

Business, Energy and Industrial Strategy Committee

Oral evidence: Electric Vehicles: Developing the market and infrastructure, HC 383

Tuesday 27 March 2018

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[Watch the meeting](#)

Members present: Rachel Reeves (Chair); Vernon Coaker; Peter Kyle; Mr Ian Liddell-Grainger; Mark Pawsey; Antoinette Sandbach.

Questions 137 - 215

Witnesses

I: Andrew Burgess, Associate Partner, Energy Systems Integration, Ofgem; Graeme Cooper, Director for Electric Vehicles, National Grid; Stewart Reid, Chair, Energy Networks Association Low Carbon Technologies Working Group.

Written evidence from witnesses:

- [Ofgem - written evidence](#) | [PDF version](#) ( 164 KB)
- [National Grid - written evidence](#) | [PDF version](#) ( 109 KB)



Examination of witnesses

Witnesses: Andrew Burgess, Graeme Cooper and Stewart Reid.

Q137 **Chair:** Thank you very much for coming to give evidence to our Select Committee today on electric vehicles, Graeme, Andrew and Stewart. If you just want to introduce yourselves quickly first, so we have everybody's name on the record, then we will get started. Graeme, shall we just start with you?

Graeme Cooper: My name is Graeme Cooper. My role is project director for electric vehicles, for National Grid.

Andrew Burgess: I am Andy Burgess. I am associate partner for energy systems integration at Ofgem, the energy regulator.

Stewart Reid: I am Stewart Reid. I am representing the Energy Networks Association, and I am the chair of the low carbon technologies working group.

Q138 **Chair:** Thank you very much. I am interested in how much extra capacity we are going to need once the rollout of electric vehicles is complete, by 2040 or maybe 2050. How much extra power will we need in the system?

Graeme Cooper: We do a lot of work to look at future energy scenarios. We look at what possible futures we could end up with, from a relatively do-nothing scenario to achieving our carbon objectives. In rolling out EV charging, particularly out to 2030, we could see much greater demand for energy, but if the charging is done smartly, so you are not adding to the peak of the day, there is not a tremendous amount of new generation needed. You need to marry up the challenge of generation and the wires to get the generation in the right place.

Q139 **Chair:** Is there any number that you would put on it?

Graeme Cooper: We model, looking forward, 9 million electric vehicles by 2030. Now, it depends on take-up, Government policy and the health of our economy, as to whether we achieve that. That will drive a need for roughly eight gigawatts of new power generation by 2030. That is if you do not do any smart charging. You can cut that by nearly three-quarters by managing when charge happens.

Q140 **Chair:** You are talking about six gigawatts or something?

Graeme Cooper: It is actually less than that. It is maybe four gigawatts of new generation, but that is only out at 2030. That is not needed right now.

Q141 **Chair:** But, by 2040, new sales of cars will need to be electric vehicles. Do you have a forecast for 2040?



Graeme Cooper: No, not in front of me right now. I will happily write to you and share that with you. The interesting thing is that, in July this year, we publish the next update to *future energy scenarios*. One of the things that we have seen a particular shift in is the electrification of transport, so there will be a very large update in that with the latest figures in, and that is published in July this year.

Q142 **Chair:** Last summer, National Grid also produced a set of extreme but possible scenarios, and included in those was a scenario that estimated that electric vehicles could increase peak demand by 30 gigawatts, equivalent to 10 Hinkley Point C power stations. What would that mean, and how realistic is that? What probability would you attach to that scenario?

Graeme Cooper: The reason for the statement was to try to articulate the importance of smart charging. But, in any infrastructure, if you plan for and model for the worst, that allows you to set the right objectives. I am sure that Ofgem will support right-sizing. One of the things that we were trying to articulate in that piece was that, if everybody in the whole country had an electric car, everybody took them home at exactly the same time and everybody charged them at exactly the same time, which is completely unrealistic, that is the worst, worst case.

Therefore, it was trying to articulate the reason for understanding usage patterns, but also understanding smart charging, in order to mitigate those. Would we ever see that demand? I am not a betting man, but the probability is close on zero.

Q143 **Chair:** Some people already have electric vehicles, albeit the take-up has been quite low so far. Are you learning anything at the moment about when and how people charge? Is there any evidence that you can bring?

Graeme Cooper: First, an education for me is that I bought an electric car, because you cannot talk about these things and not actually participate.

Chair: Oh, we do, and lots of other things besides.

Graeme Cooper: From my point of view, I found it really important to walk the walk as well as talk the talk, so I have a plug-in hybrid and I have an electric car.

Chair: Very good, that is a good example to all of us.

Graeme Cooper: It has been a real education piece to me. I had this working assumption that I would just arrive home and plug it in, and it would charge. The cold reality is that I plug it in once or twice a week; I set the timer to charge off peak; it charges for five or six hours in the middle of the night while I sleep, and it is ready in the morning. To an extent, that level of diversity is really interesting. We are not all going to arrive home at 6 o'clock. We are not all going to plug in and simultaneously charge. There will be tremendous amounts of diversity.



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From a National Grid perspective, we need to manage the supply and demand in real time. It is what our control room does. Understanding what charging is doing in real time is really quite important, which is why you see the need for data provision in EV charging. The challenge is probably more to the DNO networks, because they see it first-hand. We are one step removed.

Q144 Chair: Stewart Reid, would you like to add anything about what you have seen so far, and what it might look like when we have had greater rollout of electric vehicles?

Stewart Reid: One of the good things about this is that the industry has been looking at it since about 2010, in fact before that, on the back of the funding we have had through RIIIO for innovation. There have been a lot of trials carried out to understand what charging behaviour looks like, and we have found a number of things.

You are absolutely right. There is a lot of diversity in the way that people charge their cars. Projects like My Electric Avenue and the Low Carbon Networks Fund got some real data from real customers, to understand where and when people charge. We have also identified things such as clustering, for example, which brings forward some of the impact of electric vehicles. In the same way as you will drive along the street and see a lot of photovoltaic cells in one particular street, the same thing can apply to electric vehicles. You get areas with a higher uptake.

That focuses the intensity on a particular part of the network, so there have been specific projects carried out across the industry to understand what that looks like and what solutions we can come up with to manage that. It really is an evolving science. There are lots of new interventions and new techniques that can allow us to smooth out that charging and put it into the places where the network can cope, rather than the places where it cannot cope, in terms of both time and location.

One important thing that is emerging is that the solution is not fully on the side of the network. If you think of the meters, at that point, half of the solutions are on the network side of the meter. A lot of solutions sit on the other side of the meter, such as demand-side management and energy storage in the home, and all these things change the balance in terms of the impact that the network is going to have. We commissioned a piece of work for later this year to take all the learning we have to date, refresh it and update it, so that we can have a really good understanding of the impact of the different scenarios that are expected.

Q145 Peter Kyle: Graeme, I am also an early adopter, not for cars, but I have converted my flat to all-electric, including heating. What would be the consequences for the National Grid if the conversion to all-electric heating came at the same time as a big drive towards electric vehicles?

Graeme Cooper: The future energy scenarios modelling does not just consider EV in isolation. It considers us reaching our 2° carbon targets.



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That includes a lot of electric heating, so by the time you get to about 2030 that looks like 75 gigawatts at peak demand, versus 60 gigawatts today. I have electric heating as well. I have a ground source heat pump, so I have a level of intelligence on that. It does not heat water at the peak time of the day. To an extent, it is about smart metering. It is about smart tariffs and considering urging consumers to behave in the most responsible way.

Q146 **Peter Kyle:** You are using the word “smart” a lot in your evidence so far. We need to get a lot smarter.

Graeme Cooper: Yes.

Q147 **Peter Kyle:** Andrew, is there evidence that the market is getting a lot smarter?

Andrew Burgess: There are lots of smart initiatives. There is lots of new technology. The challenge is, first of all, for us as a regulator to make sure that the rules that we oversee and the market arrangements allow innovation to take place within the sector, and that we adapt regulation in the right way as things develop, but probably more importantly that we look after the interests of all sorts of consumers.

Some consumers will embrace smart technology naturally, like Graeme, and will be pioneers in trying to adopt things. Other consumers, we know, can be left behind and not feel able to engage in the sector. One of the challenges is, first of all, to get the smart technology in place, but then to protect all sorts of consumers, make sure that they have the right information and particularly make sure that vulnerable consumers get protected.

Q148 **Peter Kyle:** Stewart, do you believe that the move towards all-electric heating, as well as electric vehicles, could damage the security of supply for electric vehicles?

Stewart Reid: You are absolutely right that there is a strong interaction between the two. If you look at the things that the Energy Networks Association is doing, there are three waves in this. The first wave is about understanding what capacity we have in the network in a lot more detail than we do at the moment, down to the individual street level. The actual level of visibility that we have on what is happening in the network is relatively low. It is at the same sort of level that it has been for the last 30 or 40 years, so there is a lot of work to improve that through monitoring, through the use of smart metering and data. That gives you that visibility.

Q149 **Peter Kyle:** What about policies? Do you think policy needs updating? Are the existing policies fit for purpose? Are there going to be more policies to move to this world that you are talking about?

Stewart Reid: There is a whole evolution in terms of policy, to make sure that we are in the position where customers see a proposition that



they want to take on. Talking about smart solutions in an engineering environment is one thing. Turning that into something that customers will be happy to sign up to is another thing. There is a lot of work to be done to build trust and understanding with customers, and that is going to involve policy and all sorts of different things.

Similarly, as Andrew said, having the right regulatory regimes that give the right signals to distribution network operators to initiate these smart solutions is going to be key. Those are probably the two main areas.

Q150 Vernon Coaker: One of the key challenges for all of us is being able to predict what is going to happen. We have the 2040 target date to phase out new petrol and diesel vehicles, but we are now in 2018, so that is 22 years into the future. The question, therefore, is what will happen and how quickly during all that time. What assumptions are you all making about what is going to happen over that 22-year period, until we get to 2040, to phase out petrol and diesel?

Are you using the Government's target of 2040 and basing all your assumptions on that, or are you expecting market forces to deliver substantial electric vehicle uptake sooner than that? In that case, that all goes out of the window. Well, it does not all go out of the window, but certain challenges occur. What assumptions are you using as we move forward to the 2040 target?

Graeme Cooper: I will pick up a couple of things there. As far as our future energy scenarios modelling goes, we do not do this in isolation, sitting in a room. We poll widely. We talk to industry stakeholders. We talk to Government. We talk to Government Departments. We talk to manufacturers and we talk to consumers. All of that helps to build these scenarios. That is what gives us our high-high and low-low scenarios.

In all of those, we recognise that there are a number of levers. There is political direction. The 2040 target is a useful signpost, but it is purely a signpost. There are negative pieces in the media, where you see people concerned about diesel emissions. That has an influence. Also, there is the level of uptake and the perception of range anxiety. As a perception, it is real, and there are ways of fixing that. Some consumers are saying, "Maybe I will move to an electric vehicle when a car will move for 100 miles, or when I can charge everywhere".

We try to observe all those potentials and stir them into this future energy scenario, so that it is not focusing on just one driver. We would expect, within our scenarios, to cover all those bases. There are, I suspect, some useful things that could be done to drive towards that direction.

But we also start to see some interesting early uptake. One of the things I was interested in, talking to Nissan last week, is that the new Nissan Leaf, which has been out in the last few weeks, had nearly 13,000



presales before the car was launched. As a business, generally, it does not have an order book. People see them in showrooms and buy them.

We are starting to see a shift, and the uptake will not necessarily be as smooth as the predictions. I think that it will have a number of peaks as we go, but it is about reacting appropriately to support those peaks as we go forwards.

Stewart Reid: Can I add to that?

Vernon Coaker: For Scotland, it is 2032 anyway, isn't it?

Stewart Reid: It is. Experience from things like the rollout of photovoltaic cells says that customer behaviour will drive this, not necessarily Government policy. The combination of the two things will drive it. The whole ethos of the work that we are doing with the ENA is to make sure that we are ready for the different scenarios. I was mentioning monitoring before, and having insight to these bits of data that we have, so we can start to see patterns emerge.

The other thing is having a whole toolbox of solutions available, both smart and conventional, ready to go and be mobilised. Even from a regulatory perspective, within the RII0-ED1 settlement, there are mechanisms for re-opening that, to allow for rapid uptake of LCTs. There is an innovation mechanism there as well. In terms of funding, in terms of this toolbox of solutions, and in terms of the data to make an intelligent assessment of when things are going to pick up, we are working on all these areas at the moment.

Q151 **Vernon Coaker:** What I am interested in, though, is what happens if we strip that away. In the future energy scenario, for example, you are talking about the possibility of different scenarios. If we get it wrong, you cannot just build a power station, or change the way that the National Grid or the network distribution operates. There is a real practical problem. We mentioned the solar voltaics, or solar panels. That happened much more quickly than anybody anticipated. How do you deal with that? What lessons do we learn? What could we do?

It is not flicking a switch. I am not trying to be simple about it, but say this happens really quickly, you have a power station that does not have enough, and we are phasing out coal and trying to decarbonise through less reliance on gas.

Graeme Cooper: Broadly, we have been quite aggressive in our more aggressive scenarios, so we consider what that might look like and then how we operate a system in that. We cannot dictate when power stations are built; we can just take them to the market. Interestingly, if you look at people who lease a car or have a company car, it is generally a three or four-year cycle. People who buy private cars tend to have an eight or nine-year cycle, so a change overnight could be more dramatic, but not a cliff edge.



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To an extent, though, driven by Ofgem, we have a very, very robust grid system. There are a number of interconnectors being built to other countries. We already have existing interconnection. There are a number of plants that are effectively mothballed, and the capacity market mechanism delivers capacity at extremes. The right market measures are there.

Q152 Vernon Coaker: What power stations are lying idle that you could switch on, then?

Graeme Cooper: I could not name you one right now, but I will certainly let you know.

Q153 Vernon Coaker: Some of them are coal, for a start, aren't they?

Graeme Cooper: One or two, yes, but they will not be around for that much longer, I suspect. We have new generation being created all the time. We have offshore wind farms being built. We have more solar arrays being built, so the generation landscape is changing, and the market is responding to that. There is enough time, even if we see sharper uptake, to respond in the right way.

Stewart Reid: There is another angle to it. It is not the solution, but it is relevant to what we are talking about here. Where you have renewable energy, and that is being constrained for whatever reason, whether that be local or national constraints, flexible charging of electric vehicles brings an opportunity to de-constrain that wind.

Flexibility is the key to this whole thing. If we have flexibility in terms of when we charge, it provides additional capacity—not all the capacity, but additional capacity—and it allows us to get the maximum that we can out of existing network assets. At the very least, that gives us the breathing space to see that there is a big wave coming our way. We use the flexibility and the tools that I was talking about before to deal with that wave, and then we have the time to make investments in infrastructure to deal with that tidal wave of EVs, if that is what ultimately happens.

Q154 Vernon Coaker: Would it help if they brought the target forward? Scotland has 2032. Some people are saying that 2040 is a very unambitious target. Would it help with planning if it was brought forward? If it is 2032 in Scotland, what is your view of making that target apply to the whole of the UK?

Graeme Cooper: As an individual consumer, I would like our air to get cleaner sooner. From that point of view, drive change. The sooner we make the change, the easier it is to achieve targets. From a National Grid point of view, professionally, 2030 or 2040 is far enough out that there is enough capacity.

Q155 Vernon Coaker: Could you do it for 2030?

Graeme Cooper: Absolutely, yes, no problem at all.



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Q156 **Vernon Coaker:** National Grid could cope with the Government bringing the target forward by 10 years.

Graeme Cooper: Absolutely, and we would probably actively support that.

Q157 **Vernon Coaker:** National Grid would actively support that?

Graeme Cooper: I think that we would support a more ambitious target. It gives clear focus. It would allow the networks industry to respond appropriately, but if it does not change we can deliver to 2040.

Q158 **Vernon Coaker:** Stewart or Andrew, would you like to comment on bringing the target forward by 10 years? In Scotland, 2032 is ambitious. National Grid is saying that it should be 2030.

Stewart Reid: It links into the point that I was making before. We are not working on the premise that a policy is set, and that is exactly what the curve is going to look like. We are working on the basis that there could be a bow wave before that, based on customer choice, so to some extent we are agnostic to when that target is.

Vernon Coaker: I understand that.

Stewart Reid: It has been about preparation since 2010.

Graeme Cooper: To your comment about being consumer-led, even if you leave 2040 as a target, I think the list of people buying combustion engine cars post 2030 will be a very short list.

Q159 **Vernon Coaker:** Well, it is my own view. It is a personal view, not the Committee's view. I think that pulling the target forward would help.

Graeme Cooper: It is also important, on a world stage, that the UK looks to at least match our neighbours, and maybe try to be more ambitious.

Q160 **Vernon Coaker:** Is Norway the most ambitious that you are aware of, at 2025?

Graeme Cooper: It is.

Stewart Reid: It is also decarbonising internal flights.

Q161 **Vernon Coaker:** As a final question on bringing it forward, one of the problems is that transport is 25% of all carbon emissions. The Select Committee is going forward and saying, "We need to do more about air quality". The problem is that you have to generate the electricity, and you may reduce the transport emissions but then increase emissions from the electricity you generate to provide for those vehicles.

Do you feel the Government have a grip on all that, in terms of recognising that coal is going to be phased out and we are going to reduce our reliance on gas, as we move to electricity generation rather than gas? Is that one holistic policy that is all together? Do you think that



the Government have brought it all together?

Graeme Cooper: Yes. There is a clear strategy. The thing that would be useful, particularly in the decarbonisation of transport place, is the Road to Zero strategy. At the moment, we have the signpost to 2040, and it is difficult to see whether there are set points along that way. There could be a little more messaging, and I think that is due to come in May, but other than that the broader energy piece is reasonably well understood.

Q162 **Vernon Coaker:** Andrew, do you have anything to add to what Stewart and Graeme have helpfully said?

Andrew Burgess: The target is a matter for Government, for elected politicians. It signals a direction, but I agree with Stewart, in that consumers will do whatever consumers do, and the market will move at whatever pace it moves at. The key lesson from the uptake of solar is that everyone needs to be alive to change, plan for different scenarios, and be able to react much more quickly.

Q163 **Vernon Coaker:** Learning from solar, would you bring the target forward in line with 2030, as National Grid has now suggested?

Andrew Burgess: It is not a matter for us as a regulator. It is a matter for Government. We would like clarity, so if the target moves to 2030 it should probably stay at 2030.

Q164 **Vernon Coaker:** Would it be a problem for Ofgem if it was moved forward?

Andrew Burgess: It would not, no. We will fit in with whatever target there is.

Q165 **Chair:** Stewart has touched on it already, but are policies needed to ensure that any additional capacity built to meet the extra demand for electric vehicles is low carbon? It is great that people are taking up electric cars, but we need to make sure that the electricity generated to power those cars is low carbon. Is anything needed to ensure that that is the case?

Stewart Reid: That is not my main area.

Graeme Cooper: I used to be a wind farmer before I joined National Grid, so I was at the pointy end of this. On the articulation of targets, the Government's clean air strategy and all those things point in the right direction. At this stage, you are seeing coal being phased out. You see new renewable generation coming forward, and you see interconnectors to help balance load, so the combination of all those things is quite a joined-up and reasonably compelling answer.

At the end of the day, National Grid does not make electricity, and we do not sell electricity. We manage the wires and the supply and demand to service the country's needs, so to an extent, irrespective of what is on



the end of the wire, we will manage that in the right way. It is not for us to drive that?

Q166 **Chair:** Will the remaining contracts for difference auction and the capacity mechanism deliver what is needed?

Graeme Cooper: I would expect so, but as I say I am no longer in that space. Watching my ex-colleagues, you see that bigger-picture Government thinking, with the right drivers to drive savings and drive things in the right direction.

Stewart Reid: There is another related point. Where there are renewables, it is about making the maximum use of them. You will hear this word a lot, but that flexibility we were talking about before is the very thing that will allow renewables to play a bigger role, alongside some of the things like storage technologies and the like.

The Energy Networks Association has a thing called the Open Networks Project. Saying these things is really easy—"Oh, we will just do it all smart"—but the challenge is working out how you co-ordinate all these things so that the system co-ordinates with the networks, which co-ordinate with the markets, and the like. It is a very big piece of work that is underway at the moment. It has been going on for the last year, and it is working out what the systems would need to look like to support things like that. That could be the key: the fact that your photovoltaic on your roof and the battery in your garage are helping to make sure that you are using decarbonised energy to charge your electric vehicle.

Q167 **Mark Pawsey:** I am interested in following up the line of discussion that we have had about understanding where the demand for additional electricity is going to come from as a consequence of electric vehicles, and what the implications then might be for the transmission network and the distribution network. We have spoken about PV cells, and there is a reasonable chance that, if your neighbours put PV cells on their roof, you are going to do that. We can assume, therefore, that if your neighbour has an electric car, and you are chatting about it over the fence, you are more inclined to have an electric car.

There are certain socioeconomic groups that will adopt this technology earlier. Let us not forget, as well, that the capital cost of an electric vehicle compared to an internal combustion engine is roughly double for a vehicle with similar outputs. In some communities, that capital outlay is going to present them with major problems. What work has been done about mapping and understanding where the extra demand is coming from? Perhaps, Stewart, you could tell us how we are going to identify where that will be.

Stewart Reid: In terms of where EV uptake is going to be, as I said before, there is a lot of work being done at the moment, taking data from smart metering, substation monitoring, socioeconomic mapping and the like to identify where we are most likely to get that high level of uptake.



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The other thing that has been done within that is that we are overlaying the spare capacity in individual parts of the network.

- Q168 **Mark Pawsey:** Do you have an understanding of which socioeconomic groups are going to adopt this technology first. Do you expect that, by 2040, people who would currently run around in a 10-year-old internal combustion engine vehicle are going to be leaving those behind, scrapping them and running around in a 10-year-old electric vehicle?

Stewart Reid: We are already seeing early signs of clustering on the network. We have areas where there are more electric vehicles, just because of these sorts of factors. You will have people who will, in certain areas, not have that same uptake.

- Q169 **Mark Pawsey:** Graeme, if we know where these areas are, what steps are you taking to make certain that there is the additional electricity supply in these areas to accommodate those vehicles?

Graeme Cooper: One important thing is that networks need to work more harmoniously. The DNO networks will work very hard to service individual needs by individual consumers, but cumulatively that has an impact on the transmission system. Working more collaboratively on where hot-spots are being seen and where that might instigate an update to the transmission network, the dialogue is already there.

- Q170 **Mark Pawsey:** Is the work already there? Are you anticipating sufficiently to be putting additional infrastructure in now, or are you going to wait for the demand to materialise, when perhaps people experience problems?

Graeme Cooper: It is a really interesting argument. There is enough capacity on the transmission system as it stands, as a holistic understanding, for us not to do any significant upgrades for the reasonably foreseeable future.

- Q171 **Mark Pawsey:** I think that 1% of our vehicle fleet is electric right now, so it is not going to have a big impact.

Graeme Cooper: Absolutely, but even when you look at the ramp-up of electric vehicles that we have modelled, we do not have to wholesale upgrade the whole of the transmission system. There are some useful pieces to do around motorway charging. At the moment, OLEV is doing a tremendous job at supporting home charging, and a tremendous job at supporting workplace charging, but there is a gap in the middle.

- Q172 **Mark Pawsey:** Can I just ask you about motorway charging? Most motorway service areas are in the middle of the countryside, and they do not have that. What are you doing about making certain that people making a lengthy journey on the motorways can get power when they stop at a motorway service station?

Graeme Cooper: That is an area where there would need to be some targeted investment.



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Q173 **Mark Pawsey:** You said, "There will need to be targeted investment". Why are you not doing it now?

Graeme Cooper: Basically, the way the regulation works is that individual connections make an application to National Grid, and we serve one point on a map.

Q174 **Mark Pawsey:** I am bothered that you are going to wait for the demand to materialise and then try to serve it.

Graeme Cooper: One of the things that we have been doing is to take a step back and look at the whole perception of range anxiety. We see that the home charging is being well served, and we see that workplace charging is being well served. The hole is motorway service stations.

We tried to take a step back. How would you overcome range anxiety? Motorways become quite critical, because people buy a car for their biggest journey, not for average. The average first car in a family does 37 miles in a day. If you are lucky enough to have a second car, the second car in a family tends to do 13 miles in a day, so a 200-mile-range car will do everything that you will ever need for 97% of the time. The challenge is that, if you want to do a holiday to Cornwall or a trip to Edinburgh from here, 200 miles will not do it. If you had the comfort that you could travel 50 miles in any direction and get an ultra-rapid charger, for that once or twice a year you do a big journey, the problem disappears.

The challenge for that, and where we need an intervention, to an extent, is that someone needs to consider fixing the country as a whole. We can serve that, because if you have ever driven the motorways of the UK you will see that transmission lines generally follow motorways and trunk roads. We can deliver the capacity at motorway service stations for the replacement of an entire petrol station, to serve lorries and vans, and even the manufacture of hydrogen. It is not just about battery electric vehicles; it is hydrogen vehicles too. That needs specific intervention to unlock the perception of range anxiety, and then the uptake of cars.

This is the challenge that we have. The RIIO process is an excellent process, and it has delivered, at least from a National Grid point of view, over £460 million worth of savings. It is an absolute success to the consumer. It is great as a "business as usual" step. The challenge we have in the motorway service area, as an example, is that a little bit of targeted intervention is a market disruptor and does not fit within the normal framework. If it fits within the normal framework, it means that that cost is smeared across all energy consumers, when there are other ways of slicing and dicing that cost. Perhaps it targets just road users, but that is a Government decision.

Q175 **Mark Pawsey:** Andrew, what is your view? Should every electric consumer pay for the cost of this extra infrastructure, for the handful of people who want to charge their vehicles on the motorway? Is that fair?



Andrew Burgess: There needs to be a fair distribution of costs. One of our roles—and we have a number of initiatives underway—is to make sure that the costs of the infrastructure are distributed fairly, that those who impose an extra cost should bear a fair proportion of that, and that we should protect consumers in general, and not have consumers who do not have electric vehicles unduly subsidising those who do. It is about getting the right balance.

Just to go back to a couple of other things, in a lot of cases, there are ways in which the network companies can be cleverer in using flexibility and smart solutions to avoid network reinforcement. There are other cases where it is clear that network reinforcement is needed, and they have a certain amount of money within the existing price controls at the moment, where they can spend it and solve problems for the future.

Where there are particular challenges, to do with motorways, say, it is about getting the balance right between the connecting party, so whoever is driving the change, and consumers in general. We think it is probably wrong for everything to be loaded on consumers in general, because it just goes on bills. Some of the reinforcement will go on bills, but the connecting parties need to pay their share as well.

Q176 **Antoinette Sandbach:** Do you think that there will be impacts with different types of charge point and different types of electric vehicle?

Stewart Reid: Yes, without a doubt. Plug-ins have quite a different requirement versus hybrids, in terms of people's flexibility and how much energy they are putting into the car. There has been a fair bit of work done to model that and understand it. We have the raw data in the background in order to allow for these different scenarios and anticipate how they could act differently. The nature of the connection is interesting, to that discussion you just had about connecting. The bulk of the connections are not to the transmission system. Very, very few would be at transmission level. They would be at distribution level, and so you will get a very different behaviour if you have a rural connection as opposed to an urban one, or an area where there is commercial mix.

It is one of these urban myths that there is a standard profile of demand everywhere in the country, and that creating one standard tariff to shift everything to a certain time will fix things. It is much more complex than that, and an individual street can have a very distinct profile, unique to that particular street. It is really important that we recognise every location is different, and use the flexibility that we have in a sensible way to get the maximum out of each network, not applying one tariff solution to the whole UK, for example.

Q177 **Antoinette Sandbach:** How do you see the balance between smart charging, as it were, and network reinforcement?

Stewart Reid: I see smart charging as the buffer that gives you the time to make the investment, and to anticipate the need for the investment.



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In some cases, you may never need to make that investment. That smart solution may stay there, but it provides you with that buffer. One solution that we looked at gives a 20% increase in the amount of EVs you can get on a particular street, just by applying a particular flexible solution. That could be the time that we need to go in and get consents, and all the rest of it, for cables, new transformers or whatever it might be.

That buffer also allows for uncertainty. The other danger is that you invest too much ahead of need, and end up with a lot of customers' money sunk into a network that subsequently becomes stranded. That flexibility is key there.

Q178 Antoinette Sandbach: I will come on to that a bit later. What evidence is there about the impacts and acceptability of smart charging for consumers? At the moment, with smart meters, as far as I am concerned, it is just a nice little box that tells me how much it costs me to put my oven on.

Stewart Reid: In the trials that have been done, where we have engaged with customers about flexibility, generally speaking, very, very few customers do not get why charging is a good thing and are not willing to engage with it. If you turn up cold on the doorstep, and knock and say, "I would like to switch some demands off and on in your house", you will not get that response. The key thing is engagement, and it is not only direct engagement with the likes of DNOs. It is also new market participants coming in and creating products and services that are exciting and engaging for customers. A lot of these things are starting to appear.

I mentioned about the Open Networks Project. Part of what the Open Networks Project is doing is making sure that these new, disruptive solutions that are often on the other side of the meter can have a way of engaging in the marketplace, not just from a National Grid perspective, but also from a networks perspective.

Q179 Antoinette Sandbach: Andrew, from a regulatory point of view—but perhaps to the others as well, from a cost point of view—do the financial benefits of smart charging outweigh consumer impacts?

Andrew Burgess: We have not done any detailed analysis of that, but you can look at the value of flexibility across the system. In July last year, we published a joint plan with Government on a smart, flexible energy system, and the evidence there from Imperial College was that you could save billions of pounds over a long period of time by having greater flexibility in the system. If you see smart charging as part of that, it can clearly save on reinforcement costs. Obviously, we need to make sure that consumers are protected, and they understand what is involved and the implications. We are committed to that.

Graeme Cooper: At the moment, we are looking at regulation and networks just through the lens of the cost of networks. One thing that is



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really important, particularly when you are considering the move to decarbonising transport, is that this is three industries together. You have the energy industry, the transport industry and the digital industry, and all of those need to work together.

It is really important for the Committee to look not just through the lens of the cost of networks. We need to look at the broader societal cost of cleaning our air. We need to look at how it matches with industrial strategy. We need to look at how UK plc punches above its weight on a global stage. All those things need to be considered, and we need to ensure that we do not, to save money, not do something somewhere and have the unintended consequence of costing money somewhere else.

One useful consideration, which we work very closely with Ofgem on, is that at the moment we have a siloed system. Ofgem looks after the energy piece; you have a transport piece; you have the digital piece. We need an element of cross-regulation, so regulators can see where there might be a cost somewhere, but the net benefit makes it the right thing to do, and look at how that falls. As an energy industry, that is a place we have not had to be before. We have a really interesting opportunity right now, with this paradigm shift in our transport and energy system, to consider things in the round and look at the holistic solution, rather than just focusing on a grid cost or a network cost.

Q180 Antoinette Sandbach: Earlier, you said that you felt the Government had good oversight of how the piece is working together. Does that include the regulatory space?

Graeme Cooper: At a Department level, you have the BEIS industrial strategy. You have the Department for Transport, and you have OLEV sat in the middle. That is great, because you end up being able to consider industrial strategy and highways. To an extent, the energy regulator is an independent body trying to protect consumers but, in the lens that Ofgem looks through, it is protecting current and future consumers of energy. It is only looking at the energy element. It is worth looking at and unpacking in a broader context to understand whether it is regulators getting together, or whether it is directed, and to consider the broader impact.

Q181 Antoinette Sandbach: Stewart, should smart charging be an opt-in? Should it be voluntary for EVMs? Should it be opt-out, or should it be mandatory?

Stewart Reid: That is an interesting question. There is actually a consultation at the moment, looking at a small element of that: whether optionality is the way ahead. There is a balance to be struck. For example, smart metering is not necessarily something that you have to install if you have an electric vehicle, but smart metering could give us a vast amount of information: not about the customer, but about what has happened to the network and where the needs are. It is also an enabler for flexibility and a solution.



It is a combination of two things. First, we should think about a degree of compulsion as always being the enabler to new forms of flexibility. The participation in that flexibility is probably the bit where you allow people to choose whether they want to engage with new products, tariffs and so on.

Q182 Antoinette Sandbach: How are you going to design this network so that consumers who do not have a car, or do not have an electric vehicle, are not paying for the consumers who do?

Graeme Cooper: To an extent, as a consumer, I feel the bill on a daily basis. I am a consumer as well as working for National Grid. This is why some considered, targeted intervention that is not business as usual, if you want to accelerate the uptake, or overcome those barriers, is a useful thing to do, but it should not just be lumped on the bill. That is a very blunt tool.

Q183 Antoinette Sandbach: Andrew, is that something that you are looking at already?

Andrew Burgess: Yes. It is a priority for us. It is about the way in which network charges work, so the way in which the costs of the networks are recovered, and the signals that people face when they are seeking access to the system. It is about getting the balance right between having sharp enough signals for those imposing a cost on the system, and making sure that the allocation of costs across consumers in general is fair and you do not have a situation where some groups of customers are subsidising others.

Q184 Antoinette Sandbach: Should the way that reinforcements are paid for, if they are needed, depend on the type of charge point that is installed? In other words, should there be a charge levied for the power-hungry, rapid charge?

Andrew Burgess: The greater the cost that someone imposes on the system through what they are doing, the higher the share of that cost they should pay.

Q185 Antoinette Sandbach: But then what happens for rural consumers who might be miles away? Sorry, Stewart, you wanted to come in.

Stewart Reid: Yes. That is probably the nub of this whole question. At the moment, almost without exception, customers would require an upgrade and a new connection for fast-charging technology. With that pull there, there is a cost incentive for customers to think about whether there are other ways that they could be doing this. There is another layer within there, which is where people go for relatively slow charging at a domestic level, where it is socialised. There are these two differences, and that is what is being discussed in the Charging Futures Forum at the moment: what is the right way to go with that?



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Where you do have that cost, there are so many opportunities for customer to think about stuff on the other side of the meter. For example, a rural customer could have fast charging in their home with a relatively small connection by putting an energy storage device in their home, trickle-charging that through a 24-hour period and then fast-charging the car when they are home. Beyond the meter, there are ways of achieving that same functionality.

Q186 Antoinette Sandbach: Are you seeing that happen?

Stewart Reid: We have seen plenty of companies with business models that work on that basis. It is coming through to customers at a small scale at the moment, but it is definitely growing.

Q187 Mr Liddell-Grainger: Can I ask you about vehicle-to-grid technology? Is it useful, how long, and what is the cost differential going to be?

Stewart Reid: Vehicle-to-grid is not the critical issue today. The critical issue today is getting that basic charge infrastructure supplied and all the rest of it. Beyond that, absolutely, it provides lots of flexibility and options for us to get even more out of the system than we would just by providing non-vehicle-to-grid options.

It shows a lot of potential. The key question is whether it is something that customers want to do with their precious new vehicle, or something that people will pass by. There are projects underway at the moment with ENA members to explore vehicle-to-grid: how it can be done technically, what sort of impact it would have on the network and what sort of customer acceptance it would meet with.

Q188 Mr Liddell-Grainger: What do you think? You have posed your own question. Is it going to be something that people are going to embrace? Is it going to affect the electric battery technology and life? Look in the crystal ball, please.

Stewart Reid: I am going to answer that with a wishy-washy answer.

Mr Liddell-Grainger: It was worth a try.

Stewart Reid: Ultimately, if the right proposition is there for a customer, why would you not? There are business models out there offering free energy storage, because the energy storage can pay for itself under some of the future scenarios. There could be scenarios where you have a similar proposition for the battery in your car. If that happens, that sounds like quite an attractive proposition for customers. It is all about how things evolve and how it is sold to the customer, which is all about other businesses coming up with these new business models.

Q189 Mr Liddell-Grainger: Ofgem, is this something that you are going to be pushing? The Government have made some money available to look at it. Is this something that you are interested in?



Andrew Burgess: Our role is on two fronts. One is to make sure that there are not any undue regulatory or market barriers to new technology and new ideas, and the other is to protect consumers and make sure that consumers understand what they are buying. In the work with Government that I mentioned earlier, we committed to removing barriers to electricity storage. We are well on the way to removing those barriers. If there are any other barriers to vehicle-to-grid, we will look at those barriers and try to remove them.

As to whether it is successful, as Stewart said, it is largely dependent on whether consumers want to engage and how consumer behaviour works with electric vehicles. Our role is to make sure that we have the right background and circumstances to enable people to bring those products to market, but also to make sure that consumers, particularly vulnerable consumers, understand what they are buying and are protected in the right way.

Q190 **Mr Liddell-Grainger:** Is it not quite a good idea to have people putting back into the grid through an electric vehicle? Is that not something that you should be embracing?

Andrew Burgess: Potentially, it is a good form of flexibility that will save money for the system overall. But, in talking to different vehicle manufacturers and different people, there are different views about its viability. We, as a regulator, do not back particular winners. We create the right environment, and then it is up to market providers to come in and offer the service.

Q191 **Mr Liddell-Grainger:** We have this rather boring statistic of how many Hinkley Points this takes. That seems to be the watchword. Given this technology, could you see it dropping at least two Hinkley Points?

Graeme Cooper: Yes, quite probably. National Grid manages the real-time supply and demand to keep the lights on, so we are really interested in the vehicle-to-grid piece. As a business, we are supporting some of the innovative research projects, so we are contributing our historic learning, as well as learning from the study.

How important will it be? We need to go a little further down the avenue to look. The interesting one for me, though—and this is really what we are starting to see in the latest research—is understanding human behaviour. You can model what the technology will do. You can model what the networks will do. You can model what a car will do, but at the end of the day, if a human being leaps out of the car and runs indoors because it is raining, and does not plug it in, vehicle-to-grid will not work. There is that interesting human behaviours piece, which is overlaying a lot of the study. We are too early in the process to really understand whether it will be of tremendous value, and whether we shed a couple of Hinkleys in the process.

Q192 **Mr Liddell-Grainger:** Antoinette made a point that she can just about



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switch on her oven with the smart meter. I cannot even do that. I do not understand it at all. Is there going to be a technology deficit, do you think? You made the point about the rain: they run inside and they do not plug it in. If they plug it in, will they have to have a switch to say, "I am putting it back in"? Is it an automated system? Will it be automated? If so, there is going to be a differential on the grid. Can you model that?

Graeme Cooper: Can I turn it on its head slightly?

Mr Liddell-Grainger: Of course.

Graeme Cooper: If you look at the rollout of another technology, like mobile phones, you originally used to buy a very expensive phone and pay a lot to use it. Now, we see bundling of services: you get minutes, data and text in a bundle, and they will sell you broadband.

In the energy space, you might find that you lease a car and somehow the energy is included in that monthly lease. In that case, there will be software in the car or software in the meter to manage when it charges. To an extent, those who do not actively want to participate, switch things on and off, have apps and what have you will be served by technology. It will be part of a company car scheme or it will be part of a lease car, or you might end up with your energy provider at home serving the best time to charge the car. It would be bundled as part of other services—I would hazard a guess—rather than having to leap up and down, and switch things on and off.

Q193 **Mark Pawsey:** Graeme, you were talking about modelling, and anticipating where the demand comes from, but there is some empirical data available, isn't there? There are vehicle registrations when people buy a car, and knowing where that car is going to be based. Then there is the issue of the installation of charging points. OLEV, I think, has said that only 3% of new charging points are being notified to the district network operator. Is there more that we can do about making sure that data is shared?

Graeme Cooper: Absolutely, yes. First, as National Grid, we look at the published car uptake numbers. We follow those numbers quite closely, but the metering piece is done in the DNO network, so can I refer to Stewart for that one?

Stewart Reid: We have been having extensive discussions. We have made good progress with OLEV, in terms of allowing us to get visibility on that data, because it is key. There is always more that could be done. There are issues with the dataset. For example, company cars are not necessarily registered where they are going to be, so a lot of different datasets need to be worked together and blended together to give us that visibility.

We need to start to move into the second-hand market, where, for example, a customer changes from a hybrid to a plug-in. That changes the impact on the network, but we do not necessarily get sight of that



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change. That is where things such as network monitoring and smart metering are going to play a really important role to give us that visibility. It is not just about datasets; it is about tying them all together.

Q194 Mark Pawsey: In terms of the charging point notification, do you think it should be mandatory: that when somebody installs one, they should be obliged to make sure that the district network operator knows, so that they can anticipate the additional demand?

Stewart Reid: There is already a requirement to notify after the event to the DNOs. We could do work to improve that, and improve its robustness, but there is a mechanism in place to allow that to be done. It is the same mechanism that is used for microgeneration connections and the like.

Q195 Mark Pawsey: Would some central planning be helpful here, in terms of trying to anticipate this and then putting infrastructure in, or are we doing the right thing by responding and anticipating as we are?

Stewart Reid: It is really important that each area is dealt with on its own merits. For example, if I were to go to the far north of Scotland, you have an excess of renewable energy at certain times there, and that creates a different opportunity in terms of how you manage your electric vehicle fleets. It maybe means that you want to accelerate EV uptake in some areas over others.

Areas where you have an industrial history, where there is a lot of capacity on the network that is underutilised, might have a different approach to an area where you have a heavily loaded network that has had continuous growth for 50 or 60 years. There is very much a different approach in different places, and it is important to have that, but consistency in terms of the overall management of that. We are doing this through the ENA.

Q196 Mark Pawsey: You just spoke about accelerating electric vehicle uptake. What tools would you consider suitable to do that at a local level?

Stewart Reid: A number of projects are being trialled at the moment, encouraging all sorts of different things, such as the growth of flexible demand in targeted areas to help manage constraints. Energy efficiency is another thing that is being targeted in some projects, to see whether you can accelerate energy efficiency to free capacity in an area and allow it to be used for other purposes, such as EV charging. There are a number of initiatives exploring that at the moment, and they are all feeding into the ENA's Open Networks Project, so that we have a consistent toolbox for accelerating particular behaviours in particular areas.

Q197 Peter Kyle: Is the current network price control framework sufficient to incentivise the right electrical grid investments to support EVs, Graeme?

Graeme Cooper: The current price control process, as I think I mentioned earlier, is pulling the right levers, because it has saved



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consumers £460 million in the price control period. The challenge for me is this. If you want to overcome range anxiety, some bits of targeted investment will need to be made. Motorways are a really obvious example. Because they are rural, they are very expensive connections, but we can use existing transformers that have already been bought and paid for.

Some targeted pieces are right, and it is difficult to get those co-ordinated with the reopeners within the price control. To an extent, yes, what we have works, but we are looking at a very, very different future. If you want to unlock this perception of range anxiety by targeting the more peripheral charging locations such as motorways, where they are in a generally rural location but you need really fast charging, you get a disconnect. They become very expensive, and therefore, if you lumped all the cost of that on to the person charging, you would stall the market.

To an extent, we need to keep going with the RIIO price control. It is delivering savings to consumers. It is the right mechanism; it is delivering the right objectives, but some targeted intervention should be considered, if you want to generally move us more quickly to overcome that range anxiety, which is one of the biggest reasons for not buying an EV, and therefore take the step forward to decarbonising transport more quickly.

Q198 **Peter Kyle:** Stewart, do you think that the Government should be incentivising network companies to invest ahead of need or demand?

Stewart Reid: That needs special consideration. It is definitely a scenario that I could see occurring, where there would be a need for that investment ahead of need. At the moment, as I mentioned before, it is about establishing that there are two lots of solutions and freeing up as much capacity from the network as you can.

With the things you are talking about, when putting new infrastructure in, the way that we engage with these large volumes of connection applications is key. There are a number of bits of work being done at the moment to improve that and make that as smooth as possible, but also to allow us to consolidate the connections that are coming in, to give early signals that we need to be making some investment.

Q199 **Peter Kyle:** That is a brilliant and technical way of sitting on the fence, but the Government are going to have to make a decision about whether they wait for demand to arrive, or whether they use the power they have to get network providers to invest before.

Stewart Reid: If you really want things to move quickly, you want to be investing ahead of need, but on an intelligent, informed basis.

Q200 **Peter Kyle:** What does intelligent and informed look like in practice?

Stewart Reid: It means extensive engagement with regional authorities and councils, all those that are involved in, for example, the E9



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electrification. Oxford is a special zone for electric vehicles. It is about engaging with these locations, understanding aspirations and where they are going, and then taking that data, applying it to networks and providing informed, evidenced cases for investment ahead of need.

Peter Kyle: Graeme, you are chomping at the bit.

Graeme Cooper: In past careers, I have rolled out mobile phone networks. I have been involved in the rollout of fibre-optic broadband.

Peter Kyle: And setting up wind farms. You have been very busy.

Graeme Cooper: I have been a busy boy.

Vernon Coaker: And generating electricity

Peter Kyle: And driving electric cars.

Graeme Cooper: I like to be busy. There is an opportunity here. In the early rollout of mobile phones, city centres got covered very quickly, and then there was lots of space where everybody else was somehow a second-class citizen. In the same way, even today, fibre-optic broadband is in town centres but it is not anywhere else. This is a broader decision for Government to consider. If we want to have consistency between John O'Groats and Land's End to drive an electric car and charge universally, we need something that works for everybody and to roll it out in a structured way. It should be "least regrets" investment so that you are not focusing on one technology.

Oxford is great, because it is quite anti-car but very progressive about charging. However, people in Oxford do not just stay in Oxford; they need to go to other places. You really want consistency across the UK, and that is where there is an opportunity for Government to take half a step back, consider the broader economic benefit and not just focus on networks. Considering everything in the round, is consistency across the UK the right thing to do? In my mind, that is probably the best learning from other infrastructure-based technological changes such as fibre-optic broadband and mobile phone rollout.

Peter Kyle: Learning lessons of broadband is something that Antoinette would approve of.

Antoinette Sandbach: In parts of my constituency, you will still find a 2G network, and my constituents are being sold 4G.

Q201 **Vernon Coaker:** This builds on what Peter Kyle has been asking and what you have been reflecting on. Given the assumption that moving to electric cars is the desired policy objective and that we need to do that as soon as possible—and it is a good assumption to make and the policy is right—the ability to maintain public confidence will accelerate that rollout. One of the problems that we have—and we were talking about it in answer to Peter Kyle's question—is that it is an enormous investment. There will have to be a big investment in both charging points and the cars. What does one do to plan so that it does not become obsolete



within a short period of time? How do you know what is going to be obsolete?

I will give you one example that I was reflecting on. Who knows how quickly driverless cars will happen? At the moment we are assuming that someone drives around in a car and they make the choices regarding charging. What happens with driverless cars? It is really about how we prevent things from becoming obsolete too quickly.

Graeme Cooper: The piece of work we did on motorways considers this. The assets of the National Grid are there for 40 years plus, so we have to look that far ahead to consider whether it is the right sort of investment. This is one of the challenges, particularly in the motorway services piece: will we have motorway services without driverless cars?

Q202 **Vernon Coaker:** Can I interrupt? Just so I understand, if you put a charging point in a motorway service station now, are you saying that your assumption is that that would be the right equipment for 40 years?

Graeme Cooper: No, the infrastructure to support charging. The challenge we have at the moment is that motorway charging right now is not very fast.

Vernon Coaker: I see, sorry. I understand. Sorry, I got it the wrong way round.

Graeme Cooper: To the extent that you put the right infrastructure in to serve anything that could plug into it, you cover a lot of bases. You could charge cars, vans, buses, et cetera.

Q203 **Vernon Coaker:** How do you know it is right?

Graeme Cooper: It is the "least regrets" position. This is one of the interesting debates that was had, coming back to the human factors. Of people using motorway service stations, 97% go to the bathroom. That does not change whether you have a driven car or a driverless car. People will stop anyway. Even in a world where you have people who are no longer driving their own car, when you stop to go to the bathroom, the self-driving car should charge because then at least it has more range for wherever it is going next.

We cannot accurately foresee the future, which is why the scenarios are important. Any target investment should always be done on a "least regrets" proposition. Within all of these, there are some reasonably obvious "least regrets" scenarios.

Stewart Reid: From my perspective, you are absolutely right. In 10 years' time, we could be talking about the rollout of hydrogen instead of battery. There is a lot of uncertainty in this. We have talked about how flexibility and the smarter solutions—I hate the word "smart"—give you optionality. We get as much out of the existing networks as we possibly can using flexibility and energy stores, all of which are effectively short-asset-life solutions. That allows us to keep an eye on what is



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happening and only make that investment at the last point, based on informed decisions. It is a combination of optionality and really good intelligence in terms of what is happening in the marketplace.

Q204 Vernon Coaker: It is absolutely crucial. All of us, as MPs, have had problems with constituents who have had SMETS 1 installed and have now moved to SMETS 2. Essentially, people are left thinking, "Do they know what they are doing?" That is just because the technology rolls on. When is SMETS 3 coming? Then you have the charging cables, moving from the type 1 cable to the type 2 cable. The type 1 cannot be used where some charging points are type 2. Is that a "least regrets" situation?

Graeme Cooper: In a scenario with charging points—and I say this on a daily basis—in most cases, you have adaptors. Depending on the charge point, in many cases there are either two sorts of plug and socket or you can get an adaptor to work. To an extent, that is at a low level. The automotive industry is coalescing around one or two types of charge point, so you will see more commonality going forward. I guess, to an extent, it is that whole VHS versus Betamax scenario.

Q205 Vernon Coaker: Are the Government clear in saying, "This is what we want"? Are the Government clear about what they want?

Andrew Burgess: The Government are clear about wanting electric vehicle rollout. Going back to the technology point that you have been making, it is important that the risk is taken in the right place. From our perspective as regulator, we do not want consumers as a whole taking on too much of that risk, with the funding of infrastructure or charging points being made by consumers and then that technology being obsolete in a short space of time. It is much better that the market bears that risk than consumers. That is not to say that there is not some "least regrets" work that needs to be carried out, but it is important that we protect consumers from that.

Q206 Vernon Coaker: You are the regulator, Andrew.

Andrew Burgess: Yes.

Vernon Coaker: Well, Ofgem is the regulator. Where are we now with that? Is the balance right with that? What power would you have if you thought that had gone out of balance and the consumer was bearing too much risk as opposed to the market bearing it? What would Ofgem do?

Andrew Burgess: We oversee all the market arrangements.

Q207 Vernon Coaker: Overseeing it is great but what would you do?

Andrew Burgess: We are currently reforming, or planning to reform, the way in which people get access to electricity networks, to make sure we have the signals right for the network companies to invest, but also the right balance of costs between those connecting to the network and consumers in general. We can take action on that front. We can also



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incentivise the network companies to do the right thing, and they have funding in the existing price controls.

Q208 **Vernon Coaker:** How would you incentivise them to do that?

Andrew Burgess: We set outputs for them to deliver over a period of time. We give them a certain amount of funding. We have mechanisms to say that they get the same rates of return if they use smarter technology and flexible solutions as opposed to infrastructure investment. We have the sharing of any benefit between the companies and consumers. If the companies can deliver the outputs for less than anyone thought, roughly half of the money goes back to consumers. We can have those incentives. Going back to rolling out charging points, it might be that certain areas are short or certain things are not happening, and that might be where Government or regulators in general need to look closely at why it is not happening and do something specific. We really need to protect consumers from stranded investment and undue risk.

Q209 **Vernon Coaker:** What about the debate as to whether smart kits should be integrated into charge points or into the vehicle? One of your members suggested that they should be put into the cars.

Stewart Reid: Yes, and in our response to the consultation we all agreed on that.

Vernon Coaker: So it is not just one of you.

Stewart Reid: Yes. Smart charging in a form is critical if we are going to create this buffer to allow for rapid uptake.

Q210 **Vernon Coaker:** Can you explain what that means? I get it as a sort of general concept, but what does it mean to include it in the car rather than in the charge point?

Stewart Reid: The charging points and the car, in a smart scenario, speak to each other. The point you made before about standards is absolutely key in this. It is really important that we bed down a set of standards and that these are used across the whole piece. The importance for us, as a network operator, is that it allows us to make that movement of energy around the day to allow us to get the most out of the network.

The other benefits of smart systems are things like putting settings of what mileage you expect to do tomorrow so that we can make sure, as we move things around, that we still have the right amount of charge that is expected the following day. It allows us to do more sophisticated things with smart charging than you would with a basic on/off switch, which is what a dumb system would give you.

Vernon Coaker: Just to be clear, the Energy Networks Association low carbon technologies working group believes that the smart kit should be in the car.



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Stewart Reid: No, we are saying that there should be smart chargers. There are dumb chargers and smart chargers. All we are interested in is the functionality. How it is split between the car and the charger is not the issue per se; it is the flexible functionality that we need.

Q211 **Vernon Coaker:** What are the Government saying at the moment?

Stewart Reid: They are in the same position, in that smart chargers should be part of it. The details have not all been worked through yet but that is the direction of travel, as I understand it.

Q212 **Vernon Coaker:** Does anyone have anything to add to what has been said there?

Graeme Cooper: To an extent, depending on the make and model of the car, a lot of "smart" is already built in. Apps can be downloaded to the car. It is a moot point as to whether it is in the charger or in the car. The functionality is the key.

Q213 **Vernon Coaker:** So it does not matter whether it is in the car or the charge point.

Graeme Cooper: To an extent, I do not think it means so much. What you need is participation. It allows that movement of energy.

Stewart Reid: Yes, the substance from the networks' perspective is where the car is. That has a very important play on how you will move the energy around. As I said before, it is not a national movement from 6 pm to 9 pm where you solve everything; it is much more granular than that and down to individual locations. The smart charger or the car needs to be able to acknowledge where on the network it is before it[sets these sorts of things. That level of sophistication is needed.

Vernon Coaker: It is the forward thinking that is a challenge, in terms of where it is going to go. It is difficult.

Stewart Reid: Yes.

Q214 **Antoinette Sandbach:** Andrew, I wanted to come back on the regulatory environment. I want to pick up on Graeme's point. He said that there have been lessons from where rural communities have been left out in terms of digital and in terms of mobile phones. At the moment, rural customers in Scotland and in north Wales, for example, pay more for their electricity connection than consumers do elsewhere. The economies of scale that happen in cities are not being passed into rural communities. I wanted to come back to your regulatory outlook, to make sure that it is not rural communities that miss out again. Lots of people are discriminated against in terms of access to services because they live in a remote rural area. How are you going to stop that happening in this field now?

Andrew Burgess: There are a number of different issues here. If it is about connecting to the grid, consumers should pay their fair share and we need to make sure that the balance is right between the connecting



consumer and consumers in general. That is an area that we are looking at at the moment. Some of the technology available, such as storage and demand side response, can make it easier for people in rural areas to connect.

There is a more general question of the level of network charges at distribution level in different parts of the country, where it is based on the DNO areas, the length of the network and the number of people living in those parts of the country. The overall level of charges in the north of Scotland is higher than in the south of Scotland, and is higher in the north of Wales than in the south of Wales.

Q215 Antoinette Sandbach: I know a reasonable amount about this. Wales is looked at in its entirety, whereas the connections for generation run east to west. It is the rural communities that put up with the disruption in terms of having to host the infrastructure, so the pylons that impact on their business, which is often tourism. Electricity generation, in the way that you are looking at it and regulating it, is calculated on the basis of looking at Wales as a whole and not looking at where the generation is going, which is east to west in north Wales and the same in the south through to Bristol. Why are you doing it that way and why are you saying that that is acceptable for customers in those rural areas? Yes, there is a lower population rate but that is a matter of fact between cities and rural areas. Why do you think it is acceptable for customers to have to pay more just because they live in a rural area?

Andrew Burgess: Our role is to try to make sure that there is a fair distribution of the costs of the infrastructure. There are some regional variations and we did a report in 2015 on the regional variations. If you are not starting with a blank sheet of paper, if you take what the position is historically, altering that position is much more of a matter for elected politicians than for us as a regulator. We can change the way in which the infrastructure costs are divided up depending on the use of the infrastructure but dealing with the historical regional differences effectively means making trade-offs between consumers of all sorts, say, in the south of Scotland and consumers of all sorts in the north of Scotland. We feel that that is much more a matter for elected politicians than for us.

Chair: That may be something to come back to another time. Thank you very much, all three of you, for coming to give evidence to our Select Committee today on the issue of electric vehicles.