear. There are lots of interesting studies.

There is also a really important point about understanding what we mean by particulates. Particulate size is a critical aspect. When we talk about particulates, we might talk about the total mass, which is dominated by large ones, or the total number, which is dominated by small ones. The health effects, and the dominant effects in terms of emissions, are very different. Particulates are a whole science in and of itself.

Q111 **Chair:** Does either of the other two witnesses want to say anything about the metrics we should be using to measure our progress?

**Tanya Sinclair:** I come back to the original question. Andy covered a bit of the juxtaposition of the national climate change targets and local air quality targets, which are focused more on different types of particulate emissions. They all have to sit together and reach the same objective.

In cities, car use—how people use their cars and what kinds of cars they are using—is obviously a key concern, but buses are also very important. It is a really positive step that the Government have committed themselves to funding some electric bus trials and a hydrogen trial, and charging stations for those vehicles. That also has to be considered when looking at how vehicles other than cars and private drivers contribute to the national and city-wide picture.

Q112 **Chair:** Are you saying that there should be different metrics to measure progress?

**Tanya Sinclair:** No.

Q113 **Chair:** Are you saying that what we have is fine?

**Tanya Sinclair:** There needs to be better alignment between the two.

**Amanda Lyne:** There are two parts to your question. In the short term, we are doing what we can do at the moment. The challenge is, how do we make a difference or make anything happen, looking at real-world use cycles of vehicles? We have now moved to the WLTP cycle for passenger cars. There is a very different set of metrics for commercial vehicles that



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are operated. The EU has just put in place targets around incentivising OEMs to reduce the commercial vehicle output.

Our challenge in the UK is that we are very dependent on what the norms are outside the UK to do anything to impact on OEM-source vehicles or OEM standards. That is a big question for us.

Some really good work is being done by Transport for London, on the back of bus work and real-world cycles for refuse collection or other vehicles. We are learning that the real world is very different from what you need to do on vehicle standards. The challenge that we have is, how can we do anything about that when the OEMs are making vehicles in certain ways? The bus programme is an interesting example of how we have followed up with technology implementation separate from what OEMs were doing to help us to reflect a local demand—similar to what Tanya was talking about—in order to address regional requirements and the genuine air quality impacts in cities, as opposed to other areas.

**Q114 Chair:** The UK has a target to end the sale of conventional vehicles by 2040. It is less ambitious than many other countries' targets. Is there a danger that the UK's target risks our becoming a second-tier country for low carbon vehicle development and is potentially damaging economically for this country? In other words, should we be more ambitious?

**Tanya Sinclair:** I will answer that first. Rather than position the UK as a potential second-tier market in terms of its conversion to EVs—electric vehicles—studies that have been done over the past six months to a year see that, actually, the market will begin to gather pace and to take hold in a way that means that we will exceed those targets, due to market forces alone.

Obviously, that is dependent on a number of factors. It depends on Government support being right and positioned at the right level for the right types of vehicles, on those vehicles being available to consumers when manufacturers say that they are going to bring them to the UK, and on the rate of consumer adoption continuing and the positive feeling that existing electric vehicle drivers have about their vehicles being able to carry through from the first mover group of market adopters to the mainstream. It remains to be seen, but I—

**Q115 Chair:** Are you happy with the Government's target of ending conventional vehicle sales by 2040? I am not clear what your answer is on that.

**Tanya Sinclair:** I think that 2040 is an appropriate target, but we could see that target exceeded. That point could come earlier, but it does not mean that the target needs to be—

**Q116 Chair:** You would just rely on market forces to achieve that. I turn to Andy.



**Andy Eastlake:** I think that we have to be more aggressive than that if we are going to decarbonise in the way in which we need to do to meet the carbon budgets that exist. In 2040, we probably do not want to be selling and using 2.5 million large electric vehicles in the way we are at the moment. We have to be more sophisticated about the targets for 2040.

Q117 **Chair:** Is one option for the tax regime for the licensing of vehicles not just to distinguish between vehicles on the basis of their emissions, but to look at the whole life cycle? Does that need to be considered?

**Andy Eastlake:** In that timeframe, we have to look at the whole life cycle of vehicles. We also have to look at where and how they are used. Our objective is not to have a lot of zero-emission vehicles on the road, but to have zero-emission mobility. That can be delivered through a combination of buses, cars, small L-category vehicles—not the current type—rail and trams. We need to deliver a mobility system, not a fleet of vehicles.

Q118 **Chair:** I understand. Amanda, are you happy with 2040? That is the first question.

**Amanda Lyne:** I do not think that 2040 is strong enough. When you start to look at commercial vehicles, buses and things like that, you find that the vehicles are on the road for longer than 10 years, so we will certainly be impacted technically on that.

We have a target for 2020, and then we have something in 2040. It feels like we expect to fall off a cliff and suddenly do it all at the end. The reality for real users is that they are making decisions now. Some of them are very positive. There are lots of individuals or businesses that want to do something sooner than that.

Q119 **Chair:** For instance, some vehicle manufacturers have been far more ambitious than the Government target, have they not?

**Amanda Lyne:** I will take hydrogen as an example. I would say that we are also-rans on hydrogen. There are other examples outside the UK that are much stronger and clearer about the role that hydrogen will play, particularly in long-range technologies, which Andy talked about, and other applications.

The reality for somebody on the ground, if you run a commercial fleet or are using a company car, is that the incentives to go to low emission or zero-emission vehicles are just not there, without some form of carefully thought-through incentivisation. It is right to question that we should have a programme to support all that we are trying to do. It needs to be carefully thought through, instead of being a sledgehammer.

Q120 **Damien Moore:** Do you think that Government policies are sufficient, and sufficiently co-ordinated, to drive consumer demand for low carbon transport?





**Tanya Sinclair:** I will give a perspective on how we at ChargePoint see Government policy in order to answer that question. Compared with other markets where ChargePoint operates in Europe and around the world, we benefit from having a single point of contact within Government, the Office for Low Emission Vehicles, as a single Department, co-funded by BEIS and DFT, co-ordinating low emission vehicle policy across the piece, whether it is for the vehicles, for the infrastructure or for the R&D. In and of itself, that is an extremely important thing to have in co-ordinating and ensuring that policy is designed in a consistent manner.

When it comes to the infrastructure, which is where we specialise and work, the policy is set out very clearly in "The Road to Zero". For funding and incentivising, it has been fairly consistent over the years. The same types of chargers have been offered purchase incentives. We get a relatively long notice period, in terms of Government support, about whether those incentives may change. Current incentives for infrastructure, for example, are guaranteed until mid-2020.

On that basis, there is a good signal to consumers that the Government are consistent in their support. The Government seem to be very clear that, if they chop and change their policies over the years, that in itself sends a signal to consumers that the Government do not take seriously their choices or what technologies they believe are going to meet climate change targets and so on.

My final point is that the Government are very conscious of the last decade's position change on diesel and are keen to learn from that, to ensure that they have a clear message that consumers understand.

**Andy Eastlake:** From my perspective, it is not sufficiently co-ordinated across Government to deliver a consistent message—a consistent long-term message, which is critical. We have some very clear long-term objectives, but we do not have the steps, processes and policies in place to deliver those objectives in the way we have articulated.

We have seen stop-start activity around grants, for example. We do not have a clear vision of how we are going to transition our road taxation structure, fuel duty. There is no doubt that, if we deliver on our objectives, that will be a significant hole in Treasury finances, but we have not articulated how we are going to address that. I think that there is a much more co-ordinated way of thinking about how we transition from where we are today to the vision that we have of the future. We are not short of vision—we are short of structured policy across all of the areas, to deliver that in a coherent way.

**Amanda Lyne:** I agree with Andy. I want to give you an example. Recently I saw a really good presentation from the National Trust for Wales. It has done some really good work on putting in electric charging points. One site—Powys castle, in the north of Wales—has 180,000 visitors a year. On a peak day, it will have 5,000 visitors. The National Trust's analysis says that 50% of them will come more than 150 km. The



trust is keen for people to stay for two or three hours, because it makes its money out of selling coffee and cakes and doing the visit. In essence, the car park needs charging for nearly 5,000—certainly, 2,500—vehicles, in an area where I am not sure that the DNO has any real understanding of how it is going to get the electricity to the point, or people will not visit that destination.

Scottish Power networks up in the area have done some brilliant work to try to understand forecasting demand. I understand that some of the components and parts that you need are on seven to eight-year lead times. For some of the transformers, we will be digging up roads for the next 20 years to deliver even low-level EV take-up. In that particular case, it is not currently under the Government's control, because it is largely controlled through Ofgem, RIIO and negotiations on regulated businesses. From observing, I am really not sure that we have worked out how we are going to do that kind of infrastructure. I know that the national infrastructure guys have got it, but—

**Q121 Damien Moore:** Is there any evidence yet of an impact on sales from the recent changes to the plug-in grant? Have those affected anything?

**Andy Eastlake:** We had another reduction back in October or November. We had the highest level of battery electric vehicle sales, at just over 1% of new car sales in December, so clearly there was some focus on getting those electric vehicles. We are still at a level of innovator adopters for plug-in vehicle sales. Over 99% of the vehicles sold last year had an internal combustion engine, so we are still not making the transition—the exponential rise—that we need to see. I think that I am right in saying that sales of battery electric vehicles increased by about 15% last year, year on year. That is not an exponential rise, in terms of the levels that we need to see.

**Tanya Sinclair:** However, they increased in a declining market. The market for car sales overall is falling, and battery electric and hybrid vehicles are rising as a proportion of that overall. I see Andy's point. We should not necessarily be concerned about the fluctuation of the figures, which is due to broader economic factors and all sorts. The question is, where are the opportunities to engage consumers more? We feel that infrastructure is one of those.

**Q122 Damien Moore:** There has been a 55% increase in average car emissions, due to people choosing higher-emission models. Should vehicle excise duty be amended in respect of people buying these models? Would that be enough? The models that you have are not the sexiest cars on the road, are they? To be honest, somebody is not necessarily going to look at a car and say, "Wow, the road tax is really cheap on that." They are going to say, "Am I going to look good getting out of that?"

**Andy Eastlake:** Can I come back on the 55% increase in CO<sub>2</sub>?



Q123 **Damien Moore:** That is according to the Society of Motor Manufacturers and Traders.

**Andy Eastlake:** The last Government-quoted figures show that the average CO<sub>2</sub> for new cars has gone up to about 128 grams per kilometre, so that is not a 55% increase.

Vehicle excise duty is an interesting policy. It is quite powerful in the used car market because it is very visible, and, anecdotally, in the past people were looking for low VED-rated vehicles. Personally, I believe we have undermined the use of VED as a tool in driving CO<sub>2</sub> behaviour. There is significant CO<sub>2</sub>-related VED in the first year. Very few people see that because it is wrapped up in the price of their vehicle or their lease. Eighty five per cent. of vehicles are financed in some way; these days, not many people buy a vehicle with cash. The used car market is where VED potentially has more power and capability, and now there is a flat-rate VED for anything other than a zero-emission electric vehicle.

Q124 **Chair:** To be clear on the figures, 55% of the increase in average car emissions is due to people choosing high-emission vehicles.

**Andy Eastlake:** So, yes.

Q125 **Chair:** But it does mark an increase in people buying SUVs rather than super-minis—that is the problem—and the incentives are not pointing sufficiently in the right direction.

**Andy Eastlake:** Yes. A number of policies are in place that can potentially help us to drive CO<sub>2</sub> behaviour. VED is one of those; fuel taxation or fuel duty, which has been frozen for over 10 years, is another one that sends a very strong message.

Company car taxation was a very progressive and clearly laid-out CO<sub>2</sub>-related policy. That has been significantly disrupted over the past two years specifically in the low emission vehicle sector. I think it will rise to 16% next year and drop down to 2% the year after, so it is a hugely disrupted policy.

**Amanda Lyne:** We do not have a problem. Anybody driving a fuel-cell or electric vehicle loves it. I do not know whether you saw a recent article in *The Daily Telegraph*, but so did the journalist in that case. It is only infrastructure that is standing in the way.

Q126 **Damien Moore:** What about other financial incentives that could be used to support low emission vehicles? What do you think could be used other than vehicle excise duty? Do you think a good start would be to get the Government to encourage fleet vehicles to adopt low emission models? That would be a good start because you are doing it en bloc and you can give companies tax incentives for doing that. It is a quicker and efficient way of doing it.

**Amanda Lyne:** As in examples elsewhere, there could be public sector fleet targets that talk specifically about percentages that need to be zero



or ultra low emission. The bus programme has been supported actively to help do that. Some incentives for consumers linked to company cars are reflected in some of the work, but we could do a lot more with that.

Other measures are local and regional air quality-linked incentives. At the moment we are restricted to Euro 6 diesel-equivalent vehicles in the air quality zones, but we could do a lot more locally to incentivise and go beyond what is currently available with the technology solutions.

**Tanya Sinclair:** I agree with that, particularly on public sector fleets. There are some really great examples of innovation and leadership going on in the public sector when it comes to fleet adoption.

Q127 **Chair:** Do you mean at local authority level?

**Tanya Sinclair:** Yes. I can think of two off the top of my head: Nottingham City Council and Swansea Council. They have converted vans, or facilitated the adoption of electric taxis. In addition to the targets, there is a need for greater sharing of information between them and conversations more broadly about the projects they are doing. I think they are transferable in many cases. The larger and better funded authorities with better expertise and funds can inform others about EV adoption as well.

**Andy Eastlake:** Some of that work is going on. There are some very good pockets of activity. Milton Keynes is probably a great example where there is a raft of incentives and infrastructure. It probably has one of the most ambitious uptake rates of electric plug-in vehicles.

The fleet sector has traditionally been the lowest carbon sector. It is arguably making a more rational decision based on CO<sub>2</sub> because of the structure of company car taxation. That is definitely a place to target ultra low emission vehicle adoption and try to push those necessary vehicles in particular to be the cleanest ones we can. It is far more difficult to change an emotional purchase of an SUV for the school run than it is a company for a necessary vehicle for which there are potentially more tools in place that we could use to drive adoption. I would certainly see that as a clear focus for us.

Q128 **Darren Jones:** My house in Bristol does not have a driveway, and I cannot always get a parking space outside my house. How do I charge my electric vehicle?

**Tanya Sinclair:** I have the same problem. There are a number of innovations, some of which the Government have stated are worth exploring and investing more in the "Road to Zero" strategy. One of those that comes to mind is running a charging cable through a lamp post.

That has been trialled in a number of local authority areas, with, I understand, quite a lot of success. The key is behaviour change. With electric vehicles we feel we always have to have somewhere to charge, and we have to have somewhere outside our house to charge. It may be



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the case, perhaps not in yours or mine, that at someone's workplace there will be somewhere to charge, or that when they stop their car at a station car park there will be somewhere to charge. Not having that charging station outside their house may not be the critical issue we automatically think it is.

We tend to think of electric vehicles as the first generation with a range of sub-100 miles, whereas today, albeit you have to be able to afford it, the range of a lot of electric vehicles is upwards of 250 miles. We need to think less about the anxiety of always having to plug in the vehicle and more about the range of places and ways we will be driving and using an electric vehicle.

Q129 **Darren Jones:** But one of the issues, is it not, is how quickly I can charge my vehicle? A lamp post plug-in is probably not going to have the infrastructure to deliver enough power to do it quickly. Take my flat here when I am in London. I do not know how many flats are in the block, but there is a lot. It is a new build and there is one charging point in the basement garage. A colleague of mine, another Member of Parliament—I will not name her—got an electric vehicle and it was an absolute nightmare. She has to spend about an hour and a half at Reading service station, if she can get a charging point that works, to charge her vehicle in time. People do not have time to hang about a lamp post or slow charging point to charge their EVs, do they?

**Tanya Sinclair:** There are two parts to that question. Lamp post charging is about having the right type of charger for when you need it. A charger in a lamp post, or one outside your house, should only need to be slow because the car will be there for, say, eight to 10 hours. I will not get into the technical matters, but 3 kW to 7 kW should be fine for that.

When it comes to bad user experience and the charging that your colleague has told you about, I have a lot of sympathy for that. By way of background, an American company has spent 10 years growing the charging market in America. It came to the UK a couple of years ago and found that we as EV drivers accept quite a low level of service, usability and user experience. You mentioned broken charging and the wrong speeds in the wrong place. That does need to change. As a market, we all need to bring up the standard.

When it comes to how Government can help on that, the Automated and Electric Vehicles Act passed last year does have powers for the Government financially to penalise charging station operators whose chargers are not working. They need to switch on those powers to enable drivers to have confidence in using chargers.

Q130 **Darren Jones:** Bristol is a pretty good city when it comes to these issues. My constituency has some public charging points at the park and ride, which is about a 20-minute drive from my house, and two charge points at Ikea, but one is only for Nissans and the other is for other cars. Other home stores are available, but am I supposed to drive 20 minutes



and wait an hour and a half, and then go where I need to go? How are we going to make this work?

**Amanda Lyne:** You are leading straight into the reason we all believe that hydrogen technology can end up addressing some of that issue. I drive an electric car, so I have a charge point at home. I have a drive. I allow it to charge for three hours because I am in the house. I might be able to do it at the workplace. The reality is that for mass market take-up of long-range vehicles you need to be able to recharge in five or 10 minutes, which is what you get with a hydrogen vehicle. That is the real reason Toyota, Honda, Hyundai and a whole raft of other OEMs, certainly in the commercial vehicle space, understand the role that hydrogen will play.

Q131 **Darren Jones:** On infrastructure, how do we get there?

**Andy Eastlake:** The first thing to remember is that about 60% of people have off-street parking.

Q132 **Darren Jones:** I thought one third of homes in the UK did not have off-street parking.

**Andy Eastlake:** Probably about one third of homes do not have off-street parking. About 60% have off-street parking. There is a mass market that could very easily transition to home-based chargers. There are already policies coming in about insisting that new builds have charging built into them.

Q133 **Darren Jones:** Is that just one charging point or enough of them for the people living in the building?

**Andy Eastlake:** If they are slow chargers, which is what you need if it is a residential building and you park there overnight, you should be able to facilitate those in a smart way. Smart or managed charging is a key part of what we need to do. There is definitely a mass market that could adopt electric vehicles relatively quickly.

There are also a number of people who make the use of an electric vehicle work for them. They charge for 25 minutes once or twice a week at most and use it a little more in a conventional way. It is a slightly different experience, but it is quite feasible to do it. As Tanya says, there is workplace charging for people who are doing a regular commute and destination charging.

The challenge is that it is a different and far more variable and complex model to deliver the energy to those electric vehicles than for conventional gas and diesel, which works and everybody understands, but it is absolutely feasible for us progressively to increase the uptake of electric vehicles.

I drive an electric range-extended vehicle for exactly those reasons. I have a charger at home and I do not have to worry about whether I can find a charger whenever I go on a long journey. Research coming out



soon indicates, I think, that in the mass market that sort of model is more likely to be taken up than a pure electric vehicle. I think we have focused a little too much on the early adopters and innovators, most of whom are very passionate advocates, but mainstream consumers want convenience and ease and do not want risk to their travel. That may influence what types of vehicle we push forward over, say, the next seven or eight years.

**Q134 Darren Jones:** Andy, you have touched on this already, but I want to go a bit further and hear others' views not about the consumer end of the infrastructure question but generation and flexibility of provision. If we reach our targets for electric vehicle take-up, do we have enough secure capacity to provide that amount of electricity?

**Andy Eastlake:** If we do it in a smart way. If 30 million electric vehicles all came home at six o'clock at night and plugged in and wanted to charge at 7 kW, we would not. The chances of that happening are very slim, but we are co-ordinating an electric vehicle energy task force for exactly these reasons.

**Q135 Darren Jones:** Why do you think it is a slim chance? Logically, there is a high risk, is there not, that you come home from work, plug in your car and do not go out again?

**Andy Eastlake:** The risk of everyone coming home and plugging in is high, which is why we have to think about it and plan it. Not everybody needs full charge immediately and for the whole period. Ninety eight per cent. of journeys are less than 50 miles, and average car mileage is going down. Therefore, the amount of energy you need to do the journeys you are making is probably not as significant as you say.

**Q136 Darren Jones:** Your point is that you need to let consumers come home and plug in their cars, but other people need to allow it to be smart. How sophisticated are our charge points in terms of flexible tariffs and deciding when to turn things on and off? Are we anywhere near the concept that you might be able to store energy in your car and make some money by selling it back at peak times? How far away are we from that?

**Tanya Sinclair:** In a short sentence, not very far at all. To return to your last question, Andy mentioned that the EV energy taskforce was commissioned by the Minister for Transport to assess the UK's energy system readiness for the mass uptake of electric vehicles to pass 20% to 30% of the overall market. I sit on part of that taskforce and look at the consumer and engage with that.

The technology is here today. From July, the chargers eligible to claim the EV home charger grant need to be smart. The definition of "smart" is the ability to transmit and receive signals and adjust the rate of charge accordingly, whether that is to do with price, time and so on. The chargers that we make for homes have been able to do that for some time. What that offers consumers, whether they are themselves



controlling it or somebody else is controlling it as they wish—it is for the Government at large to determine exactly how that is done—is the ability to manage the rate of charge according to flexibility of demand and so on, so that, as Andy said, when everyone plugs in their car not everybody starts charging at that time, and that is done smartly at a local or regional level to ensure that energy demand is managed.

**Q137 Darren Jones:** Are there any energy companies that provide flexible tariffs today?

**Tanya Sinclair:** I could not speak to that personally, but I believe there are EV tariffs. I do not know the details.

**Andy Eastlake:** I believe there is one at the moment. We are into a complex system of mobility, vehicles, homes and the energy system. That is exactly what we are grappling with at the moment. There are some very good projects: Electric Nation has done some very interesting studies on this, and the ETI commissioned the consumer, vehicles and energy integration project. A lot of work is going on around how people will use their electric vehicles and charging, and how we might consider a sensible and pragmatic management of that process. There is no doubt that we need to manage the energy; it is how we manage it and who manages it. At the moment we have a car that can control when you charge and probably a charger that can control when you charge, and we will soon have a home and potentially a distribution network operator that can do it. Managing those potential conflicts is an incredibly interesting challenge, and that is one of the things we have to put in place.

**Amanda Lyne:** You are hearing that the fact is that decarbonisation is highly dependent on our ability to change consumer behaviour and make people feel comfortable that they can do the whole list of things Andy and Tanya have talked about.

I have a good example. At the moment an average petrol station with eight to 10 pumps requires about 100 kW of power. If you converted all that to provide the energy for electric vehicles, you would need a megawatt at every single petrol station. If that is at DNO level, you need to get the electricity into that facility. The reality is that we will need to invest in generation technology to do EVs from renewables or anything else because we need to decarbonise. One of the opportunities we see with hydrogen technology is you take that consumer variance away. You can manufacture the hydrogen somewhere else in a controlled way and connect it to a different part of the grid. You can keep producing it either during the day or night; you create storage for the energy, which is the hydrogen itself, and you bypass all those issues. In the meantime, the consumer can fill up in five to 10 minutes.

**Q138 Darren Jones:** I am asking quite tough questions, but I support the idea of electric and low carbon vehicles. I am not championing the continuance of diesel vehicles, but there seem to be so many elephants in





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the room, whether it is about making sure we have enough energy generation for peak demand; whether National Grid or DNOs are operating and investing to ensure enough power is going to the right places to charge at the right times; that we have sufficient regulations and players in the market that allow flexibility of the grid; whether we roll out charging points that are good enough and are in the right places that meet people's varying and different needs across the country; whether we have energy companies that provide flexible tariffs—we have got only one in the country today—and whether people buy cars in the first place. There is a huge job for Government to bring all this together and speed it up, because this is not going to happen if we leave it to the market. It is too messy, is it not?

**Amanda Lyne:** I agree with you 100%.

**Andy Eastlake:** I absolutely agree that we need a very co-ordinated approach because it is a radical change to the whole system.

**Tanya Sinclair:** Yes, but the Government are already working on it and so is the market.

**Darren Jones:** That is a very good answer, but in my view the Government are not doing it well enough.

Q139 **Chair:** Inevitably, we have been hearing competing claims of plug-in, electric and hydrogen vehicles. Andy, you are sitting in the middle of this discussion. How do you arbitrate the turf wars between these two technologies? Do you see that ultimately one will triumph, or will it be a mix of the two technologies?

**Andy Eastlake:** An electric vehicle has an electric motor and a battery; a hydrogen vehicle typically has a battery. Zero-emission hydrogen vehicles typically will have to have the ability to recuperate energy onboard.

It is not one or the other. Hydrogen will be a piece of the energy system. There is certainly a focus on hydrogen in the heavy duty area, because currently we do not see battery technology delivering heavy duty, long haul vehicles. Unless there is a fundamental shift in battery technology, we will need high-energy capacity, which is typically delivered by hydrogen.

I see both of them, but we have to accept that, even if we meet the trajectory of electrification with hydrogen update zero-emission vehicles, 2035 is when 50% of our energy for transport will be delivered by electricity. We still need conventional liquid fuels and we have to decarbonise those as quickly as possible as well while we transition to an electrified and potentially hydrogen system.

Q140 **Chair:** What do we do with the millions of redundant batteries at the end of the life cycle of a vehicle? Are there plans in place for the Government to deal with that?



**Andy Eastlake:** Battery technology is a clear focus for the UK in its industrial and research agenda. Some great work is going on, first, in making batteries more efficiently using less material, and, secondly, how we reuse them. As Tanya touched on, our energy system with the level of renewability we need to put in to decarbonise it will need storage. Second-life batteries make an ideal store, so there may well be opportunities to use them there. I hear Amanda coughing a little. There are definitely challenges in the capacity to make enough batteries for this electrified future and how we deal with those.

Q141 **Stephen Metcalfe:** I want to talk about the hydrogen option in a second. Do you think the slowish take-up in electric vehicles is partly to do with Darren's description of how the system currently works and the pressures on the system if more people sign up to EVs? Do you think they are waiting to see if improved battery technology will give us the range and speed of charging that might take us closer to the existing model? Do you think the introduction of autonomous vehicles and AI will change the way we consider our relationship with vehicles? At the moment it is a very personal thing. If it starts driving itself, do you have that personal relationship, in which case do you need to own it? Do you care as long as it is outside when you need it? Is part of the barrier that we are going through a seismic change of how we view our personal transport? You said mileage was falling, but maybe we are not going to get there until someone is brave enough to do it, or we are forced to do it.

**Andy Eastlake:** You are absolutely right. There are so many complex things going on in transport. Vehicle technology is changing at a pace never seen before. We have seen battery capacity double in about three or four years in some vehicles. We have the connected, autonomous, automated agenda. "Autonomous" is a dangerous word to use in the short term, but for automated systems that have been embedded in vehicles there is an argument to say that there is always jam tomorrow—it is going to be slightly better.

That is always one of the challenges we face, but it is also a hugely exciting future. Perhaps the bit we have not grappled with sufficiently is changing mobility and the change from owning a car that sits on our drive, or the side of the street, 95% of the time to buying journeys. Do I really want to own a vehicle at all? Is that the model we need? One of the key things we need to think about is delivering a mobility system for the future. The strategy clearly articulates that we want healthy travel to be a component of every journey, and that does not lend itself to personally owned vehicles.

Q142 **Stephen Metcalfe:** If we look at the potential role of hydrogen, as I understand it, there are two primary ways of making it. One is to process fossil fuels and the other is to use electrolysis, which is effectively why some people just call it electricity storage. A phrase thrown around is "low carbon hydrogen". Will you define low carbon hydrogen?



**Amanda Lyne:** That is a very good question, Stephen. You have people coming in later who will help to provide you with information about that. When we talk about low carbon hydrogen we are talking about decarbonised hydrogen in some format and the efficiency of the cycle for creating hydrogen, whether that is adding energy because you have used fossil fuels or you have made electrolysis, which is less efficient than putting it directly into the vehicle, if you can connect it directly to renewables and everything. The elephant in the room that Darren talked about is that fundamentally we believe that, if you are to do hydrogen, you have to do the energy system piece that ensures your generation is delivering the decarbonisation you require to do it.

In the UK at the moment the majority of hydrogen stations have been supplied by electrolysis. There are a few examples of SMR. There is a cost equation. The big challenge with hydrogen is that you need to do a lot to make the price work, largely because we are comparing it with an infrastructure in EV that is paid for because we have a distribution network, whereas in hydrogen we are trying to make it generate.

It is not an either/or; the technologies are complementary. You can also get a zero-emission combustion engine based on hydrogen technology complemented with battery, but hydrogen itself is zero emission and you can follow that through.

Q143 **Stephen Metcalfe:** Low carbon hydrogen is hydrogen that is made using decarbonised electricity.

**Amanda Lyne:** Or a mechanism to include renewables within it. We have the renewable transport fuel obligation, and there is some discussion looking at how you decarbonise that. Colleagues later will talk about how you take the carbon out altogether.

Q144 **Stephen Metcalfe:** If we want to expand the use of hydrogen in our transport system, to get the most benefits we need to increase the supply of low carbon hydrogen. How do we go about doing that? What levers can we pull?

**Amanda Lyne:** On electrolysis, you could be more open to mechanisms to reward connections with renewable electricity. The renewable transport fuel obligation is an example. Unfortunately, the over-implementation of it is potentially not making it work in the best way. If you want to access bio-generated hydrogen from syngas and those kinds of things, we need to think about how we value the fuel in that process and the mechanism that helps it be cost-effective for consumers to adopt it. There is a range of things that we could do.

Q145 **Stephen Metcalfe:** Are those things ready to go, or do we need demonstrators?

**Amanda Lyne:** You need to try to match vehicle availability with the infrastructure. That is the challenge. You want a scale of implementation,



but in truth I think we are pushing it into the long grass because it is too difficult to do.

Q146 **Stephen Metcalfe:** Bearing in mind we make recommendations to Government, how do we pull it out of the long grass and try to stimulate further work on it?

**Amanda Lyne:** There is a team in BEIS working on the hydrogen economy. I think that could be prioritised as a team to look at the joined-up part that we are trying to do with it.

Q147 **Chair:** Is there any other country from which we can learn?

**Amanda Lyne:** The leading examples of hydrogen for mobility are Korea, Japan and California. Even the Germans have got cold feet a couple of times. They have put in hydrogen infrastructure and have not got the vehicles to go with it, but they still invest in a regular programme to feed the infrastructure through. I think that is how we do it. We have even suggested to DFT that we have a hydrogen vehicle taskforce, but I do not think that is seen as a priority at the moment.

Q148 **Stephen Metcalfe:** You said that the team in BEIS is looking at the hydrogen economy. Is transport the most appropriate place to start using hydrogen in our wider energy system?

**Amanda Lyne:** It is an area of low-hanging fruit that we can do if we do it in a way that respects the fact that it helps us deliver decarbonisation.

Q149 **Stephen Metcalfe:** If you were a mainstream vehicle manufacturer trying to sell to the average consumer, would you be investing in hydrogen technology and trying to bring such a vehicle to market?

**Amanda Lyne:** That is a really good question. The other day I sat in a room with the Toyota UK team, who were quite frustrated because they felt there was some reason for them to bring hydrogen fuel-cell vehicles into the UK. They are doing it; they have been committed to it for the past 15 to 20 years, but they are a bit disappointed that we are not following up and having a cohesive programme.

Q150 **Chair:** Do you mean it is frustrated with Government for not incentivising it sufficiently?

**Amanda Lyne:** We have done what we have done, but we are not taking the next step. The specific answer is that you only have to look at the Hydrogen Council, which is a very high-level group of CEOs and corporate members that talks about its commitment to and interest in investing in the hydrogen economy, vehicles and otherwise.

**Andy Eastlake:** There are some sweet spots that we ought to consider. The benefits of hydrogen are very fast refuelling, lots of energy on board and far lower weight impact than a huge battery. We have seen some good examples of buses, which might be operating 18 hours a day. That can be a challenge. There are some sweet spots in terms of where



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hydrogen is genuinely low carbon. Scotland has an excess of renewable energy, and Aberdeen is doing some really good things.

As for taxis, city centre vehicles should be zero emission as a first step. Arguably, taxis are one of the assets that need to sweat 18 hours a day, double shifting typically. Hydrogen might well suit that application in quite an elegant way. It has been mentioned that we should not be trying to play electric and hydrogen off against each other; we should be trying to identify the benefits and applications and let those emerge.

**Q151 Bill Grant:** On the uptake of technologies and ownership and Government support, you said we are at a bit of a crossroads. Should the Government now focus their efforts on electric cars and vans and look to hydrogen for what I would describe as heavy goods, or large goods vehicles? Have we arrived at that crossroads, or is there a crossover for both?

**Andy Eastlake:** We have not got to the point where we should be trying to pick a winner. There are discussions about how we decarbonise, or make heavy duty vehicles zero emission. One of the options is huge batteries—a solution being suggested by one manufacturer. We could put catenary systems along our highways, which is very big infrastructure. Hydrogen fuel-cell trucks are certainly an opportunity. What we do need to do is look at the necessary technologies. Electric motors are a key technology within all those vehicles, so there is a focus on electric motor development and materials.

**Q152 Bill Grant:** That is the propulsion system.

**Andy Eastlake:** As a propulsion system.

**Q153 Bill Grant:** There is no connection to the internal combustion engine; it is a whole new fuel and propulsion system.

**Andy Eastlake:** By driving the wheels in an electric motor you can recapture a lot of the wasted energy when you brake. That is a really good thing to do. There is an efficiency gain. Then it is about: how do I store enough energy on board? That might be in a battery; it might currently be in a range extender with a conventional engine; and it might be in a hydrogen fuel cell, or indeed a conventional engine powered by a low carbon fuel.

**Tanya Sinclair:** If we are talking about what more the Government can do, it is very important that they consider what we do in the UK and what we do well. Whether it is manufacturing or R&D, there is a lot of very exciting work going on and it is very well supported by Innovate UK and the Catapult system, for example. In the UK we have only 15 people—30% of them, or five people, are engineers—working on global R&D projects for high-speed charging and complex infrastructure for buses and heavy goods vehicles. A lot of very interesting work is going on and I think Government policy should align to support that. There is a wealth of it going on around the UK.



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Q154 **Bill Grant:** It is supporting both aspects.

**Amanda Lyne:** We are also about seeing technology neutrality. If you look at the balance of technology neutrality, the latest comms from OLEV about investments in the second stream—investment in the different technology areas—repeat an investment in the hydrogen transport programme of £23 million versus two investments, one of £30 million in vehicle-to-grid technology and another £40 million in wireless charging, which are new inputs.

Q155 **Chair:** We do not have neutrality at the moment.

**Amanda Lyne:** The focus at the moment is on consumer electric vehicles. One third of our CO<sub>2</sub> is going through larger vehicles and commercial vehicles, so we are not doing anywhere near enough with that. Even when you look at what we are doing with consumer vehicles, we are not balancing it. We are not asking for all of it but just some of it.

Q156 **Bill Grant:** I think we all share the view that there is not a level playing field vis-à-vis Government support for hydrogen and electric propulsion.

**Amanda Lyne:** From a technology point of view as well.

Q157 **Bill Grant:** They seem to be favouring electrical as opposed to hydrogen propulsion.

**Andy Eastlake:** I think there is a natural focus on EVs at the moment. There are far more vehicles available at an affordable price. There is a complete electricity network that is able to deliver energy to those electric vehicles. We have a handful of hydrogen stations. I was personally responsible for putting in a hydrogen station, which has since been removed because it was not used. This is one of the reasons hydrogen has taken off in the consumer sector. At the moment there is probably not an offering that is appropriate for the consumer.

**Tanya Sinclair:** To come back to targets, the Government have to invest proportionately in the technologies that will help them reach their targets quicker. At the moment that does not appear to be the case due to the number of vehicles available.

Q158 **Bill Grant:** It is not proportionate at the moment; it is favouring electric vehicles over hydrogen ones.

**Amanda Lyne:** I think it is right in the short term, because that is where we have been, but when you are talking about technology development there are crossovers. If you are doing hydrogen fuel-cell vehicle work with the motors that Andy has talked about, it would benefit hydrogen, but the breadth of technology is not covering the wealth of what we should be investing in.

Q159 **Bill Grant:** You have touched on something very important. Hauliers today are planning ahead. If they are running a large fleet, they are investing significant sums to reach time targets.



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If the refuelling infrastructure for electric vehicles and hydrogen vehicles goes forward, who should co-ordinate it? Can they work together, or are they distinctly separate? Can we expect both of them to do it? Am I going to have a Betamax and VHS moment where one video recorder succeeds and one fails? Is there a risk of history repeating itself?

**Amanda Lyne:** Andy has talked about horses for courses. To go back even further than Betamax and VHS, we go to horses and how we run them. There is no doubt that we need more electric vehicle infrastructure because the proportion of EVs will be more than 1%. We need to cover the whole breadth and do more of it now because it is going to take us too long to meet the target if we do not.

Q160 **Bill Grant:** There is a role for both technologies working together to meet the targets.

**Amanda Lyne:** Yes.

**Andy Eastlake:** People have spoken about the potential for a plug-in hydrogen vehicle. You could envisage a place where you have a vehicle that uses both. The key is understanding the benefits of hydrogen and battery technology. If we have 1 kW of low carbon energy, it is most efficient to put it into a battery driving a vehicle in a city centre; that is the biggest way of displacing fossil fuels.

Let us give an engineering sense to some of these things first and apply a technology-neutral approach, which arguably the Government are doing. The objectives are zero emissions from the tailpipe and decarbonisation of our transport system.

Q161 **Chair:** You say the Government are doing it, yet the money going into the development of the different technologies is not neutral.

**Tanya Sinclair:** It is proportionate to the size of the market.

Q162 **Chair:** That just reinforces the existing market, does it not?

**Tanya Sinclair:** Yes, it does.

**Amanda Lyne:** There is a timing issue. If we do want to do HGV and commercial vehicles, the reality today is that every commercial vehicle will be a diesel vehicle. There is not even any hybridisation in commercial vehicles that an operator could choose to buy sensibly. There is a challenge of timing, which always gets difficult because you need a longer-term strategy and thinking about the way you do things.

Q163 **Bill Grant:** I was interested in the conversion of vehicles. I take it that you have an internal combustion engine and you substitute the fuel tank, whether that be petrol or diesel, with a hydrogen tank.

**Amanda Lyne:** We reduce the proportion of the diesel by the equivalent amount of hydrogen energy. That is what our company does. It is in the combustion engine. At the moment we have about 40 vehicles on the



road that have been supported by R&D programmes, and it gives a percentage reduction.

Q164 **Bill Grant:** The public uptake is very low at the moment. Is it available to the public?

**Amanda Lyne:** I have fleet operators that are starting to think about how they would do it in a wider sense.

**Chair:** Thank you all very much indeed. We appreciate your time.

## Examination of witnesses

Witnesses: David Weatherall, Jenny Holland, Sam French and Graham Hazell.

Q165 **Chair:** Welcome, all of you. Thank you very much indeed for coming this morning. May we do brief introductions? There are four of you. If you all answer everything we will be here until midnight, so do not feel you have to answer every question if you believe that what you want to say has already been said.

**Graham Hazell:** I am a consultant to the Heat Pump Association, which does what it says on the tin. I represent major manufacturers of heat pumps plus installers and distributors of heat pump equipment. I have been in the industry for over 25 years, and I have been a building services engineer for 35 years.

**Sam French:** I work at Johnson Matthey. Today I am representing the Decarbonised Gas Alliance, which is an alliance of over 40 companies covering areas that include transport and end use, carbon capture, utilisation and storage, industry, science, the gas networks, trade unions, energy companies, engineering standards and consulting groups. It represents some of the largest companies in the world all the way down to some of the most innovative UK companies.

**Jenny Holland:** I am from the UK Green Building Council, which has over 400 members spanning the entire built environment value team. We campaign for sustainability in the built environment.

I am wearing another hat as chair of the End Fuel Poverty Coalition—a coalition of about 30 fuel poverty consumer environmental groups, local authorities and trade unions campaigning to end fuel poverty, and the EST is a member of that coalition.

**David Weatherall:** I am head of policy at the Energy Saving Trust, which was established by Government back in 1992 to promote energy efficiency in homes. That is still a central part of what we do, although we now also deliver extensive programmes on clean transport and community energy, but we work principally on that. I am here to talk about that core role of energy efficiency in households.

Q166 **Chair:** I should have said, as I said at the start of the session—I do not know whether all of you were here—that, if you have any other interests





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to declare beyond what you have already told us, now is your opportunity to do so.

How should building regulations be amended to help drive the decarbonisation of our homes and the industrial sector? Aligned to that, in 2015 the Government abandoned their zero carbon homes standard, which they were moving towards. Do you think that should be reinstated as a target, and would it need amending or clarifying if we were to do that?

**Graham Hazell:** We have a fundamental problem with building regulations, and have had for a number of years. The grid carbon factor of electricity is way behind. It is woefully high in building regulations by a factor of over two. It is exaggerating any emissions electrically by consumers by more than a factor of two. That is a fundamental problem.

Q167 **Chair:** Explain that further.

**Graham Hazell:** When we generate electricity, there is a carbon penalty to be paid for it. That has dropped considerably. In the building regulations it is currently 520 grams of CO<sub>2</sub> per kilowatt hour of electricity generated. However, it is acknowledged in the next version of the SAP, the assessment protocol, that the figure will be nearer 233. GLA is currently using 233; Salix, a Government funding mechanism, is currently using just over 300. Therefore, it is exaggerating how much carbon the electricity we consume is producing by a factor of over two. For me, it is more than doubling the carbon intensity of a heat pump completely artificially.

Counterwise, that is fooling us because we have more than double the benefit of solar photovoltaic on the roof, so it is a double whammy. That is a big issue, but it is quite a small thing to do.

Q168 **Chair:** Going back to the question, what do we need to do to the building regulations to drive the decarbonisation of homes and other buildings?

**Graham Hazell:** Simply, in building regulations that figure needs to be changed to one that is more realistic.

Q169 **Chair:** Just doing that would be sufficient.

**Graham Hazell:** That would be a massive step, because if you are hampered by a factor of more than two and your emissions are less than half what this is saying they are, that is a major step. We can currently run it through the building regulations. With a heat pump, for instance, you are being heavily penalised.

**Jenny Holland:** Could I come in on the general point? It is worth stressing at the outset that those of us campaigning for a sustainable built environment have been hugely disappointed at a time when the need to decarbonise is better understood than ever before. It is now six years since building regulations were last upgraded—the longest period



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without uplift since building regulations in their current form were introduced in 1984.

We have a review of building regulations kicking off in MHCLG with a view to making some long overdue changes next year. We went to see the relevant officials in the Department last week to put before them our set of asks for building regulations. At their heart lies a call for essentially the reinstatement of what would have been the 2016 zero carbon homes policy. It is a fairly modest start, but in our work with local authorities and developers up and down the country we have found that that uplift, which is a 19% improvement on carbon emissions compared with 2013 regs, is viable across all parts of the country regardless of land prices. That is the modest start for which we are asking in 2020.

Q170 **Chair:** There is support from house builders, is there not?

**Jenny Holland:** Yes. Bear in mind that the zero carbon homes policy was defined in 2011 and had cross-party and cross-industry support. From that time until the standard was unceremoniously scrapped in 2015, developers were beginning to produce innovative solutions to scale up supply chains and all those kinds of things. It was a standard deemed to be eminently workable and viable in 2011 when it was defined. It was not the most stringent value that could possibly be set, but everyone thought it could be delivered in 2016. It is now four years later. I do not think there is any question but that it is cost-effective and viable across a range of situations and geographical areas.

**David Weatherall:** I support everything Jenny has just said. We also need to be working towards building regs that address issues of indoor air quality and better address issues of ventilation and overheating risks. We also clearly need to be focusing on the enforcement of building regulations and making sure that we address the problem of design versus add build so homes achieve the standards they are expected to achieve in the energy components of the building regulations.

Q171 **Chair:** There was a concern from Government that the standard might have been negatively impacting on the rate of new home building. If we impose the tougher standards you are calling for, do you think it would have an effect on the rate of house building, or do you think house builders could accommodate that increased standard?

**Jenny Holland:** I do not think there is any question but that they can accommodate it. In anticipation of the standard becoming mandatory in 2016, tens of thousands of homes were already being built to what the anticipated standard would be. If we fast-forward to today, this trend is continuing up and down the country because where local authorities are setting higher energy performance standards than required by building regulations developers are meeting them. The extra cost of building homes to the standard we are calling for is a tiny fraction; it is between 1% and 1.5% of the build cost, but if the standard were mandatory and



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set in advance, some or all of that cost would be offset by developers negotiating a lower price for the land on which they are planning to build.

Q172 **Chair:** Which is the point Lord Deben made for the Committee on Climate Change.

**Jenny Holland:** It is also very interesting that that was acknowledged in the impact assessment that the Government produced when they developed the 2011 zero carbon homes standard. They said, "It is anticipated that additional cost of zero carbon homes will largely be passed back to land owners in reduced land value uplift." Therefore, if it was true in 2011, I cannot think it is not true today.

Q173 **Stephen Metcalfe:** My understanding is that the Government at the moment are focusing their reduction in emissions from homes, particularly existing buildings, on band C homes. Is that the right thing to be doing? Are they right to focus on band C?

**Chair:** Is it sufficient?

**David Weatherall:** There are two points in regard to that. We think that the band C targets as expressed in the clean growth strategy would be effective in achieving a substantial reduction in fuel poverty. At the moment only 2% of people who live in homes rated band C or above are in fuel poverty, so it can have a significant impact.

The Committee on Climate Change stated in its analysis of the clean growth strategy that the building components, including both band C targets, were consistent with the fourth and fifth carbon budgets, along with other measures to be taken. Our view is that both targets are okay, but there need to be more policies around them to get us towards there. Alongside that, we should not be saying we go only to band C. If people want to go to band B or A, or build super-low carbon homes, that is great and there should be systems to encourage people to do that.

**Jenny Holland:** David is absolutely right. It is the lack of policy rather than the targets being wrong. The Committee on Climate Change has said that, if the band C targets are delivered in full, we will meet our fourth and fifth carbon budgets, but there is a significant lack of policy and other drivers underpinning that.

What we are saying is that energy efficiency should be designated as a national infrastructure priority. We are glad to see the Committee on Climate Change endorsing that last week in its report on housing. We are saying that there should be some extra Exchequer funding to support that.

The funding generally assumed to be required to meet the EPC band C target by 2035 is about £5.2 billion of total investment a year. Do not raise your eyebrows too much! Of that, only about an extra £1 billion of public funding is required. The rest can be leveraged by way of private investment.



Therefore, it is about policies, funding and a range of incentives to stimulate the able-to-pay market, for instance. There is a huge gap where those policies and funding mechanisms should be sitting.

Q174 **Stephen Metcalfe:** Who would benefit most from the additional £1 billion of public funding that needs to be found? Would it be the user or the system?

**Jenny Holland:** I am not sure I entirely understand the question.

Q175 **Stephen Metcalfe:** If it is to make homes more efficient and reduce emissions, is the benefit of that £1 billion going to be felt by the people paying lower bills, or is it the fact that we have reduced emissions and therefore we are doing better at meeting our targets?

**Jenny Holland:** What we are saying is that that extra £1 billion-worth of public funding should be used to provide improvements to low-income households. In those terms, one of the issues one often finds is that, where a low-income household is improved and, therefore, the fuel bills are lower, that household has a tendency to stop underheating and start to heat the home to higher levels. That does have an offsetting effect on the potential level of carbon emissions that could otherwise be saved, but the low-income sector is only a small part of the households we are talking about. In addition, if a low-income household is improved, it is improved for anyone who then lives in it.

Q176 **Stephen Metcalfe:** That is clear.

There is a restriction in the energy company obligation focusing efforts towards low-income or vulnerable households, which I am sure is very good for fuel poverty and helps those who are most vulnerable, but does it limit the amount we can achieve in reducing and saving emissions?

**Jenny Holland:** Potentially, as I have just said—but that is a small part of UK households.

Q177 **Stephen Metcalfe:** If energy companies were not obliged to focus on low-income and vulnerable families and their primary focus was to reduce emissions, would we get a bigger reduction in emissions by not obligating them to work with the lowest-income families and the vulnerable?

**David Weatherall:** Our perspective is that ECO is currently the only national funding scheme for energy efficiency in homes. It is in place. Energy efficiency funding schemes for homes are in place for tackling fuel poverty and carbon emissions, primarily. While it is the only national funding scheme, it is hard not to see that it should be targeted entirely at the homes that are struggling to pay their energy bills.

Q178 **Chair:** But, without any mechanism to drive reductions in emissions in other properties, we limit the impact on reducing emissions.

**David Weatherall:** Our view is that ECO should be one part of a wider funding mix. We do not actually think that ECO is the best mechanism to target fuel poverty.



Q179 **Chair:** You use other mechanisms.

**David Weatherall:** While it is the only mechanism, it seems right that it should target that area. We would like to see a wider range of funding from taxpayer sources and private funding, including a supplier obligation. In that picture, as Mr Metcalfe has indicated, we think the supplier obligation would be better targeted at supporting broader actions to drive carbon. Where we are at the moment, it is right to be focused on fuel poverty.

**Jenny Holland:** The trouble is that ECO has to be all things to all people, which is fundamentally not right. It is worth pointing out that England is the only country in the UK that does not have a taxpayer-funded energy efficiency programme, following the demise of Warm Front in 2013. ECO has had to pick up every aspect of improving the housing stock—

Q180 **Chair:** The cost of that applies to electricity users, and it is regressive.

**Jenny Holland:** It is regressive. We would not advocate using ECO to make good the massive funding shortfall in meeting our fuel poverty targets because it is inherently regressive.

**Chair:** Sure; understood.

**Graham Hazell:** In our industry there is a comfort shift, as Jenny said, in that the savings you get in carbon are slightly reduced by the fact that people now feel able to heat their homes to what would be regarded as more normal temperatures. We certainly have that. Somebody called me the other day who had converted from oil to a heat pump. I asked him, "What are your savings?" He said, "Well, I don't really save much money."

Q181 **Chair:** So we should not be introducing heat pumps.

**Graham Hazell:** No. I asked him about his user profile. Now, he is heating his home to what would be regarded as a normal temperature. He was only heating it to 16°, and, even then, only in occasional rooms. Now, he heats the whole house to a reasonable comfort level and it costs him roughly the same, but there is still a carbon saving. We have to balance the carbon saving with comfort and people having homes that do not cause health problems, when previously they had not been able to heat their homes because of fuel poverty. There is a balance.

Q182 **Stephen Metcalfe:** Looking at the system as a whole, the recent English Housing Survey showed that improvements to home energy efficiencies had slowed. Do we know why, or can we speculate why that is the case?

**David Weatherall:** Clearly, one reason is the fact that we are not delivering anywhere near as many measures as we were under previous programmes. The scale of ECO has been halved, as Jenny has just said. We used to have a taxpayer-funded programme. The only slight proviso I would give alongside that, which is the critical issue, is that we are doing more and more of these things. Many of our homes now have insulation,



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double-glazing and more efficient boilers. Therefore, we also need to work hard on finding new things—the principally better-off homes have already done everything—that can be done next in terms of energy efficiency.

Q183 **Stephen Metcalfe:** I suppose that is the point I am making. Is that slowdown because we are reaching a saturation point among those who can afford to do it?

**Jenny Holland:** No.

Q184 **Stephen Metcalfe:** Or is it that they are just not aware of what else they can do?

**Jenny Holland:** Largely, it is about the decrease in the size of Government programmes.

Q185 **Stephen Metcalfe:** People do home improvements and energy efficiency because they save themselves money all the time. There are things outside Government schemes, are there not?

**Jenny Holland:** It is interesting, though, how little demand there is out there.

Q186 **Chair:** But that is through ignorance, is it not?

**Jenny Holland:** It is for a whole series of reasons.

Q187 **Chair:** I am the Chair of the Science and Technology Committee. I would be interested in introducing a heat pump into my house. I have no idea where to go. I have absolutely no idea who might be available in Norfolk to assist. I suspect my ignorance is not unique and that very many people have no idea, because there is no easily available information about how you make your home more energy-efficient.

**Jenny Holland:** But people have got to want to do it in the first place. This is what was fundamentally wrong with the green deal. The assumption behind it was that thousands and thousands of householders out there were dying to make energy efficiency improvements to their homes and the only thing stopping them was a lack of available finance. The results speak for themselves.

Q188 **Chair:** The incentives were not there.

**Jenny Holland:** Financing mechanisms and better information are part of what needs to be a much wider framework, which includes council tax and stamp duty incentives. It must also include a much wider range of financing options.

Q189 **Chair:** Let us just bring in David quickly.

**David Weatherall:** I could not resist on the advice point. This is absolutely critical. If you are in Scotland and are thinking about installing a heat pump, you can call the Energy Saving Trust acting on behalf of the Scottish Government. We would send an expert adviser to look at your



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home and help you to identify what you can do to take action. Last year we provided that advice to nearly 4,000 customers in Scotland, and 85% of them went on to take some action.

We have been repeatedly highlighting that one of the areas where there have been cuts in England is in that provision of advice and support, for the people who are living in fuel poverty and need help in that way, and those who want to take more ambitious actions.

We were established 26 years ago to provide that advice, but, unfortunately, from the middle of last year the Government—BEIS—axed the energy saving advice service, which was the last telephone helpline, and now there is only a website.

**Q190 Stephen Metcalfe:** You mentioned using incentives such as stamp duty or council tax. Would you be generally supportive of that?

**Jenny Holland:** Extremely supportive. The first report I ever commissioned on stamp duty incentives was about 15 years ago. I seem to have been boring everyone to death on them ever since.

It makes perfect sense. We were within a whisker about four or five years ago of the Government introducing stamp duty incentives. I don't know what happened, but they never came about. Absolutely, if householders are starting to see that purchasing a more energy-efficient property makes financial sense, they are going to start to demand those properties.

It is the same with council tax incentives. If people can see that they are going to start to be rewarded for living in an energy-efficient home and penalised for living in an energy-inefficient home, it is going to start to drive the market, as are a range of financing mechanisms, which include low-interest loans and home equity loans. There is still a role for pay-as-you-save mechanisms. It is just that the green deal was not brilliantly constructed.

**Q191 Stephen Metcalfe:** How would you improve it if you were reintroducing a system?

**Jenny Holland:** Get rid of the "golden rule", for a start, which limited the number and type of installations that you could put in; and the very lengthy repayment period made what was a fairly commercially reasonable interest rate look just ridiculously onerous. Those are some of the things that one would do.

The green mortgage market also needs to be pump-primed to take more of a place in the range of financing mechanisms.

**Sam French:** I come back to the question. You make a very important point. I am in entire agreement with the other people here. Energy efficiency is very important, but how are we going to hit these targets? How are we going to get towards the Climate Change Act targets as well



as potentially net zero when we live in a system with a huge amount of infrastructure? A lot of capital has been spent; people have boilers in their houses; industry uses a lot of gas for driving thermal processes. We have a whole car park of cars out there. We have to consider what we are doing within the existing infrastructure as well as what we are building new.

Going forward, we see a fundamental need for a decarbonised electricity system to play alongside a decarbonised gas infrastructure. This provides an opportunity. We do not know exactly what our energy system is going to be in the future. We are going through a transition. As you go through it, you need as many options as possible, with different technologies.

We also know there is not going to be one answer. It is going to be by region, by geography, by policy. We heard earlier about different countries leading the way. Yes, Japan and Korea are leading the way in hydrogen vehicles: they are certainly not in heating. The UK is one of the most progressive countries in its thoughts around how we decarbonise heating, with some of the most ambitious projects out there—for example, the H21 North of England project, which is hugely ambitious, to decarbonise a large swathe of the UK to 100% hydrogen. I am not saying that is definitely the future, but we have that kind of ambition.

It also supports very strongly the clean growth plan in the Government's industrial strategy, looking at investing into areas of the UK that really need the investment—the north-west, the north-east, up in Grangemouth, up into St Fergus.

There are also projects that may be even more realistic, such as HyNet or Acorn, again based in Scotland, which are looking at bringing a portion of the decarbonised gas as a blend that can go into a system and be used within existing infrastructure.

That is quite an important part of how we deal with the transition. It is not all about all new or how we do everything new. It is also about how we use what we have. We definitely need energy efficiency improvements. We need new houses to meet standards because otherwise we are wasting time in everything else we do. We will need heat pumps in areas, but we also need to provide consumers with what they want. Some of that will be choice.

Q192 **Bill Grant:** The English Housing Survey suggested that investment in energy efficiency in homes had either stalled or slowed. Landlords, or owner-occupiers in particular, might have had their fingers burned with schemes or scams for that investment. Do you think that has caused a step back from the marketplace? People have been disappointed in what companies have promised them with these efficiencies and it has not materialised, and, therefore, they are reluctant to invest. Has that been a player?

**Sam French:** Are you asking me specifically?





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**Bill Grant:** No.

**Sam French:** The projects that I am talking about are very large scale and will take time and policy to come along. I do agree that there has been a perception that things like heating networks have not always worked as well as they could. There needs to be some consumer understanding of what heat pumps offer. It is very similar to what an electric vehicle might offer and how we charge it, as was discussed earlier. All these things are learning, but we are learning and these things are developing. We need to support all of them.

Q193 **Chair:** Let us hear from David.

**David Weatherall:** Certainly, there is an issue that we could communicate these products better, including the benefits, what to do if something goes wrong, and dealing with hard stories. The whole home improvement industry has always been beset by challenges in that area, but the big picture is that rates of energy efficiency improvements have stalled. They have not slowed; they have stopped completely this year for the first time for 20 years. The big reason for that is the cuts in funding to energy efficiency programmes.

**Graham Hazell:** There is also an issue with our energy prices. Obviously, 85% to 90% of the country are on gas, and our gas prices are the second lowest in Europe. That, therefore, means that any saving you make is reduced.

Q194 **Bill Grant:** So it is a disincentive to improve.

**Graham Hazell:** It is a disincentive. When you do the figures, you think, okay, I am going to spend £500 or £600 on cavity wall insulation, and, at best, I may save £100 to £135. Do I want to invest that money? Am I still going to be in that house, or would I like to buy my kids their school clothes? The fundamental problem is making choices, and the savings that we can make, unfortunately, are often quite low.

Q195 **Darren Jones:** Could one of you set out an example of a low carbon heat technology that is being adopted today and what that would mean for a consumer?

**Graham Hazell:** It is very easy for me: heat pumps. We have a whole variety of heat pump genres—ground source, air source, plus other versions. A really good ground source can even compete, running cost-wise, with gas, which is relatively low price, as I have just mentioned.

Q196 **Chair:** What are the running costs of the pump?

**Graham Hazell:** Of the heat pump?

**Chair:** Yes.

**Graham Hazell:** It would be similar. A ground source would be slightly less compared with air source.



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Q197 **Chair:** What is it? Is it the electricity?

**Graham Hazell:** It is the electricity, yes.

Q198 **Chair:** Where does the cost come from?

**Graham Hazell:** You are converting electricity. You are using electricity to move heat, to pump heat, and you are getting a good ratio. You are only putting roughly 1 kW in and getting 3 kW out. Sometimes you will get 4 kW and sometimes a little bit less, but let us use that as an average. You are using that energy to transport energy from either outside the air or the ground.

Carbon savings are absolutely immense, even against gas. Today, for instance, the carbon factor would less than halve the emissions if you use a very modest heat pump. The problem is that the price of the fuel does not relate to the carbon content. For instance, a couple of years ago we had oil, which is very high carbon producing. The price was 30p a litre. To go back another two years, it was 60p to 65p a litre. It does not relate to the carbon content.

The user is often concentrating on costs, both initial and running cost, but it is a whole different ball game when we look at carbon. We can easily save carbon, but it is difficult to sell that to the end user unless they see some payback on their investment, because these technologies are an investment for the future.

Q199 **Darren Jones:** That is the issue with retrofit, but are we seeing more new build houses with heat pumps being installed instead of gas boilers?

**Graham Hazell:** Unfortunately, we go back to my original point about the building regulations. New build obviously comes under the building regulations. Building regulations at the moment severely hamper anything that uses electricity, even something that uses electricity really efficiently. The take-up of heat pumps in new build is certainly a lot lower than it would be if that carbon factor was changed. If it was changed, you would see a quite dramatic change.

Q200 **Darren Jones:** Is that because they are more expensive for developers to put into the house in the first place? I get the carbon issue, but is it a price issue?

**Graham Hazell:** There is a price issue, going back to the earlier point that new houses will cost slightly more with some of these technologies, but I agree with Jenny. It is actually a very small percentage of the cost of the house, and, as it feeds through the developing chain, it will be the land price that eventually makes up that difference—not immediately but after a few years as a land bank. That is the important point. There is an on-cost. It is relatively small, and we have to say, "How much do we value carbon reduction?"

Q201 **Darren Jones:** That is something we need to drive out in the policy.



**Graham Hazell:** It is much cheaper in new build to do it up front. One of the problems we have at the moment is that we are building all these legacy homes. For instance, a home that has microbore pipework in it—very small-bore pipework—will not be able to be transferred into a heat pump down the road. We need higher flow rates. Microbore cannot support the flow rates. Minibore is fine; 15 ml is fine.

Q202 **Stephen Metcalfe:** What is microbore?

**Graham Hazell:** It is 12 ml/10 ml—very small, flexible copper pipework. The attraction is that it is very easy to install. You are unwinding it from a coil. If you are putting it in, you can almost use cable in the system.

Q203 **Chair:** Does that mean that in many existing homes heat pumps are not an option?

**Graham Hazell:** I would not say many existing homes, but homes built with microbore pipework in particular will not be.

Q204 **Chair:** Do these tend to be modern, lower-cost homes?

**Graham Hazell:** They tend to be more modern, yes. Older homes tend to have more normal 15 ml pipework.

Q205 **Chair:** The older homes are more easily convertible than some of the modern homes.

**Graham Hazell:** Some of them, yes. You have space restrictions as well. We will need a hot water cylinder because the heat pump heats the water up slowly. It is not instantaneous like a combination boiler. We will need a little bit of space for a cylinder. Again, modern homes are not built with those sorts of spaces. We are building homes right now on a number of fronts that will either be very difficult or impossible to change in the future, and that is terrible.

Q206 **Darren Jones:** The key point with heat pumps is that, if we want to achieve this very positive contribution to reducing carbon emissions, it is going to have to be because of public policy as opposed to just allowing the market to carry on in its current position.

**Graham Hazell:** Yes, it is, but, as I mentioned about the carbon factor, that is a realistic change. That is not a fudging of the figures.

**Darren Jones:** No, I understand.

**Jenny Holland:** I want to flag up the fact that in its report last week the Committee on Climate Change picked up on the point that the SAP methodology currently undervalues the carbon savings that can be delivered by heat pumps and other electricity-based heating systems, principally because it does not account for the decline in carbon intensity of the grid. There is a very strong recommendation out there from the Government's own advisory body on climate change that the SAP methodology needs to be looked at to encourage us to move towards lower carbon solutions.



Q207 **Darren Jones:** What are the alternatives to heat pumps?

**Sam French:** I do not have the 2018 figures, but in 2017 there were something like 22,000 heat pumps installed and 1.6 million gas boilers. That is the incumbent. Gas boilers, we believe, will take something like 20% hydrogen as a blend without any change whatsoever. That could start happening tomorrow with policy change. That is the first thing.

Secondly, boiler manufacturers are working hard today with hydrogen-ready boilers. They are starting to distribute and sell a boiler for natural gas that will work on 100% hydrogen in the future.

The other possibility for the boilers going out the door today is for conversion. We saw that on the change from town gas to natural gas in the 1970s. It was a phased way of doing it. We can use our gas infrastructure and the appliance that the consumer likes within a decarbonised scenario.

Q208 **Darren Jones:** Converting from natural gas to hydrogen.

**Sam French:** That is one example. That could happen in certain regions. In other regions we might be using biomethane from anaerobic digestion. We might be using bio-SNG from black bag waste. There are different decarbonised gases, which have to go in sync with the electrification—

Q209 **Darren Jones:** I am sorry to interrupt, but are those fuels not more expensive than natural gas, which is the market—

**Sam French:** They are, but they are less expensive than electricity, as has already been mentioned.

The other possibility going forward is combustion of a gas in a boiler. It is not the best way to do it. We can be heading towards micro-CHP and CHP—combined heat and power. Again, this is hydrogen driving the provision of electricity and heat for your whole house. There are different routes and different things that can be done. A key thing is that we need to learn by doing.

There are a lot of questions about cost. We do not know about cost until we start deploying at scale. We need to go and learn. We are at a divergent time because we are in a transition, so we need as many tools and as many ways to look at the different system and how it could settle out as possible. Maybe for the next 10 years we are going to have to do some projects, “low regrets”, but they might not be the largest part of the future system. We need to learn by doing.

Q210 **Darren Jones:** Presumably, there is little point in not moving on energy efficiency in the homes and moving on low carbon. You need to couple the two.

**Sam French:** You have got to—absolutely; they go hand in hand. The other thing is that it is not just about heating and not just about domestic heating. Industry uses a lot of thermal processes that it is nearly



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impossible to electrify. They are going to have to be driven by gas. Unless we want to offshore all our manufacturing, we are going to have to have a decarbonised solution for industry.

**Q211 Darren Jones:** What does that look like for industry if it is not heat pumps from electricity?

**Sam French:** You can do electric heating in some kind of clamp furnace. It is very expensive. It can really only be done at fairly small scale and does not provide the direct heating that generally comes from a gas burner.

**Q212 Darren Jones:** Is there a market-ready alternative to natural gas for industry?

**Sam French:** Yes. A lot of work has already been done on hydrogen as one of the most beneficial—either hydrogen pure or blends. In the same way, people are also looking at a combined cycle for power generation. Today, 50% of our electricity comes from gas. It is going to be a while. We will need a dispatchable gas system to allow us to have more and more renewables on our system. There are days when it is not windy and there are days when the sun does not come out. We need a resilient system.

**Q213 Darren Jones:** This is my last question because I am conscious of time. How do we get around to delivering this stuff? On the issues coming forward, the Government probably say to you, "The priority is to reduce our carbon emissions. We want to do that, but it is going to increase prices for consumers and there will be extra costs around infrastructure spending. If we change the building standards on housing, we are not going to meet our house building target. What do you want? Houses for people who are homeless or do you want energy-efficient houses? Which ones are you going to prioritise?" These, I suppose, are the real challenges for Government—to try to make a trade-off between the two.

The renewable heat incentive ends in 2021, and there has been some conversation about carbon pricing for heating with gas, but, presumably, that would be passed on to the bill payers. What are the levers that Government could use to get this coming through? What would be your recommendations?

**Graham Hazell:** Heat pumps are available and ready now. Other technologies need developing. We do not know the pricing yet, either. Obviously, there are problems with how you divide up the grid, et cetera. In terms of gas, they are part of biomethane, but heat pumps are ready now.

**Q214 Chair:** But what should the Government be doing? That is the point. What levers should the Government use to drive this much faster than is happening at the moment?

**Darren Jones:** Could each of you answer?



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**Chair:** Quick answers from all of you.

**Graham Hazell:** The driver has to be to put a cost on carbon. It has to be helping us to educate people about heat pumps. The industry has done a lot. As David said, we have had a lot of closures of different departments. We need support for independent advice. You asked earlier, "Where do I go for advice"? People would like to see an independent route for advice.

The Government could certainly support that. There are things they could do with the planning regulations. For instance, if I have a heat pump that is only 0.6 metres cubed, I can go through a permitted development. If it is 0.61, I can't, and yet the size of it is almost irrelevant. The noise of it is very low as well. There are tweaks we can make to the planning regulations as well that would help.

**Sam French:** We should realise that the expansion of renewable electricity in the power sector was driven and paid for by consumers. We have ways of sharing with society, across society, a lot of these costs. In explicit terms for the gas area, RIIIO-2 is going to be really important. Within that, the gas distribution networks do not need to make up ideas about what would happen if there was no gas grid. We should start from the perspective that we need both of them for the best, lowest-cost solution for consumers going forward, and then look at supporting them in deploying projects. So we are doing things at scale that make a tangible difference in the next 10 years. We can do that within the frameworks of CFDs and ROCs, potentially. The business models are there. We need to support them.

**Jenny Holland:** I have already touched on a number of those things. We need mandation in terms of a significant uplift to building regulations in 2020 to put us on a path to net zero carbon new buildings in 2030. There will probably need to be some quite significant uplifts in building regulations throughout the 2020s.

Another element of mandation that we have not touched on, but which is certainly proving extremely effective in the non-domestic sector, is the minimum energy efficiency standard for private rented sector buildings. What we want to see, and Government are already consulting on this, is a trajectory for ramping up that minimum energy efficiency standard from band D, at which it currently sits, through to band C by 2030. Then, alongside the mandation, you have to have incentivisation through a range of demand drivers that I have already mentioned.

Q215 **Chair:** You mentioned stamp duty and council tax.

**Jenny Holland:** Yes, and a range of financing options for all households, if we are just talking about homes. Then we need to see some proper Exchequer funding to help low-income households who cannot do this without assistance. Those are things that Government can do, many of which are about encouraging others to do what is necessary.



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**David Weatherall:** I think every report on heat decarbonisation trajectory starts with, "There are two 'no-regrets' actions we need to be doing now, one of which is the energy efficiency stuff in buildings and the other is consumer engagement and getting other people understanding that this is coming and starting to think about what they can do." Jenny has just described the energy efficiency action and the "no-regrets" actions on that side.

On the consumer engagement, advice and support side, we really should be looking to work with householders to get early adopters installing some of these measures, carrying out an assessment of how they work in homes, which will enable us to see how they work and start to raise consumer understanding and appetite for it.

**Chair:** Thank you. We have a quick question from Bill and then Damien.

Q216 **Bill Grant:** It may well be that Sam has already touched on it, but the hydrogen blend with natural gas up to a given percentage would give you a carbon reduction. Could that gain be lost in the production of hydrogen that you would have to put into the system, or is there no carbon impact in the production of hydrogen?

**Sam French:** There are different routes for hydrogen, as was discussed briefly earlier. We can either use electrolysis, which is taking water to produce hydrogen and oxygen, and requires electricity to drive it, which brings with it the greenhouse gas intensity of the grid, or you could run it solely from renewable energy, but then it only works when the sun shines or the wind blows. That makes the economics difficult.

The other route, if we are talking about large-scale volumes of hydrogen in the short to medium term, can come from using natural gas, converting to hydrogen and capturing the CO<sub>2</sub> through CCS-type processes.

Levels of greenhouse gas emissions associated with the two routes vary because of the supply chain that comes with them. It depends, as we have said, whether you are using the grid or direct, and where you are in the world. However, it is viewed that we can get up to levels of 95% CO<sub>2</sub> capture from natural gas and that in the short term those will have as low a carbon footprint as if it was driven from electrolysis.

Again, back to the conversation earlier for transport, we need life-cycle analysis. We need a view on what the emissions are for the whole process all the way through the supply chain. We cannot have natural gas lost through the natural gas transmission system and then say that hydrogen is 100%. We cannot.

Q217 **Bill Grant:** There has to be a policy analysis.

**Sam French:** Yes, and it should be outcome-focused on the minimum level of emissions possible.



Q218 **Damien Moore:** I will make this quite quick and I will cover some of these questions together. To what extent are the Government breaking the cycle of inaction on hydrogen development, as the Committee on Climate Change has urged? Will the projects that you mentioned, such as H21, gather the evidence that is required? Will we need more of these projects, and is there sufficient co-ordination of the projects?

**Sam French:** I will take that one on. BEIS has put in a number of programmes looking across the supply chain—RHI for Heat, looking on the domestic side; I won't go through them all. They have at least five or six reasonably large programmes looking at all the key elements down the supply chain. There is no point in spending huge amounts of money on the use side if we cannot make the stuff or it is dirty. At this level, BEIS does have a co-ordinated plan.

It is the next step that will be critical, which is not tens of millions—it is hundreds of millions. It is hundreds of millions that will make a real difference, a real needle-moving, tangible difference to our overall greenhouse gas emissions, but we will have to finance projects of that size and scale. We cannot continue doing lots of small, tens of millions of pounds, little projects. We now need to be bold and brave, and we have to realise that this might not be the final outcome but it will be part of the final picture.

The part that BEIS does struggle with is that we have a hydrogen team; we have a heat team; and there is the transport piece coming in from DFT. The power of hydrogen is that it cuts across all these sectors within the energy system. It cuts across power; it cuts across transport; it cuts across heating. It also looks at the hardest parts. It is the heavy duty vehicles; it is the dispatchable power. It is the buildings and industry that are really difficult to decarbonise by electrification.

So yes, I think Government are trying hard. They need to be committed to deploying at scale multiple projects during the next decade to allow them to arrive at the 2030s and to make really large decisions in an educated position, with a really good view on the benefits and costs. All of this should line up to make us leaders in this market. This should be an export opportunity.

Q219 **Chair:** Presumably, there are economic opportunities for us getting into that lead position.

**Sam French:** Exactly. Let's put ourselves in that leadership position and export. There are a lot of countries around Europe that rely on gas for heating. They are in a similar predicament to us.

Q220 **Damien Moore:** What is the best way of us being able to deploy this gradually? I know you have said that we have got to invest from tens of millions to hundreds of millions, which is right if we are going to take this forward. It is not going to happen in one go. What would be the timescale in deploying this gradually?





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**Sam French:** BEIS ran a recent hydrogen supply competition, which is just about to be announced. There are a number of projects through that which will be real, tangible projects, based on specific sites. Those can go into competition and go through the phases to the point where they require a financial investment decision. Those projects will be of the order of hundreds of millions, but they are reasonably small in the greater scale of things.

Let them run through to deployment, putting that metal on the ground, so that we are really doing this. Underlying some of that will be a requirement for CCS. It is about not just heating but decarbonising industry. All these things join up.

The projects are in process. It will come, whether after the initial funding rounds that are earmarked now, or whether in the next spending review we get sizeable finance, which will be match-funded. Industry has to come to the table here. It is not all about the Government and private sector paying for it. What we really want to see is a transition where the private sector takes over from public sector financing over time, and public sector finance should fade out.

It is about a provision for the next competition that is going to build some of these projects that are currently being designed.

Q221 **Chair:** Thank you. Are there any final comments from any of you? Is there anything that you came along with a burning desire to get across to us and you have not yet done so?

**Sam French:** I just want to reiterate: learn by doing. We have got to deploy stuff and we have got to do it soon.

Q222 **Chair:** Understood; thank you.

**Graham Hazell:** I think we have the technologies there that are ready and waiting. They are proven. We do not need to wait for any major development work.

Q223 **Chair:** There is a need to get on and deploy them.

**Graham Hazell:** We need to get on. Industry needs to move.

Q224 **Chair:** Jenny.

**Jenny Holland:** I would reiterate what your colleague Mr Metcalfe said about whether the scope for the installation of more energy efficiency measures was exhausted. The answer emphatically is no. There are about 7.5 million lofts and cavities that still need to be filled alongside those improvements, with draught-proofing and better ventilation—all those kinds of things. We have by no means exhausted the stock of things that need to be done.

Q225 **Chair:** Are there any other reactions to the Committee on Climate Change's report last week and the specific point about the Government



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seeking to end new homes being connected to the gas grid by 2025? Do you have any reactions to that?

**Sam French:** For me, it takes away one of our opportunities to decarbonise.

Q226 **Chair:** So you don't agree with that.

**Sam French:** I don't, no.

Q227 **Chair:** David.

**David Weatherall:** Not so much on that point. I would not know if the vast majority of homes that are going to exist in 2050 will be connected to the gas grid. It is perhaps less problematic than some people have been claiming, but the point about hybrid heat pumps has come up so strongly from the CCC but has not come up in our session today. It does sound a promising technology, but I reiterate that we need to be testing and trialling these technologies in real homes.

Q228 **Chair:** Is the hybrid not an existing technology? This is one that still needs to be developed.

**Graham Hazell:** It is an existing technology; it is just not widely deployed at the moment. The Freedom Project in Wales has done an analysis of hybrids, and we are waiting for the report. It enables heat pumps to be put into situations where they may not be able to rely completely on the heat pump for many reasons. It could be a building fact—

Q229 **Chair:** So a hybrid between the pump and other existing systems.

**Graham Hazell:** In gas. You can have heat pumps in gas as well. They are not all electrically driven.

The problem with new build, as David said, is that there are so many properties already on gas that, if and when hydrogen or methane come along, and it is cost-effective, they can be on that. Do we need to double-invest and put a gas supply into a new development and electricity supply, bearing in mind that, if we hedge our bets too much, both will need to be large enough to take the lion's share of the load and therefore there will be a degree of redundancy? Is there money to do that—to build in redundancy?

The heat pump industry has suffered for many years in that there is an established gas network. If we want to convert to heat pumps, often we will have to pay for upgrades to the supply. That may have to be done in future if those new developments went over to electricity completely and it was later decided that maybe there is a mix. There is previous history of having to invest. The risk is that we invest and spread our money too thinly if we do not make a decision one way or the other.

**Jenny Holland:** This is not a technical point and I have not had a chance to review the evidence that led the Committee on Climate Change to



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make that recommendation, but the incredibly hostile media reaction that followed the announcement that new households were not going to be able to be connected to the gas grid demonstrated very clearly to me that Government need to be very careful in framing their low carbon policies, because you need to bring consumers on board. You cannot have them thinking that some sort of Big Brother Government is stopping them using what they consider to be a convenient means of heating and cooking.

This has to be done carefully if you are not going to have a massive backlash, and you need to bring installers along as well, many of whom are very comfortable with the technologies that they install on a day-to-day basis but are not so comfortable with evolving technologies.

**Graham Hazell:** It is interesting that many self-builds, where people are building for themselves—"Grand Designs", et cetera—will elect only for electricity sometimes. But Jenny is right. We do have an attitude, "We've got to be connected to the gas." I agree with Sam: there will be a mix of solutions. There is no one solution, but certainly that means you are not double-investing.

**Chair:** Okay; good. Thank you very much indeed. We really appreciate your time.