

Science and Technology Committee

Oral evidence: [Smart meters](#), HC 993

Tuesday 3 May 2016

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Written evidence from witnesses:

- [Nick Hunn, WiFore Consulting Ltd](#)
- [Dr Sarah Darby](#)
- [British Gas](#)
- [Department of Energy and Climate Change](#)
- [Smart Energy GB](#)

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Members present: Nicola Blackwood (Chair); Victoria Borwick; Jim Dowd; Chris Green; Carol Monaghan; Graham Stringer; Derek Thomas; Matt Warman

Questions 1-118

Witnesses: **Nick Hunn**, Chief Technology Officer, WiFore Consulting Ltd, **Pam Conway**, Head of Smart Strategy, British Gas, and **Dr Sarah J Darby**, Environmental Change Institute, University of Oxford, gave evidence.

Q1 Chair: Welcome to our evidence session on smart meters. We are responding to our evidence check on the subject, to which we received over 580 responses on our online forum. I open by welcoming the panel. Thank you for coming along to speak to us; I think all of you have given us written evidence. Should smart meters be understood primarily as an energy-saving product, for billing efficiency or for changing the way in which consumers behave? Would you like to start, Pam Conway?

Pam Conway: Smart meters do a number of different things for customers. We believe that we have evidence that shows that smart meters provide data and insight to customers to help them to manage their energy usage and make informed decisions. Our latest research shows that, on average, customers are saving 3% on their dual-fuel bills and that is sustained over time. Customer feedback to smart meters has therefore been very positive, with 60% to 70% saying that they are making behavioural changes, such as using only the amount of water that they need in the kettle, switching off and unplugging when they are not using any of their devices, or using energy-saving light bulbs. As a result, we believe that smart metering can help to inform customers to make informed choices, so

that they can look at what kind of products they might want to use to help them to save energy. It also means that they have more accurate bills and that, in the future, faster switching will be possible. It saves them inconvenience as well, because they do not have to submit meter readings.

Q2 Chair: Mr Hunn, you have heard Ms Conway's view—it will change behaviour and lead to more accurate bills and more switching. Do you think that is an accurate reflection of what the smart meter roll-out will do?

Nick Hunn: That is still unclear. There is not evidence of whether it is sustainable. Obviously there is a short-term hit for a number of users when they can see what they use. I would like to make one point: I always thought that the main reason for smart metering was to get more data to help to improve the grid, but that was not mentioned. I do not believe that historically any utility has found it cost-effective to roll out smart meters just to automate billing. We have made up the concept that this is all being led by customer savings, when there are probably other ways of getting customers to save money. Year on year, domestic electricity usage has gone down for the past 15 years, mainly due to regulation on more efficient appliances—we have more efficient TVs. Yes, it is good to save energy, but the main reason for smart metering should be getting the data to control the grid and that seems to have been lost as the primary reason.

Q3 Chair: Dr Darby, where do you fall between these two poles?

Dr Darby: I fall between them. I agree with Nick that smart metering was introduced as a means of improving system efficiency in the electricity network as a whole. It was an extension of the sort of smart technology that was already being used in the '70s at transmission level and rolling it downwards, as it were. The smart metering programme is fundamentally about that. Having said that, I believe that it can be used in such a way as to help customers save money. We now have quite a body of evidence to show that that happens and is being sustained.

Q4 Victoria Borwick: Earlier the word “switching” was used. Could you clarify whether you meant switching suppliers or something else?

Pam Conway: I meant switching suppliers.

Victoria Borwick: Okay. That is handy for everybody watching, so that they know what we are talking about.

Q5 Chair: Ms Conway, you mentioned that there are a number of studies that say that smart meters lead to an average reduction in energy consumption of 2% to 3%. DECC expects that dual-fuel customers will save an average of £26 a year by 2020. Do you think that a saving of 50p a week will be enough to change consumer behaviour?

Pam Conway: What we see as helping to change consumer behaviour is that, by having a smart meter, consumers are receiving data around their energy usage, as we talked about. That is being served back up to the customer in a really accessible way, through in-home

displays, so that they can see in real time, as they use energy, what impact it has in terms of pounds and pence. We also serve that insight back to customers through online tools such as the “my energy” report, which breaks down their energy usage by appliance and by day, week and month. They can compare that with the usage of other households like themselves. That information helps to drive the customer’s behaviour change and, therefore, the savings. The savings come almost as a result of the data insight, rather than necessarily from people thinking of it as 50p a week. For some people, even small amounts have a significant impact on their energy bills and their being able to heat their homes.

Q6 Chair: What is your view, Mr Hunn?

Nick Hunn: I think that £26 a year or 7p a day is not a big incentive. Back in 2010, we started to roll out in-home displays, which were much cheaper devices. People could clip them on to a meter. Essentially, they showed the same information—how much energy you were using. You could see that in real time, so people would turn their kettles off. There are far cheaper ways of achieving savings than trying to justify a smart metering programme just on those savings. Some people will do it for 7p a day, but how many people here would change their behaviour to save 7p a day?

Q7 Chair: Dr Darby, can we disentangle the evidence about smart meters from the evidence about the efficiency that is coming in from better appliances and the move towards energy efficiency in other areas?

Dr Darby: No, not entirely, because the issue is mixed in with all those things. The river moves on, and we always have a different mix of appliances and possibilities open to us. Smart metering is just one more thing added to that. For that reason, we have controlled trials, so that you can compare groups of people who have smart meters with those who do not. DECC commissioned a large-scale survey of 2,000 people who had been smart metered and 2,000 who had not; it was carried out in 2013-14, at the end of the early stage of roll-out. DECC found that, after between six and 30 months, 60% of those who had been given a smart meter with an in-home display, which is the main point of contact for the customer—the thing that customers actually see and respond to—were still using it. The people who had had the smart meter and the display for longest were the ones who were most likely to express satisfaction with it and to think that they had been saving energy with it.

There was a separate quantitative data collection for people with smart meters. It was found in that early stage that the savings were about 2% for electricity and about 1.5% for gas, again compared with a control group. This may seem counterintuitive, compared with what you may have heard, but if you see the use of better information and feedback to customers as a learning process, you would expect the effect to increase a bit over time. That is what seems to be happening. The figures for savings by people who have smart meters compared with the figures for those who do not have gone up to 3% now in the British Gas experience. Other long-term trials also tend to show that you get an increase over time. The figures are quite small, when you compare a smart-metered group with a non-smart-metered group, but if the feedback is done fairly carefully so that people have better direct feedback, through a display that is nice and clear to understand, and good less

direct feedback, through an informative bill or other means, those combine and people are more aware. Typically, they save energy, compared with people who do not have the feedback.

Q8 Chair: Yes. Of course, British Gas has done a rather larger survey as well, hasn't it? As I understand it, you have deployed 2.7 million smart meters already in homes and businesses.

Pam Conway: That is correct.

Q9 Chair: We received written evidence from you that indicates that the data are based on 100,000 meters installed since 2014. Can you explain why you have that dataset, rather than a larger one? It would be helpful for us to understand the reasoning behind that.

Pam Conway: Yes. As you said, 2.7 million meters have been installed. We have done the analysis with 100,000 customers with smart meters—40,000 with gas and 60,000 with electricity. For that evidence to be robust, you have to compare it like for like with customers who do not have smart meters. We needed to look for customers we could match. We looked at the size of a household, their average annual consumption and the region in which they were based, and matched a smart-metered customer to a customer without a smart meter. To ensure that the numbers were robust, we had to do the study over at least a 12-month period, to get the initial results of a year one understanding of the consumption saving and then a year two, to see whether it was sustainable. To allow for that period of time, we needed to select customers who had been with British Gas for 24 to 27 months. That gave a sample size that is statistically robust, to enable us to extrapolate what we are seeing with other customers. To go back to your point about the 2.7 million meters, that puts constraints on finding like for like across that base.

Q10 Chair: Are you working on a system of opening up the datasets in an anonymised way, so that researchers and Committees like ours can look at the datasets for the entire 2.7 million and make connections independently, in an academically rigorous way?

Pam Conway: The study that British Gas carried out was a closed study. We are looking at how we can aggregate data and provide anonymous data for us to look at without going down to customer level, to enable us to work with partners and other groups to understand what more we can find out about customer usage of smart meters. Some of the groups we are looking at are pre-payment customers—standard pre-payment versus smart pre-payment. Equally, we are looking at smart pre-payment versus credit pre-payment. We also want to look at how physical in-home display might make a difference versus virtual in-home display. There are other cohorts, such as customers who have smart meters and a time-of-use tariff versus customers who have smart meters without time of use. We are looking at a number of different groups, and where we can work with partners, we will.

Q11 Chair: That was not quite clear to me. Are you planning to produce open datasets that are anonymised? If so, is there a date on that?

Pam Conway: We do not have a date in mind at the moment. This is something we are considering. We are looking at who would be the right partners to work with, if we were to open up our datasets.

Q12 Chair: Okay. This is the last question before I go to colleagues. In your judgment, how easy is it for consumers—both those accustomed to concepts of energy efficiency and energy savings and those who are not, especially the more vulnerable consumers—to use in-home displays to work out from the data they get which particular actions and behaviours are causing those data and what they need to change in order to save energy? How simple is it?

Nick Hunn: It depends a little on the displays. We have a number of different manufacturers. Some displays are really quite intuitive; some look like pieces of laboratory equipment and are not. It also depends on the messages that go out. One thing people do not look at is that almost all the messages going out are about turning things off. You can interpret that in different ways. One way of saving energy is just to eat microwaved ready meals and never to cook anything from fresh, because using an oven or a hob takes more energy. We need to be careful that this is not taken as being just about saying, “You have to save energy.” As well as giving people numbers and saying, “Don’t do this if the red light is on,” we need to understand how you use energy and the choices you make with it. Just putting in a little device with a number in it will help, but you may find that you are producing more problems.

Dr Darby: The design of the device is very important. It needs to be as user-friendly and as clear as possible, primarily telling the customer what is going on. As has already been alluded to, this is not all about money and saving money. A very big part of the response to in-home displays tends to be delight that at last the customers are starting to understand a bit more what is going on in their home and to feel a greater sense of control over it. That is an energy service in its own right, you might say; there are all sorts of ways in which you can interpret and make use of this energy. How much use people can make of the information will vary a lot, depending on their prior knowledge.

At this point, it is worth mentioning the importance of what happens at installation. The unsung heroes and heroines are the installers, who go into homes and meet the customer for the first time. They have to try to size up what kind of person they are and what sort of conversation they can have with them. They explain to them, “This is your smart meter. This is what it can do for you. This is your display,” and give them a quick demonstration of how to use it. They start to get them interested and give them something to work on, and leave them with some useful information to go on afterwards. That matters quite a lot in getting value for the customer out of the smart meter.

We also found in the evaluation that what the customer is primed to expect before the installation is very important. Often there is a role for some support after installation, particularly for the more vulnerable customers, to help them to use their smart meter and the information it gives them as a tool to manage their energy.

Q13 Victoria Borwick: To follow on from what the Chair was saying, could we talk a little more about these in-home displays? I believe that some are wired and some do not need wires. Could you tell us about the different in-home displays and how much detail they

cover? You talked about the advantage of having an energy report and so on. Who knows most about the different sorts of in-home displays?

Nick Hunn: I might, as I used to design them and wrote some of the standard. They should all be wireless. The SMETS 2 specification says that they will all be wireless. They will display the energy used, both gas and electricity, and that may be as a number or a graphical display. They will provide you with historic usage—what you have used over the last week or month—and the cost of that, based on your current contract with an energy supplier. How it is displayed is largely down to the individual manufacturers, who can use their design engineers to produce whatever they think is most useful for the customer.

Q14 Victoria Borwick: Does each supplier have their own, or can people have a choice? That goes back to how much information people have, because presumably it shows how successful their use has been.

Nick Hunn: Each supplier generally makes a choice of what they will supply. I used to be a manufacturer. We found that the different energy suppliers tended to want to use different companies so that they could be branded to match their particular style. There is no need to do that, but it tends to be what happens within the industry.

Q15 Victoria Borwick: Ms Conway, do you want to talk about the ones that British Gas supplies?

Pam Conway: We have in-home displays that are wireless. They are plugged in for us to be able to use them. They have a traffic light system on the display. As you use a particular appliance or if you have the heating on at a particular moment in time, you see how much you are using relative to the rest of your energy usage for that day—in pounds and pence as well. It will also include your tariff information, so that the information showing in pounds and pence is related to what you are actually paying.

The report I referred to earlier is an online report. The in-home display is just one way of accessing the information around your energy usage. The online report is a much more detailed analysis of what you have used in a particular period. Thanks to the algorithms that are created around the data we collect through the smart meter, we are able to give you a breakdown of which appliances you have used your energy on. Is it cooking, heating or hot water? People get a clearer understanding of what energy they are using on what kind of things to enable them to understand what they might do more or less of.

Q16 Victoria Borwick: Excellent. I turn to the people you are talking about who are able to do this. What different meters do you have for people with different access issues or disabilities? First, how do you decide where the machines are located? Secondly, what opportunity is there for those with hearing, sight or other loss, or other disabilities, to access the information you talked about?

Pam Conway: As much as possible, we try to replace the meters where they are located at this moment in time—

Q17 Victoria Borwick: They might be outside in a box.

Pam Conway: It might be outside. It might be under the stairs. It might be in the kitchen. It might be in a variety of places.

Q18 Victoria Borwick: If somebody has access issues, are you able to put the meter somewhere else?

Pam Conway: Where we have an access issue, we will try to resolve that issue and put the meter where it should be located—where it is currently located.

Q19 Victoria Borwick: Does the in-home display have to be with the meter?

Pam Conway: No. The in-home display can be plugged in anywhere round the home. There are two separate things—the meter and the in-home display. The in-home display can be anywhere in the house, wherever is most convenient. A lot of people have it in their kitchen, where they are using a lot of appliances. They may have it in the living room. That is separate from the meter.

In terms of no access, obviously this is a technology that is developing. As the programme rolls out, we are still working through different solutions for different types of customers in order to ensure that they have smart meters. To go back specifically to the vulnerable customers you mentioned, we are still working on some of the technology—

Q20 Victoria Borwick: What are you doing?

Pam Conway: I do not have all the details of the technology drops that we have, but I can certainly get our infrastructure team to provide the Committee with more information.

Q21 Victoria Borwick: It would be really helpful if you could explain what you do for people with a variety of disabilities. That is only fair. Mr Hunn, in your previous life, when you were designing these, were you able to think about the access needs of various customer groups?

Nick Hunn: Very much so. Our background was very much in design and data analytics, so we wanted to put in as much as we could to make them accessible for as many people as possible. There are requirements in the standards that they should be able to cope with that. Obviously you have some disability areas—people with poor sight, people for whom English may not be the first language and people who are just not used to numbers. Basically, most of the meters look like pieces of scientific equipment, not the sort of device that you would have in your home to help you, so there is probably still quite a lot of work and iterations to go through to get good designs. I love the traffic lights that British Gas has put on theirs. Sadly, that was rejected as something that should be standard in the specification.

Q22 Victoria Borwick: The point that you have made is that it is about the interaction between the smart meter, the meter and the report. As you say, it still requires people to be reasonably savvy to understand all that information or to get the best out of it. Is the aim that people would go on having their in-home displays for some time? If so, for how long? What would you view as best practice for how long they should have their in-home displays plugged in?

Pam Conway: Currently our customers keep their in-home displays where they can see them. We find that 45% of our customers use or refer to their in-home display at least once a day or more, and that 65% do it once a week or more. After a lengthy period of time, 54% say that they are using their in-home display more often than they were at the beginning, when they first got it.

Q23 Victoria Borwick: Does that go back to the complexity of understanding the data it is showing?

Pam Conway: From what we can see from customer engagement, the reason why they refer to the in-home display is that they find it useful. They find it useful to understand what they are using, and that helps them to understand what they might do differently. On the reassurance point that my colleague made earlier, just understanding and seeing in real time, in pounds and pence, what you are using is very helpful for customers. In-home displays are a key point of access for customers. They are really simple and easy to use, especially with the traffic light display, because it is a very simple way of understanding whether you are using a little, a lot or an excessive amount. In the future, given the way the world is moving, with new trends in smartphones and people relying more on smartphones to live their lives, we think that there will be developments in virtual in-home displays on your phone that people can use. That is one of the trials that British Gas is running at the moment, with 3,000 customers.

Q24 Victoria Borwick: You started putting these in a couple of years or so ago. Is that the length of time for the studies on in-home displays?

Pam Conway: In-home displays can stay in the home for as long as customers want them.

Q25 Victoria Borwick: Okay. Do you think that they will continue to develop and change?

Nick Hunn: I hope they will. There is one risk: the mandate is that when a smart meter is fitted the customer is given an in-home display, and that is free; if they change supplier, they probably will not be given another one. With luck, the one they have should work with the new meter, but there is still a lot of work to be done to make sure that happens. There is general acceptance that a large percentage of customers will probably stop using them after the first year. There is nothing in the plans to say that a customer will then get another in-home display if they change supplier, so it is about that one-off hit. You need to try to change behaviour in the first year when the smart meters go out. At the moment, there is nothing in place to try to keep that going.

The virtual displays are a good idea. There is a big question as to whether they are a better idea. The displays we have date back to 15 or 20 years ago, when people started designing them. We have updated them, but the iPhone has happened since then. People tend to look for information on a phone.

Q26 Victoria Borwick: The difference is that a smart meter is about connectivity for yourselves, the grid and the managing of supply, whereas the display is more for the customer.

Nick Hunn: Yes.

Q27 Victoria Borwick: We must not confuse those.

Nick Hunn: It is an issue with the programme that you are trying to please a lot of different people.

Q28 Victoria Borwick: Do you envisage that in future you will still have the smart meter in order to control the supply, but the information for the customer will be on their mobile phone?

Nick Hunn: If we go back a little bit, almost all the energy suppliers were putting out in-home displays that did not need smart meters; they just used little clips that went on to the existing meter wiring. That is a much cheaper way of providing customer feedback and getting customer interaction. That has been conflated with the whole of the smart meter roll-out. I do not think that anybody has sat down and said, “If you really want customer change, what is the most cost-effective way of doing it?”

Dr Darby: I sound a note of caution about the smartphone. We have a wealth of information and data that in-home displays are effective. We have very little—almost none—on the use of smartphone data.

Q29 Victoria Borwick: That is the next 15 years, isn't it?

Dr Darby: We have some on website-based data, which is that it tends to be very low effectiveness indeed. The great thing that the in-home display has going for it is that it is just that—it is in-home, in your kitchen. After a while, if you persist beyond the first few weeks or so, you domesticate it. It becomes part of the family and you check it before you go to bed, to see that you have not left anything switched on; you just keep an eye on how things are going. The problem with smartphones and online data is that there are so many fascinating things that you can do online or find out on your smartphone. You have to be very keen indeed on monitoring your energy consumption to go out of your way to look for data online, so the tendency is for that not to be used. Another thing, to do with data privacy, is that you keep the information from the in-home display within the home to look at. I cannot see how it could go online or on to a smartphone without giving away your fine-grained data.

Victoria Borwick: I know that colleagues have questions on that topic later. That is fine.

Q30 Chris Green: Ms Conway, the average family home wastes about £470 a year on food. Typically, a smart meter will save considerably less than that for the average consumer. You can argue that smart meters are not something the average consumer is really crying out for. They are not a major concern, because there is so much waste elsewhere. If they were really concerned about saving waste, there are better options for doing it.

I would suggest that this is not so much about the consumer. Perhaps there is more of an interest for the industry, to ensure that the energy supply is smoothed off at its peaks so that you do not have such extreme peaks at the top. Because of baseload supply, perhaps you want to take those peaks off the top and put them in the troughs, as far as possible. You want to smooth energy requirements to as close to baseload as possible, because that makes it more efficient for suppliers. Is there any evidence on how much of a price differential between peak and off-peak times would be needed to produce a substantial change in the behaviour of domestic users? Would you need double or triple costs at peak times?

Pam Conway: We have been trialling a time-of-use tariff, which is called free Saturdays or Sundays. Customers can have free electricity between 9 am and 5 pm on either a Saturday or a Sunday—the day of their choice. That is being trialled with 4,000 customers, and we are actively recruiting more customers to those trials. We find that, on average, customers are saving £60 per annum on their energy bills. That accounts for an 11% reduction, which is reasonable. Five per cent of that is through energy shifting—moving their energy use from a peak time to the free time. The key thing is that the non-free time is fixed at the same standard tariff price as the other tariffs, but the time on the Saturday or the Sunday is free. We believe it is motivating for customers, because they are changing their behaviour and seeing a saving.

Q31 Chris Green: You are saying that at certain times you give people the energy for free.

Pam Conway: The electricity, yes.

Q32 Chris Green: That implies that, presumably, for the rest of the time it is more expensive.

Pam Conway: No. I was saying that for the rest of the time the price is the same as it would be on a normal standard tariff. It is not more expensive.

Q33 Chris Green: If every household across the land had a smart meter, do you think that is the policy that would be pursued, or is it a policy that can only be pursued while trials are being done?

Pam Conway: We are trialling it to understand the effects. You noted that demand-side response is a positive for the energy industry as well. If we can manage the peaks and troughs and see that people are using less energy, we would not necessarily need to buy as much wholesale energy and would be able to pass those savings back to customers.

Q34 Chris Green: What I suggested in the question is that there is an interest in electricity suppliers. Because of the cost of building electricity plants and the cost of the electricity network, there is an incentive to reduce peak demands so that you do not have to build as many power stations—you do not have to build that network infrastructure. There is an interest now, but at some point in the future there would be a requirement and an ability to knock off those extremes. Therefore, despite the way the trial is being run at the moment, in the future, when electricity companies have more days and more ability to knock off the peaks, they would do so. Has any work been done in the UK, or do you know of any international studies, on reducing peak usages?

Pam Conway: In the UK, particularly for British Gas, we are in the very early days of the trials and of trying to understand the impacts. In the scenarios you outline, there is certainly potential for time-of-use tariffs to help with the demand-side response.

Q35 Chris Green: When you say help, is that consumers making a voluntary choice or the industry encouraging people?

Pam Conway: At the moment, it is consumers making a voluntary choice, first, about a tariff they want to sign up to and then changing their behaviour as a result. In the future, all these things are up for consideration, depending on the learnings that we have from time of use. Our trials at the moment are all about offering customers choice and the ability to have a time-of-use tariff, if they want it.

Q36 Chris Green: To make it clear, you have just said that we have trial studies now that will look quite benign to people, and will test the technology and everything else. In the future, how these tariffs are imposed at a later date is up for consideration and discussion. If you find that that is by increasing the cost of electricity by two or three times at peak times, when you do not want people to use so much electricity, that has not been ruled out.

Pam Conway: It is certainly not what we are trialling at the moment. As I said, we are in the very early days of understanding customers' appetite for time of use and its appeal, and understanding the impacts of that on demand-side responses. It is really too early to tell.

Q37 Chris Green: Dr Darby, do you have any comments or thoughts on that? In particular, is there any research in other countries on dynamic time-of-use meters?

Dr Darby: Where the ratio between the peak and the off-peak time cost is very slight, you tend to get a pretty slight response. We have seen that in Italy and Ontario, for example, which are also smart metered with early generation smart meters. On the whole, with a more dramatic signal in terms of price, you tend to get a more dramatic type of response. In Northern Ireland, there was a tariff called the Powershift, where the peak price was about three times the non-peak price. That was very successful as far as the customers were concerned. In fact, the customers were doing so well out of it that the company had to discontinue the tariff. That gives an indication of what was an appealing tariff—possibly, from the company's point of view, a bit too appealing. It certainly got plenty of response. That is quite close to home, of course.

Nick Hunn: There is a lot of overseas evidence; the issue is how relevant a lot of that is. If you look at daily usage in Australia, Texas and Arizona, there is a massive change because of air con and pool pumps. That does not really relate to the UK. We have the gulf stream, which means that we have one of the smallest variations between peak and standard demand of almost any country in the world.

The fight between regulators and users has been interesting. Ireland is one case, and I think Portland also tried a three-to-one tariff. In order to make that work, you need either to set a low value for the cheap one, which the customers jump on and then the energy supplier loses money, or to ramp up the peaks so much that the regulator steps in and says, “You are not allowed to do that, because it affects the energy poor.” The UK is in a position where we cannot take much learning from overseas. We have such a different demand curve from most of the rest of the world that we are going to have to make it up as we go along.

Dr Darby: We have two quite recent trials funded by the Low Carbon Networks Fund: the low carbon London trial and the customer-led network revolution trial in the north-east. Both of those tried some dynamic pricing arrangements. They found quite a bit of willingness from customers to take part in various different tariffing arrangements. The low carbon London trial is interesting because it tried to simulate not just a regular peak—winter evenings—but the impact on the system of having a lot of wind or little wind, looking ahead to a time when there are lots of renewables in the mix. It was sending signals to customers a day ahead, as you might do on the basis of a weather forecast, to tell them what the price was going to be. A lot of customers quite got into that, and found it an appealing and engaging thing to do.

Q38 Chris Green: From a personal perspective, my interest in reading those emails on a daily basis might wane after a very short period of time. There are concerns about customers being able to compare electricity prices at the moment. On the face of it, these tariffs seem to complicate the situation. Is there any evidence about how customers will struggle with the additional challenge of comparing more complicated tariffs?

Dr Darby: It depends quite a lot on the kind of life you lead. You could be a single parent with young children who also has to go out to do an evening job. If you have to pack an awful lot of activity into the hours between 4 pm and 7 pm, you are not going to be at all flexible about those hours. On the other hand, some people are able to be far more flexible in how they use electricity. That would seem to argue for having quite a range of tariffing arrangements to suit people with different living patterns. If the normal rhythm of people’s lives was favourable to the grid, the tariff might reinforce that a bit.

Q39 Chris Green: The people who are most engaged—those who are really curious to receive the emails and monitor their electricity usage on their smartphone—will be quite interested in getting the best tariff. People who are less engaged and are not early adopters will get a worse tariff, especially if they are juggling a very busy lifestyle. You could end up with a greater differential between the people with the best prices and those with the worst prices.

Dr Darby: If you had an imaginative range of tariffs, you might be able to accommodate quite a lot of different people and make it add up to something that was valuable for the system as a whole. Clearly, you would want to watch very carefully that vulnerable people were not being disadvantaged by whatever range of tariffs was available.

Q40 Chair: We have been focusing quite a lot on the response end—the behavioural end—but we started off with Mr Hunn saying that one of the key purposes of smart meters was to increase systems efficiency. In your written evidence, you say, “There should be a far more thorough investigation made into the value of data granularity and latency for grid optimisation, which should assess whether there is real value for the grid operators in day old domestic electricity usage data along with the cost benefit of upgrading meters for more real time information if there is.” In the context of the discussion that we have just had, could you explain to the Committee your criticism of the data that have been gathered and what you think needs to be done?

Nick Hunn: My criticism is of the metering programme as it stands, not of smart metering. My concern is that we are using the metering programme to pull data back from the meter. Basically, it measures the usage every 15 minutes in the course of the day in each home. At the end of the day, it sends that amount of usage back through DCC and then to the energy supplier. The energy supplier uses that for its billing. From a grid point of view, it is useful to know what is happening and to have a better idea of just how customers are using data. For that, it is useful to get data back in real time, not a day after the event. If you get more data back, you can provide a lot more information. When I was with Onzo, one of the things we were working on was pulling data back every second, which is probably not relevant for most people, but it allows you to disaggregate. You can see exactly which appliances are being used and tell which member of the family is having a shower. More usefully, for things like people living alone, you can check medical behaviour. If people start to change the time when they make a cup of tea, it is probably due to memory loss, or it could equally be caused by a urinary tract infection. There are lots of interesting things that you can put in.

We have put out a programme that has the most expensive meters in the world, but they are pulling back some of the smallest amounts of useful information, which is only really being used for billing by the energy companies. We are missing an opportunity to put out a system that can provide data in real time when things change—when you see changes in behaviour—and can be used to push forward information to control the grid. As we have a grid that is more distributed, with more renewables and less predictable energy, we are going to need those data to help control it. It feels as if an old, out-of-date system is being put in, just at the point when we need something to cope with distributed generation.

Q41 Chair: What is your assessment of those comments, Dr Darby?

Dr Darby: I get concerned about the sheer scale of the smart project and how unwieldy it seems to be becoming at times. At the moment, the smart energy code runs to about 800 pages. When I looked, the first 79 of them were on definitions. The sheer complexity of all that rings alarm bells for me, hence what I said in my written submission: we need to return quite frequently to the questions of exactly what we want this system to do, for whom and how. As I think Nick was saying, does it all have to be bundled together in one

big system where everything has to connect with everything else? That is my area of unease about the smart metering programme. As you have gathered, I am very keen on the idea of an intelligible energy system and having as much feedback in the system as possible. It is very important that we hang on to what we have learned from that so far and do not lose the benefits we have gained from it.

Q42 Chair: Do you think that the current meters that are being rolled out under this scheme will produce enough data to be useful for grid efficiency?

Dr Darby: They are already producing data that are helping end users—customers and businesses.

Q43 Chair: I mean the other end—the grid operators.

Dr Darby: More could certainly be done that way. Some experimental uses of smart meter data are being tried out at the moment. One project I am involved with involves three villages in Wiltshire doing a community energy programme with local generation and local storage, using smart meters as part of the package. All the information is being used at local level. It is an imaginative programme. We are trying out possibilities, and there is room for a lot more innovation along those lines.

Q44 Chair: Ms Conway, I am conscious that we are taking a bit of time to get here. Briefly, do you think that the data being produced by the current smart meters is sufficient to address the issue of grid efficiency, as well as changes of behaviour by the users?

Pam Conway: The smart meter data is of a standard that we have not had previously and that we certainly do not get from standard meters. Already that is making a difference in terms of how we use the data for customers and the grid. On the point about frequency of meter readings and data, we know that if we can get more frequent data it can be aggregated to help to inform product design and grid efficiencies and innovations. At the moment, customers have to opt in to provide their data on a half-hourly basis, rather than a daily basis. If that was a potential opt-out, there might be more chance for us to provide greater innovation in the future.

Q45 Carol Monaghan: I would like to ask about the infrastructure. Mr Hunn, in your submission, you raise some questions about the use of 2G for data transmission and reliance on that coverage, in terms of the longevity of the system. We know that the target is 100% roll-out by 2020, which is an ambitious target as it is. Is there a different system that we should be employing to transfer the data?

Nick Hunn: In the timescale you have, if one is still aiming for the target of 2020, there probably isn't. By 2020, we will probably need to start to think about replacing meters with something else. Connectivity is a difficult question at the moment, because the technology has not really kept up. Technology has been going down the road of, "What do you need for smartphones?" not, "What do you need for smart meters?" 2G is at the end of its life. What is coming next from the cellular networks is called narrowband IoT. It will

probably not be deployed until well into 2022 or 2023 and is as yet untried. We have some interim technologies called low-power wireless area networks. One of those technologies is being used by Arqiva in the north of the country. It is an awkward time, because we are rolling stuff out with a technology that is going obsolete but before the point where it is very obvious what the next one is. There is a real chance that we will have a very large number of stranded assets.

The new technology that Arqiva is using is quite interesting. Typically, it is running at 868 MHz, which is the same frequency that is being used for the meters that are difficult to reach, so there is a possibility that it may even interfere with itself. I just do not feel that much thought has been given to the wireless cogs in this, rather than ticking the box. It was a good choice in 2010, but when we put out meters 10 years later, it really is going to be obsolete.

Q46 Carol Monaghan: You are saying that potentially we will need a new set of meters to keep up with the technology. At the moment, we have a massive infrastructure project to get the system in place. Who is going to pay for the next infrastructure project to get the next set of meters into position?

Nick Hunn: I have been asking the question and have not had an answer. I was rather hoping that you might have.

Q47 Carol Monaghan: So there is an issue. I suppose there is a danger—correct me if I am wrong—that the cost could end up back at the consumer’s doorstep.

Nick Hunn: Yes. Traditionally we have put in meters, and in theory they have a 25-year life. I know that recently I had a gas meter replaced that had “1935” on it, so meters last a long time. These meters will need to have at least the communications hub replaced by 2025. We are now looking at meters that will need regular replacement, far more so than any meter has in the past. That means extra cost, and it is invariably the consumer who picks it up.

Q48 Carol Monaghan: The £26 saving a year is really not much of a saving.

Nick Hunn: No.

Q49 Carol Monaghan: Ms Conway, you look as if you would like to come in.

Pam Conway: Yes. That is one point of view. We disagree that the 2G network is obsolete. This is a communications network that is being rolled out UK-wide, on the back of some Government procurement contracts. There are clear and robust commercial contracts to ensure the longevity and robustness of that technology, and that it works and is sufficient for communications. We believe that that will be maintained and will have the longevity that is needed to ensure that smart meters are useful for consumers for their lifetime.

Q50 Carol Monaghan: At the moment, we have a situation where in parts of the UK 2G coverage is not great as it is. You are saying that there is a robust system at the moment, but we do not even have full 2G coverage, never mind 3G or 4G coverage.

Pam Conway: We are saying that there is a robust programme to roll out the network, on the back of the Government procurement contracts that are being created. The commercial contracts will be of a standard to ensure that those points are addressed and that the network is maintained.

Q51 Carol Monaghan: I understand that there are 45,000 homes for which smart metering is deemed non-economic and there is a kind of get-out clause. It will not be a 100% roll-out; it will be 100% minus 45,000 non-economic premises. I do not know whether any of you has a view on how we incorporate those non-economic premises in a smart metering scheme that is supposed to cover the whole of the UK.

Dr Darby: I doubt whether that would be a particularly significant issue, unless there were some very special benefits those 45,000 households were missing out on. From the system point of view, I would not expect it to make a big difference. From the householder point of view, if there were particular smart metering-related benefits they were missing out on, I would hope those could be achieved by other means. I would not see it as an issue, really.

Q52 Carol Monaghan: We are hearing a lot about smart meters being greatly beneficial to the consumer, because they can manage their power consumption and so on, yet it is okay to leave a chunk out.

Dr Darby: Yes, but it has been possible to improve feedback to customers without smart meters. It can still be done. I am simply saying that you can use smart meters as part of the process. It has been done before without smart meters and it still can be.

Nick Hunn: I think that number refers to the ones that will not have 2G coverage, so the data will not go back to the energy suppliers. There are much higher numbers of households where at the moment it is unlikely that the in-home display will be able to connect to the meter. DECC has estimated that that affects between 25% and 35% of the entire roll-out. They are developing an alternative technology to try to solve the issue, but it has not been demonstrated as yet.

Q53 Carol Monaghan: Would those be flats or apartments, for example?

Nick Hunn: Typically, flats and apartments—places where the meters are in a basement and are difficult to reach.

Q54 Carol Monaghan: Is the metering issue being taken into account when new buildings are being constructed?

Nick Hunn: I am not aware of any. They are still being built with meters in the basement.

Q55 Carol Monaghan: My final question is about SMEs. Again, it is related to the geographical location of the meter. We have had some suggestion that, for small businesses, the meter may be in a basement, off site or in another location. Has any work been done to try to ensure that small businesses benefit fully from smart meters?

Pam Conway: Yes. Since 2008, we have been putting significant effort into trying to help all our businesses benefit from advanced metering. There have been some technical hurdles, but we have a continual effort and are continually committed to trying to resolve those. As with any technological roll-out, there will always be new instances of things that you have to overcome. Part of the programme is continually to develop the technology and to find solutions for as many customers as possible, whether business or residential, to ensure that they benefit.

Q56 Carol Monaghan: Are you confident that awkward business properties will still be able to connect to the 2G network?

Pam Conway: On the residential side, we are working on those technical solutions right now. We are working with other suppliers to look at a project to address that specific need—the meter being able to speak to us and to communicate. That is already under way, with the proper governance and structure put around it. The intention is to have a solution in place so that by 2018 we will be able to install smart meters in residential properties. Equally, on the business side, we are looking at similar types of projects to understand what we can do to help our business customers in those situations.

Q57 Jim Dowd: We had a so-called smart meter fitted last November. It is one of the stupidest smart meters I have ever come across in my life. The only benefits that I can see are remote billing or sending the numbers back to the supplier. As to the rest of it, I have not been able to derive a single benefit, other than seeing the daily totals rack up time after time. There is no comparison possible with them.

I want to ask a few questions about security. Mr Hunn, earlier you said that you do not feel that the current regime maximises the information that would benefit the grid. Do you feel that there is a security risk to the grid from the current regime of smart meters?

Nick Hunn: I think there is. A concern I have is that every smart meter has an isolation switch so that it can be remotely connected from the supply. It is there because it makes it easier for energy suppliers to disconnect or to reconnect a customer without having to go out. My concern is that, if somebody could hack into that or turn off very large numbers of meters by mistake, the sudden shock of taking them off the grid—even worse if they were all turned back on at the same time—would cause significant damage. To me, that is an unnecessary risk that has been taken out.

I have looked at the comments that have been coming back in some of the offerings from energy suppliers, which say that they take data and security really seriously. I am sure they do, but they qualify it by saying that they store all the data according to the Data Protection Act. To me, that suggests a mindset that does not understand the issues of embedded security. Yes, that is about data, but hackers are about trying to get in to see

whether you can kill a network. GCHQ has looked at end-to-end security. What we have not done is look at what could happen if a rogue programmer were to join one of the meter companies and write code that just turned them off. My experience is that industries that understand security write their software in a way that is critical. I do not see those systems being put in place in this industry. All this technology is very new to the smart metering industry, and it worries me that something that has that risk does not have greater maturity before we try to roll it out.

Q58 Jim Dowd: You anticipated one of my further questions: what is the purpose of the ability to disconnect remotely? It is purely for the benefit of the supplier, not the customer.

Nick Hunn: There is no benefit for the customer. It is purely to allow the supplier to disconnect or to connect a new customer without a physical visit.

Q59 Jim Dowd: I have a question about whether appropriate steps have been taken to make smart meters as secure as possible. I infer from what you have said that that is not true.

Nick Hunn: I am not a great programmer—I have not written software commercially for about 20 years—yet I am fairly confident that, if I were working for one of those companies, I could insert code that would make every meter turn off on a particular date in a year's time.

Q60 Jim Dowd: You would?

Nick Hunn: I wouldn't, but I could.

Q61 Jim Dowd: You obviously have a keen sense of humour. What role do you think that suppliers such as British Gas have in maintaining smart meter security and developing new fixes, firmware and so on? I note from your evidence that you are not a great fan of the firmware capabilities of most suppliers.

Nick Hunn: I believe that the equipment that is being designed should be vetted by people who understand that security. You have them in aerospace, the automotive industry and medical suppliers. Processes to look at how code is written, checked and tested should all be in place. I am just not seeing those processes. It is an industry that is just getting into this, and I would expect to see that safety-critical approach being applied, and to see it in the way meters are tested—that people deliberately try to break them. At the moment, if we look at some of the testing, with different meters and different vendors, the work is just trying to get them to work, let alone trying to break them.

Q62 Jim Dowd: Do you feel that suppliers generally—I realise that it is a generalisation—are engaging with the idea of optimising the system, or are they just accepting it in a passive way?

Nick Hunn: Our specification for smart meters is so complex that they are all just chasing their own tails to try to get something they can deliver. The timescales do not help us. We

have designed a system that is more complex than any other in the world. We have asked people without a lot of experience in this technology to make it and we have asked them to deliver it in volume in an unrealistic timescale. Those are all features that really worry me about something that has the potential to do serious damage to the grid.

Q63 Jim Dowd: Finally, we use the term “smart meter” as if there is just one, but, of course, they are manufactured by a variety of industrial concerns. How do you rate co-operation between them on finding common standards? Is there any?

Nick Hunn: There is certainly co-operation. They have set up a group called the SSWG to try to work together on standards. There is a range of abilities. Some of the manufacturers that make pre-payment meters know a lot more about security. The ones that are looking just to do a basic measure and send off the data know less. It is an industry that has no history of companies having to work with one another, other than that you need to have the same size connections so that the wires go in—physical interoperability. We have moved into a world where they are putting in wireless communications, they have to talk to one another and they need to speak the same language. That is a challenge. It takes most industries 10 to 15 years to get their head around it, and this one is being forced to try to do it in two or three. Again, it worries me that this is all being rushed, with a highly complex specification. That is where errors come in.

Q64 Graham Stringer: Can I follow up that last point? One of you pointed out that the SMETS 2 detail amounted to 800 pages.

Dr Darby: That is the smart energy code.

Q65 Graham Stringer: Oh—the smart energy code. Whether it is SMETS 2 or the smart energy code, when it comes to working out the detail, has the problem of consumers being able to switch supplier with the same meter been solved?

Nick Hunn: I cannot answer that one.

Pam Conway: There is a programme, which is being led by the DCC, on interoperability. There is a scheduled programme, by which point all customers will be able to have smart meters and will be able to switch easily from supplier to supplier.

Q66 Graham Stringer: But they cannot do it at the moment. Can people do it now, if they have smart meters?

Pam Conway: People can still switch now if they have smart meters.

Q67 Graham Stringer: Yes, but using the same meters.

Pam Conway: No. Not all customers are able to switch from all suppliers to all suppliers right now. We are working with the DCC and their scheduled programme of events to ensure that, at the planned time, all customers will be able to have smart meters and will

be able to switch. At the moment, we are working with smart services and other suppliers to create the systems whereby customers will be able to switch easily.

Q68 Graham Stringer: So they cannot. What is the schedule for that? When will they be able to switch easily?

Pam Conway: The DCC go live is later this year. By 2018, going into 2019, all customers should be able to switch easily between suppliers.

Q69 Graham Stringer: It has been mentioned that people like their smartphones. Are these systems compatible with smartphones? Do they communicate with them?

Pam Conway: At the moment, the obligation is to provide an in-home display. The Government changes have allowed suppliers a derogation from the obligation to supply an in-home display, to allow us to do trials to understand whether we can create apps that people can have on their smartphones, giving them a virtual in-home display. We are running a trial at this moment in time.

Q70 Graham Stringer: At the moment they cannot, but they may in the future, if you develop the apps.

Pam Conway: Yes. That is right.

Q71 Graham Stringer: When you compare the cost-benefit analysis for smart metering in the United Kingdom with other countries, the assumptions look heroic. Why is that?

Pam Conway: I am sorry. Could you repeat the question?

Graham Stringer: The benefits to consumers seem to be much greater in the impact assessments done by the Government for this country than those you get in other countries. That is what I mean by heroic assumptions. Why do you think that is? What are the assumptions in our analysis that mean we get a more positive cost-benefit analysis?

Dr Darby: This country is unusual in that we have factored in the provision of customer feedback in a way that very few other places have. In nearly all the roll-outs worldwide, they put in the smart meter but there is no customer display. There may be some provision for improved billing, but that is probably as far as it goes. That is the reason, really. The design was geared specifically towards having a more effective customer interface.

Q72 Graham Stringer: Do you think the assumptions are justified and will be realised?

Dr Darby: On the basis of what we have seen so far, the 2% to 3% savings that were anticipated are being realised.

Pam Conway: We believe that the savings will increase as we develop more sophisticated feedback and tools for customers. There are instances where customers who are really

engaged—for example, customers who have spontaneously requested a smart meter—are saving up to 4%.

Nick Hunn: There have been analyses elsewhere—Germany did one—that looked at both having customer input, with in-home displays, and not. They could not find that it was financially positive. In the early days, there was an independent review, commissioned by DECC, that said that the roll-out would not be financially viable. DECC then produced their own numbers, which had the enhanced customer savings, to say that it would. Some freedom of information requests have been put in to find out what the calculations behind those numbers are. I believe they are still being fought.

Q73 Graham Stringer: That is very interesting. Looking at some of the assumptions about the financial savings to consumers and how they relate to pollution savings and carbon savings, Professor Dieter Helm says in “The Carbon Crunch” that, essentially, those kinds of savings are illusory, because people just go out and buy another electric appliance and you generate the same amount of carbon. Do you think that Dieter Helm’s criticisms are accurate?

Nick Hunn: Some of his criticisms are very accurate. There is another interesting thing, which you see sometimes in the US. We are concentrating very much on the austerity—that everybody should be persuaded to use less energy; elsewhere you have energy companies that say that it should be their job to produce as much energy, without producing CO₂, as the customer wants. We seem to be one of the few countries that insist that the only way forward is that everybody uses less energy. That may have a wider energy policy—

Q74 Graham Stringer: Is there any clear national benefit to smart gas metering? We are unusual, if not unique, in combining smart gas metering with smart electricity metering.

Nick Hunn: It is very difficult to argue a reason for it. When cooking, you do not decide to turn something down and cook it more slowly in the hope that it might save energy. I do not think that anybody has ever been able to tell me—I have asked the question in DECC—whether it is more energy efficient to cook my roast dinner at a slow temperature than at a high temperature. Most gas boilers are either on or off. There are a few advanced ones that allow you to change the amount of gas. If you want your house to be warm and you want to save energy, get a smart thermostat. The Hive thermostat that British Gas does is brilliant and will save you far more money than a smart meter ever will.

Dr Darby: Again, I sound a note of caution. We do not have much evidence on that yet.

Nick Hunn: I thought you had published quite a lot of evidence on it, which seemed very robust.

Pam Conway: As with everything else, it is about customer choices and customer decisions. We are fully committed to smart meters, because we believe they provide customers with the information they need to make choices. While there are direct savings customers can make just through being aware of what they are using and making behavioural changes, the information also allows customers to understand whether they want to invest in carbon-saving technology, such as solar panels, to get insulation or to do

other things. The Hive thermostats, in particular, are a useful way for people to understand how they can control their heating, as they allow people to take control remotely. Again, it is all down to customer choice and behaviour change. It is about understanding that having your heating on in the evening is not necessary and that you can use your Hive thermostat to make changes. We have seen that have an impact on customers' bills as well.

Chair: Thank you. I am afraid that we have now kept the Minister waiting for over half an hour, so we will have to call him to the table. Thank you all for your evidence, which has been very helpful. We may have a few follow-up questions, especially on the technical details to do with compatibility.

Examination of Witnesses

Witnesses: **Lord Bourne of Aberystwyth**, Parliamentary Under-Secretary of State for Climate Change, Department of Energy and Climate Change, **Daron Walker**, Senior Responsible Owner, Smart Metering Implementation Plan, Department of Energy and Climate Change, and **Sacha Deshmukh**, Chief Executive, Smart Energy GB, gave evidence.

Q75 Chair: Welcome to today's inquiry. Thank you very much for your patience in waiting for us for so long. I know that you have been outside for some time. We got rather caught up in some of the technical details around SMETS 1 and 2 and other issues of 2G, which I hope that we will explore in a moment.

Minister, can I ask you about some of the evidence that we have just heard? Dr Darby spoke to us about the smart energy code. She said that it was over 800 pages long and that the first 79 pages were on definitions. She made the very sensible statement that it is important that the smart meter programme does not try to do everything at once and that we need to know exactly what its priorities are—what it is trying to achieve. The question I asked the previous panel was whether the priority was for it to be an energy-saving tool for consumers, a system for improving billing and switching or a means of improving the system's energy efficiency. My question to you is: in the context of what is a very expensive system, what are the key priorities of this programme? Are you confident that the product that is being rolled out will deliver on those priorities?

Lord Bourne of Aberystwyth: Thank you, Chair. I appreciate your comments about the delay. There will be some key votes in the Lords, so forgive me if I have to rush off. You can indicate if you want me back, depending on the timing.

The overarching aim of the programme is to engage with consumers, to give them information about their energy use, which they do not have at the moment. Essentially, we have an analogue system, rather than a digital one. It is the last redoubt of estimated billing. On delivery in 2020, the programme will end that for consumers. From the evidence that we are seeing, consumers are very grateful for that. Of course, because of that overarching theme, at the same time consumers will get better information on tariffs, which will enable them to switch, and they will get better information on energy efficiency. Those are secondary benefits from that overarching, broad theme. The evidence so far is that, overwhelmingly, people are saving on their bills and are very

pleased with the system as it rolls out. Admittedly, we are in the early stages of that at the moment.

Q76 Chair: Some of the evidence that we have had talks about the granularity of the data, our grid resilience and whether we are doing enough to make sure that we are taking the opportunity to use that data effectively, so that the system can respond to peaks of energy use. We had evidence just now in which one of our witnesses commented that consumers have to opt in for data to go to energy companies half-hourly. Would it be more sensible for that to be an opt-out system?

Lord Bourne of Aberystwyth: At the moment, we are still on the SMETS 1 stage of delivery, rather than the SMETS 2 stage. The benefits of the roll-out of meters that is happening at the moment are that people are able to see when their energy use shoots up. For example, if they plug in the kettle or have something that is high consumption, they are able to see that. The evidence is that people are responding to that in their conduct. When SMETS 2 is operational—all the signs are that we are on target for it to go operational at the end of August—it will roll out gradually, ramping up significantly in 2017 and 2018. At that stage, people will be making comparisons with other energy suppliers. The evidence is that most people are keen to do that, because it will enable them to get a tariff that is more appropriate for their needs. It could be organised as an opt-out or as an opt-in, but we think that we have the balance right as things stand.

Q77 Chair: That does not quite answer my question. Perhaps Mr Walker would like to come in.

Daron Walker: We have developed the data access and privacy framework very carefully over a number of years, through a range of consultations. The principle behind all of it is that we want consumers to be in control of their data and to have confidence that their data will be used appropriately, and that they give their consent when that data is used by others. The existing framework is that energy suppliers will have access to monthly data automatically, to allow them to do billing. The more disaggregated you get, the more explicit the consumer consent has to be. For daily data, individual consumers have to opt out. When you get down to the really granulated half-hourly data, consumers have to opt in actively and explicitly. The whole framework is about making sure that consumers take the decisions about how other parties make use of their data.

If consumers feel that they are getting really good benefits from giving greater access to their data, they can choose to do that. It is incumbent on energy suppliers to demonstrate to the consumer that, if you opt in and they get your half-hourly data, they can give you a series of additional benefits. We have taken a great deal of time to establish the framework. Where other member states did something a bit more opt-out from the start, there was quite a big privacy backlash; consumers were concerned and the roll-out was delayed. We are taking a much more proportionate approach. As time goes on, we may well see that consumers feel very comfortable, have confidence in the way in which their data are being used and are more inclined to consider a different approach, but that is how we have established it from day one.

Q78 Chair: Is it your expectation that the majority of consumers will have their daily data going to energy suppliers?

Daron Walker: My expectation is that consumers will be able to see near-real-time data, through their in-home display. It will vary from energy supplier to energy supplier, depending on how much they want to start engaging with that data access point from the start of their roll-out. British Gas, which you have heard from, has a standard opt-out with daily data and is encouraging people to opt in with some of their half-hourly data. It will vary across different suppliers, depending on what their commercial proposition is and how they want to develop that part of the market.

Q79 Chair: We are moving to the point where we will be producing what is potentially a very valuable dataset for our energy resilience in the UK. I am trying to understand what is your modelling of exactly how useful that will be, given the privacy system that you have put in place.

Daron Walker: It is quite a difficult question.

Chair: It is a difficult question—sorry.

Daron Walker: Can I try to answer it slightly differently? Fundamentally, in the business case as established, the energy consumer has near-real-time access to the data, and the evidence shows that they can make savings of 3% or 4%. We have very prudent estimates in our business case. Some of the stuff you are talking about, which I know the Committee will want to come on to, around time of use is further down the line, because you need other changes in the system to facilitate that. To take one example, at the moment Ofgem is working to introduce the ability to have elective half-hourly settlement with suppliers from early 2017. On the back of that, some energy suppliers may start to offer time-of-use tariffs to consumers who are a bit more engaged with the market already. Those tariffs would allow them to encourage people to switch to different times of day.

In terms of how I see the programme developing over time, step one is getting consumers to understand how they use energy right now—how much they are spending and consuming. Once they are a bit more informed and empowered, they can start to engage with more sophisticated products on the market. What we do not want is uninformed and unengaged consumers starting to engage with complex tariffs, because that could have unintended consequences.

Q80 Chair: What work is Smart Energy GB doing to make sure that consumers are informed and know the choices that they are making, so that when those decisions about opting in or opting out come along they are made on a sensible basis?

Sacha Deshmukh: Our work has that at its very heart. In the work that we are already seeing with consumers who have been engaged in the roll-out thus far, we have found very high percentages of consumers—in the high 80s, almost up to 90%—who are very satisfied with understanding the data and the data usage from their meter and are finding it genuinely useful in planning their daily lives. There are also strong levels of

recommendation. That kind of feedback is giving us a good sense that consumers have a strong understanding.

The roll-out is at its foundation stage. It would be a good and right challenge for the Committee to say, “That is a good beginning. What comes next?” This will and has to be the biggest behavioural change programme that this country has seen—in some ways, you could argue, that the world has seen—on a very important subject. We do not just stop with those pieces of information. We have a programme of activity that we call smart energy for all, which is our programme of work on how to ensure that behavioural communication can happen with consumers from all sorts of different backgrounds and demographics, as we are trying to do this with every household in the country.

At the moment, the message we are focusing on is the initial message to do with understanding what a smart meter is and how to access that meter and some of the initial benefits that it delivers, because it is important that we explain to people what is real. We have already worked with a number of experts, and consumers themselves, on how that will evolve as time of use becomes real, as smart metering enables much more confident shopping around and switching and as there are smarter appliances that are able to talk to a grid because it has been digitised, thanks to the smart meter. We are ready for that to become a bigger part of our message and volume. Even with the initial engagement and the more focused message that we have had, it is very encouraging that consumers are reflecting back to us a sense of what they think the future will be like. It is a very accurate sense. They are able to take even from those initial messages a sense of why this is being done, as a nation and an energy system.

Q81 Chair: As I understand it, the key systemic analysis or piece of research that has been done is the 2012 to 2014 early learning project, which is based on a dataset from 2011. Is there a plan to do, hopefully, a larger and more up-to-date analysis to see how the project has fared since then?

Lord Bourne of Aberystwyth: You are absolutely right about the early learning project. That has led us to believe, consistent with what I said earlier, that savings are being made on energy bills. As the system evolves, both on SMETS 1 and on SMETS 2, we will monitor progress continually and engage in research, to make sure that we are getting the best value out of the system. We need to do two things. First, we must look at the system to see whether there are policy tweaks that may be necessary. Secondly, we need monitoring to make sure that consumers have the requisite information and are making use of the system as it rolls out. Both of those things will be done on an ongoing basis. You are absolutely right. They will be key to it.

Sacha Deshmukh: The early learning project was incredibly valuable. There have been other studies in addition to that, by the Centre for Sustainable Energy, Kingston University and a number of others. It is worth the Committee noting that Smart Energy GB carries out its own research, including a twice-yearly, 10,000-person piece of research—the largest single sample in the energy sector. It looks at energy for both non-smart and smart customers. Clearly, as it is a national sample, the smart sample within it is relatively small at the moment, although considered robust; that is why we made the overall survey so big. It is getting broader and bigger. It is published every six months and gives a regular view

on smart meter usage, reported energy savings and the overall customer experience, further adding to the research that the Department has.

Q82 Chair: But there are no immediate plans for a large-scale repetition or update, covering the next stage of the project.

Daron Walker: There is no large-scale update to that, but you will have heard from British Gas about some of its findings on savings from its installation. It will have a rolling programme on that. We have taken forward some research on the back of the early learning programme. That identified that one of the most effective ways of engaging consumers with the data they have is to start tailoring the advice, so that you do not just have generic energy efficiency advice, but the installer looks at the property they are in and tailors the information that they give the individual consumer. Right now we are working with the energy suppliers and university experts to create a materials pack that could be deployed in that way. As the Minister said, we have an ongoing programme where we have access to data. There is the smart metering code of practice for installation, which is reviewed annually to see what progress we have made. Learning from that will be fed through into ongoing policy development. It really is based on evidence from start to finish. We have a whole series of evaluations. It will be an ongoing process.

Q83 Chris Green: There are a number of trials going on at the moment. We have not had full roll-out of smart meters, so the way tariffs may be applied later on may be distinctly different from how they are applied while we are going through a trial period. When the possibility of peak-time tariffs being double or perhaps treble the standard tariff was raised with the last panel, it was not ruled out. Lord Bourne, would you be happy for suppliers to charge double or triple the standard price for peak-time electricity usage in order to change consumption behaviour?

Lord Bourne of Aberystwyth: The first point to make is that the supply side—I speak regularly and frequently to the big nine suppliers, as well as to others, on occasion—is at arm's length. Essentially, we have a market system. What we anticipate happening, based on evidence from elsewhere—we have looked at the position in Australia and the States and some of the European countries we work with—is that people will make informed choices based on the tariffs that are available. With the market system that we have, we are confident that the market will respond by offering cheaper tariffs for people who are able to make use of them. That will not be everybody, admittedly. We readily recognise that there will be some vulnerable people—it is part of our mission to protect them—who are at home all the while and cannot make use of a time-of-use tariff. They may need to have the heating on all day, for example. However, for those who can make use of a changed, cheaper tariff, we expect the market to respond. If some of them do not, others will.

Q84 Chris Green: Are we being given to believe that currently consumers choose their energy supplier with informed choice? At the moment, are we seeing people switching tariffs on a regular basis because the consumers of Britain are well informed and have the desire to change their tariffs?

Lord Bourne of Aberystwyth: At the moment, they do not have the information. That is the point we are making. This is not based on estimated bills; we are moving to a system where there will be half-hourly settlement of bills, so people will know each half-hour what they are spending on electricity. For example, it will not make sense to put on the washing machine when there is peak demand. People will say, “Hang on a minute. Why don’t we make use of it when the cost is lower?” At the moment, we do not have that facility, because we are working from estimated billing. As we move to precise billing, people will be better able to determine the best tariff for them. As I said, it will not be right for everybody to have that type of cheap tariff, because some people will need a constant supply throughout the day, but there are an awful lot of people for whom it will be appropriate to look around and see whether they can choose a tariff that will not be as costly. It is also beneficial to the nation at large, because it will smooth demand, which will mean that demand is less at peak times, and enable us to manage the whole system better.

Q85 Chris Green: To achieve that smoothing, are you comfortable with double or triple the price at peak times?

Lord Bourne of Aberystwyth: I did not say that. I said that it will be a market mechanism. I do not think that will happen because of competition. We have many more energy suppliers now than we had even five years ago, so I just do not see it happening.

Q86 Chris Green: Mr Deshmukh—if that is the right pronunciation—you referred to your expectation of huge behavioural change. Clearly, to make that behavioural change happen, you would be comfortable—or would even find it desirable—if very high tariffs were applied at peak times to stop people using energy at those times, because of all the ramifications that has for the number of power stations and the network.

Sacha Deshmukh: You are talking about a classic debate around the ladder of interventions and what drives behaviour change. There is no doubt that one end of the ladder of interventions theory around behaviour change is enforcement around price or around the law. That is not the only mechanism that could deliver behaviour change—certainly on the scale the policy framework has been designed around already, or even on a bigger, more ambitious scale; you need only look at areas such as recycling, where good behavioural change campaigning has got us up to 72% or so recycled materials.

Change4Life and smoking cessation are the kinds of campaigns I was involved in prior to this. I am not an energy sector person; I am a behaviour change person by background. I do not believe that time of use is the only tool, or even a necessary tool, to deliver the scale of behaviour change that we want to achieve in energy at the moment. In an analogue system, with lack of information, it is very difficult to support anyone in changing their behaviour. That has been a vicious cycle that has trapped many of the attempts to do so in energy to date. It can be broken with smart metering, good information systems and good engagement around those, even at the beginning. That will be a very big step forward. What will build from that is automation—appliances and systems. The reason why people like Martin Lewis, at MoneySavingExpert, are so keen on smart metering is that they see that automation can help people to make the right choices, to find the right tariffs that match their existing behaviour. Price could play a role over and

above that, but with the kind of public policy protections Lord Bourne was just talking about for the more vulnerable.

Q87 Chris Green: You have highlighted two examples. I get quite a few letters from people concerned about recycling—the bins—in my constituency, to do with the coercion, as they see it, in the way in which recycling is happening. The way the Government, or previous Governments, have applied smoking cessation policies has also been quite coercive. Are you comfortable with coercion financially, if necessary?

Sacha Deshmukh: I am comfortable with public policy makers. All of you in this room are public policy makers; I am not. These are the decisions that public policy makers have to make around any intervention and any behavioural change necessity. Thanks to digitisation and smart, I think that behaviour change in energy will be driven primarily by the combination of informed consumers, engaged consumers and a much better functioning market.

To take the example of smoking, Government policy was to make sure that the market was not flooded with cheap products. No one is talking about Government having to make that kind of choice on energy. We want a highly functioning competitive marketplace. We are moving to a place where people lead lives and consume energy in very different ways. We have done research, together with UCL, looking at time of use. We have also done research on pre-payment customers, where there is a huge service improvement from smart. Up to 48% of people say that they are interested in buying and using their energy on pay-as-you-go. That is partly a reflection of the complexity of the way we work, an increasing rental market and the increasingly mixed households that we have in rental. Those are the kinds of new services that will be provided by a marketplace, and can be supported within that, to enable people to change their behaviour. Personally, I do not think that you will need some of the styles of intervention that have been necessary in other places—particularly in the health area, which you talked about. However, those are examples of the fact that you can see people make a behaviour change through a combination of understanding that it is good for them in a marketplace and good for their household, and that it has a national benefit.

Q88 Chris Green: Mr Walker, has DECC modelled how many consumers can be expected to move to time-of-use tariffs if they are not made mandatory?

Daron Walker: It is really early days for time-of-use tariffs. Obviously you cannot offer time-of-use tariffs until you have half-hourly settlement. Time-of-use tariffs are really interesting and the benefits to the system are potentially enormous, but it is important to recognise where we are in the stage of development of that market. In the impact assessment for smart metering, we have assumed very low levels of penetration of time of use. Smart metering is about enabling future possibilities, as well as delivering real benefits right now. The smart meter will allow you to record consumption data for every half-hour and to have different prices for each half-hour. That does not necessarily mean that the market will do that rapidly. To an extent, we have time-of-use tariffs—static ones—right now, in the form of Economy 7. We recognise, however, that there needs to be broader change in the system before you can start talking about the benefits that might

come from those. The short answer is that we have not done modelling, because that is more for the future. It is not embedded in our business case.

Q89 Chris Green: Do you have a view on current consumer opinion on time-of-use tariffs? Has any work been done on that? To put it in context, why would consumers choose time-of-use tariffs if 39% of them end up paying higher bills as a result, as the consumer-led network revolution project found?

Daron Walker: That is why this is an area where you have to tread with care. Step one, from my perspective, is having consumers who understand how and when they are using their energy, as otherwise they are going in blind to sign up to a tariff that may be completely incompatible with their usage. We have found from the studies that do exist that, when people are engaged and it is explained to them how the time-of-use tariff works, they can see the benefits. Economy 7, which is something that many people in GB use right now, is a very good example. They are used to turning on their storage heaters or immersion heaters during the night, when electricity is cheaper, and they avoid doing that during the day, if they are on that particular tariff. The key thing is to make sure that you give consumers the tools they need to understand how they are using energy. At that point, people can start marketing tariffs to them. They can decide to sign up to a time-of-use tariff, when those start to emerge, or that they prefer to stay on a standard tariff with the same price for every minute of the day.

Q90 Chris Green: Lord Bourne, are you comfortable with the idea of surge pricing for electricity, in the same way that Uber changes its prices according to demand?

Lord Bourne of Aberystwyth: To repeat the point made by Daron Walker, we are a long way from the situation we will be in on SMETS 2, when people will make the changes of tariff that we anticipate will happen. That is further down the line. At the moment, the key point about the installation of smart meters—I have seen some installed and have been there when apprentices were training—is an explanation of how people are able to monitor their electricity use. That is what is happening under SMETS 1. It will continue to happen while SMETS 1 runs through, until the summer of next year. I will come to your point in a second. Just so that people are aware, we are talking about something that is some way down the line. At the moment, the point is to make people comfortable with a device that explains their electricity use, and that there is an explanation to them of how they could save money. For example, when I was at one installation, the installer said to the householder, “It seems a bit high at the moment, but you haven’t got anything on.” She said, “I haven’t really got much on, except for a fridge—oh, and I have a big freezer, with virtually nothing in it.” He told her, “That’s not a good idea.” Straightaway, that sort of conversation is taking place.

To come back to your question about the way in which the different tariffs will operate, clearly I want consumers to have the best possible choice of tariffs available and to make the best choice that is suitable to them. I am not comfortable with their paying more than they need to pay. This is about getting consumers’ bills down by making them better informed and better able to interact with the system, hence the need to protect the vulnerable, and we have mechanisms in place to do that. We are a long way from it, but

would I be comfortable with people paying more than they need to pay? No—not surprisingly, perhaps.

Q91 Chris Green: There are all kinds of different models that may emerge in the future. Mr Deshmukh, would you be concerned about the kind of surge pricing that Uber uses for its taxis?

Sacha Deshmukh: My only real concern would be about lack of transparency of information for the mainstream consumer who is able to engage with that information and lack of public policy protections for people who are more vulnerable or in some way have a barrier to engaging with it.

Q92 Chris Green: Presumably a surge would be a time when there was a huge amount of pressure. If you were not interacting with the prices, you would be unaware of it and would be consuming energy at what you might consider an extortionate price.

Sacha Deshmukh: I have a fair background in some of the issues to do with confusion and lack of transparency for the more vulnerable to date. For five years or so, I was a trustee and vice-chair of Citizens Advice England and Wales. At the bureau network frontline, both in the contact centre at the telephone service and in the face-to-face bureaux, there is a huge amount of contact with people who are struggling to date with an analogue system that is very unsophisticated when it comes to differential pricing. To give you one illustration of existing confusion, in one piece of research that we conducted, we found that almost a third of people thought they were currently on a package where energy was cheaper at night. We had pre-selected everyone included in that research to ensure that they were not on Economy 7. They absolutely were not getting energy at a different price, yet a third of them thought that they were. You cannot criticise those people, because what information did they possibly have to enable them to understand what they were spending at any time? They were pre-smart.

Going forward in the marketplace, you absolutely could have some very dynamic prices and some well-informed consumers, supported by intermediaries of the MoneySuperMarket- type and by information they are engaging with themselves, using very dynamic tariffs that reflect the way they live their lives. Just as there has already been a huge amount of thinking about what protections are needed for the more vulnerable to make sure that they can heat and eat in our society in today's system, I am sure that public policy makers will consider and make the right decisions about what is required to protect those people going forward as well. I am also sure that organisations like my previous one, Citizens Advice, will communicate hard to make sure that those decisions are incorporated, but it is already very much there in all the cross-party thinking that I hear in this area. I feel that that will be reflected forward, as it has to be in any digitising marketplace.

Q93 Matt Warman: We were talking earlier about the reliance of smart meters on 2G mobile networks. Lord Bourne, could you talk to me about how comfortable you are with that

reliance, and whether you expect the problem of stranded assets, which we heard about, if the 2G networks are not supported?

Lord Bourne of Aberystwyth: I will answer very briefly and then hand over to Daron Walker for the more technical aspects of the question. We are not solely reliant on 2G at the moment; it is a mixture of 2G and 3G, and ultimately we will move on to 4G, so it is not quite as straightforward as that. I do not think that there is a serious issue of stranded assets. Daron, perhaps you could address that.

Daron Walker: It is probably worth breaking the question down into the post-DCC world and the pre-DCC world. As Lord Bourne said, the technology that will be used by Telefónica, which is the only communications service provider using cellular technology, will be dual 2G-3G from the start. The first 15%, roughly, of the communications hubs will be based on that technology. They are not susceptible to any 2G concerns, because they can work on 3G. The next iteration is likely to operate on the 4G network. That is the post-DCC world.

One of the issues the question about 2G may be poking at is to do with the first generation of smart meters—the SMETS 1 meters. First, all the energy suppliers have all the right incentives to make sure they have procured communications to allow them to carry on talking to those devices for the whole of their life. The incentives are already aligned. I can tell you that we have spoken to individual suppliers. They have contracts that mean that, from the last point at which they install a SMETS 1 meter, they will have at least 10 years of communications coverage. Not only are the incentives aligned, but the data they are handing us show that it will not be a concern. Then you have to ask the question: is 2G going to be closed down anyway? Our understanding from working with Ofcom is that there is no evidence that it will close down in the early 2020s.

Q94 Matt Warman: Realistically, in 10 years' time, do you think that one of those first-generation meters will still be considered good enough by the Department, the industry and so on?

Daron Walker: Yes, I think so. As far as the consumer is concerned, the SMETS 1 meter pretty much does everything that a SMETS 2 meter will do. The main difference is around the fact that currently it operates outside the DCC. It has the ability to do time of use and to talk to an IHD. There is the ability to extract data through a consumer access point. All of that is embedded in the first generation of meters. Fundamentally, where innovation will happen is in the home, making use of the data. We do not see massive innovation in terms of the smart metering system itself; it is more about taking the data and innovating with that. The smart meter will be able to send pricing signals inside the home. If you want to sign up to a time-of-use tariff, devices in your home will be able to listen to the fact that the price is different at a given time of day. It is absolutely right that these meters will still be on the wall in 10 years' time.

Q95 Matt Warman: As we heard earlier, effectively some of the meters were developed 10 or 15 years ago. Do you really think that technology will not have moved on in 20-odd years, since they were first thought of?

Daron Walker: There are two things. Do I think that technology will move on? It will. I imagine that smart meters will move on through time. What they are doing is sending text messages, effectively, from an energy company and sending back data. It is smart, but it is not like a broadband service. These are not complex messages. It is not video streaming. The innovation and the exciting part will happen when you take the data that are sitting and recording every half-hour, start to consolidate them and offer products off the back of that, subject to the consumer consenting. It is important to separate those issues. The technology will develop, but I see that as happening in the home, outside the smart metering system. This is a very simple thing—recording the energy that you use every half-hour. Then you can extract the data remotely or from within the home.

Q96 Matt Warman: By the time we get to the 10-year horizon you are talking about, do you think that smart meters will be virtualised as an app for the vast majority of consumers anyway?

Daron Walker: Again, it is worth separating the two things. You will always need metrology, to measure how much electricity and how much gas you are using.

Q97 Matt Warman: I suppose that I should have said the in-home display, rather than the meter.

Daron Walker: We are open-minded about the in-home display if there is really strong evidence that alternatives could generate the same sorts of benefits. When we went through the process of establishing the initial consumer offer, we consulted very broadly. There is very strong evidence globally that the combination of a smart meter and an IHD can drive savings of 3% or 4%. Our business case has 2% on gas and 2.8% on electricity.

The Minister would be keen for me to say that we issued guidance very recently to allow suppliers to trial apps or other alternatives to IHDs, exactly as you were saying. However, it is incumbent upon us to make sure that the evidence is really robust before we start to adapt our policy and switch from something that is very well understood and that we know delivers savings consistent with our business case. There is also the issue that 30% of the population do not have smartphones. The IHD is really a gateway into starting to understand your energy consumption. There may well be other developments. At this point, the evidence is strong for that combination and it is emerging for the other aspects.

Q98 Matt Warman: Finally on that point, what about the 20% or 30% of people, or whatever it is, who decide for some reason that they do not want a smart meter? How does DECC plan to explain to them that this is still a good idea? What number of those refuseniks is acceptable?

Lord Bourne of Aberystwyth: You are right—there are some people who do not want them. They are perfectly within their rights, as smart meters will not be made mandatory. We suspect that the educational programme that is going out explaining the possibilities will make a difference; I will ask Sacha to come in on some of that. Understandably, people—particularly those in vulnerable groups, perhaps—may be a bit anti and say, “This

is something new. It doesn't look like good news. We don't understand how it works." I identify with a degree of that myself. You need to be convinced.

First, there is the talking in the post office queue and the chat in the pub or over the garden fence with a neighbour, as it becomes much more commonplace. There is evidence to suggest that people change their minds if a relation or a friend has had one and has said that it has really been great, that they have saved a bit on their bill, they can now see how the system operates and they do not have estimated bills. Alongside that, of course, we are having engagement through radio broadcasts and, ultimately, TV, as DCC goes live in August. That will be ramped up a bit with Gaz & Leccy, whom you have probably all seen. When we get to the stage of wanting to strangle Gaz & Leccy—I reserve the right to do that myself at some stage—people will understand much better the system and what it is seeking to achieve. We are not there yet, but it will happen over time. Sacha, do you want to explain more about the programme?

Sacha Deshmukh: I was asked a similar question on the radio recently. I said what I genuinely believe, which is that most good things in life do not have to be compulsory. That has been the starting philosophy that has gone into this programme. I think it has enormous benefits for the consumer and for all sorts of different household types, including the biggest benefits for the most vulnerable. That is what drives me personally and why I wanted to be part of this and not some other behavioural campaign or issue at the moment.

We have to think incredibly carefully, and we have been doing so, about who may be less engaged merely by being outside a mainstream message or who may feel that there are barriers to their engaging with this with enthusiasm. That is one of the biggest things to think about. As people understand why this is happening and what it is there to deliver for a household or the country, we see very high levels of support—way higher than the numbers that you indicated. We have to make sure that the engagement campaign reaches all those different groups.

You cannot stereotype. We published a big piece of work called “Smart energy for all” that looked at the engagement journey that would be necessary not just to complete a successful installation but to ensure usage. Sticking with installation, even there it is important not to stereotype. To date, some of the elderly have been among the most enthusiastic in taking up and using. That is partly to do with how they are already trying to monitor energy and the fact that this could bring them something. You talked before about the display, which is a relatively straightforward piece of technology for them to use, and they like it and enjoy it.

There are other communities that we will support on installation through our work in Smart Energy GB in communities. For example, for cultural reasons, if there is a woman home alone, they may not like to accept a man coming into the house to do an installation. That may be seen as something that is not acceptable in a cultural community. Those are the kinds of things we have to be ready for and which we are dealing with in what will be the biggest single infrastructure transformation, in the most comprehensive way, that this country has done for a generation.

It is important to separate whether people are enthusiastic when they are educated and understand—the levels are very high, and they see strong benefits—from whether we have

a comprehensive plan. I believe that we do, but it has to be a very sophisticated one, to make sure that we get it to the huge breadth of people around the three nations of this country.

Q99 Matt Warman: You raise an interesting point. You are right to say that the most vulnerable groups have the most to gain from this. If some of those groups are also the most resistant, what is the balance between the carrot and the stick for this sort of project?

Lord Bourne of Aberystwyth: We are very much against making this mandatory. As Sacha indicated, we believe that education on the benefits is far preferable. Sacha is absolutely right. If you drill down into the detail, a lot of the people you might suppose would not engage with this project and whom you might consider vulnerable—some of the older people—are actually very engaged with it from the installation, perhaps because they are at home more and therefore have the time and the interest. That has been interesting, looking at the facts.

Yes, we need to be on our guard for some people who are vulnerable. That is why it is part of our mission to ensure that the vulnerable are protected and we have that written into the contract with Smart Energy GB. We can do that in many ways. At the most obvious level for a vulnerable group, those with poor eyesight, we are making sure that the visual displays have large letters and that a Braille system is being developed—things of that nature. We also want to ensure that the benefits for vulnerable groups are appreciated by those groups. We work closely with citizens advice bureaux, which sit on the monitoring panel, for example, to make sure that we can get messages to them about some of the good aspects. Pre-payment meters will become a thing of the past. Already a lot of suppliers have indicated that they are phasing them out. That is in their interests, as they are very expensive to administer, but it is certainly in the interests of many people who are on them at the moment. There are many benefits. We must make sure that we protect groups who are vulnerable. We must move relatively slowly, to make sure that we are not rushing this and that people are on board for the benefits before we roll the system out further, bearing in mind that it will not be rolled out completely until the end of 2020.

Q100 Jim Dowd: Earlier this year, the *FT* reported that there were “glaring loopholes” in the design of smart meters until GCHQ intervened to ensure they were closed. Who instigated the involvement of GCHQ? Was it GCHQ itself or was it the Department?

Lord Bourne of Aberystwyth: I am not sure about that, to be honest. I will pass the question to Daron in a minute. I know that we work very closely with GCHQ, because we take the issue of security extremely seriously, but I do not know who instigated it.

Daron Walker: I will give a few facts about this, because I saw the *FT* article as well. We have been working with GCHQ on the design of the security system since the beginning of the programme in 2009, through the initial design phase, until we created a high-level implementation plan.

Q101 Jim Dowd: Did the Department invite GCHQ to get involved?

Daron Walker: We invited them from the very get-go. We have been working with them since the very beginning. Procurement for the DCC and its associated services started in 2011. As the detailed design of that emerged, we worked with GCHQ to look at the overall system design again. As you understand more about the detail, you can adapt and modify your security framework. From the very start, security has been designed in.

You will hear from other witnesses in this context, but in the system we have now, which we co-developed with GCHQ, there are lots of safeguards embedded. The only people who can send a message that affects supply are the energy suppliers. They have to send it to the DCC, which has to countersign it to validate that it is coming from a valid supplier. Only then will it pass through to the meter. If the meter does not have the relevant signatures from both those parties, it will just discard the message. There are split responsibilities, lots of encryption and cryptographic signatures.

On top of that, the DCC has anomaly detection. You can imagine that you would expect a certain number of disconnect messages or change-of-tariff messages per day. The DCC has anomaly detection, so if there were suddenly large numbers of those messages flowing through the system, the DCC would quarantine them. There are safeguards at every level within the system. In my view, the *FT* article was not consistent with the facts.

Q102 Jim Dowd: Surely not—not in the press. So you are confident that the smart meter system is as secure as it needs to be and will remain so.

Daron Walker: We are, yes.

Q103 Jim Dowd: In DECC's submission, the Department mentioned the security sub-committee but did not give any further information. Could you give us a brief outline of its remit and how it operates?

Daron Walker: At the moment we are in a transition, with the Government still chairing various committees, including the relevant security committee. That works with industry to look at the security credentials, the standards and that kind of thing. Once the system is in the enduring stage and effectively it becomes business as usual, then there will be a security sub-committee that is a sub-committee of the Smart Energy Code Panel. The smart energy code effectively sets out the rights and obligations of all the different parties using the system, and there is a sub-committee that has the energy suppliers on it. It has access to the security services for advice, and they look at the security of the system and look to recommend or take views on new emerging threats or new technologies that might come along. That is how that works.

Q104 Jim Dowd: Has the Department done any contingency planning in the event of an attack on the smart meter system?

Daron Walker: What do you mean by contingency planning?

Jim Dowd: If your security were to fail, for example. We heard from a previous witness how the programme could be set up to cause disruption.

Daron Walker: We think that there are lots of appropriate safeguards to avoid any significant attack on the system. The DCC has within its licence conditions a requirement to do contingency planning should there be some kind of disruption, but this is a contingency; this is not in any way expected. In addition, if any of the relevant keys were somehow disrupted, then again you can replace all those keys and certificates on the system. There are contingency plans built in, but obviously the best way of avoiding the need to have a contingency is to have a secure system from the get-go, which is what we have worked hard to do.

Q105 Jim Dowd: Prevention is, indeed, better than cure in most cases. Lord Bourne, who owns the data on the smart meters?

Lord Bourne of Aberystwyth: The consumers own the data and we are very keen to ensure that that is the case.

Q106 Jim Dowd: Can they access it readily?

Lord Bourne of Aberystwyth: When the system is up and running, they will get detailed half-hourly settlements; so they will be able to see the data in real time effectively.

Q107 Jim Dowd: Can smart data or data generated by the smart meter system be shared with security services without the permission of the consumer?

Lord Bourne of Aberystwyth: Again, we have been very keen to make sure this is exceptional. The main driver here is to make sure that the consumer is in control of the data; it is their data. But as in many areas of life, if there is a serious crime involved, you would expect—and it is the case here too—that the security forces and the police would have access to the data if they were seeking to avoid a crime or for evidential purposes to prove a crime. For example, perhaps a large cannabis factory may be indicated by very high usage round the clock—that sort of thing—but we have been keen to confine that to very specific situations where there is a serious crime involved.

Q108 Jim Dowd: But that would be provided with or without the consumer's consent. Clearly, if it is a criminal, you would not tip him off.

Lord Bourne of Aberystwyth: Essentially, as a last resort, we would need to do that, just as I suspect at the moment—I do not have the legislation in front of me—presumably it would be the case now that you would be able to access telephone records, for example, where it would be sensitive use of data; but it is very much confined to those specific situations that are exceptional.

Q109 Jim Dowd: What do you perceive to be the greatest threat to the smart meter system? Would it be attack, fraud or issues around personal data?

Lord Bourne of Aberystwyth: The system as it is, as Sacha has indicated, is a massive project; it is a very exciting project, without equal, I think, in this country. Certainly in

recent years it is far greater than the switch to North sea gas, for example. It is not without its risks, admittedly. I live with this 24/7. There are risks, as I would be the first to admit, but one of them is DCC going live. That has been the immediate risk, but we have been hitting all our targets and dates. That is good news as we go forward and I am very pleased to be able to say that. There are other things. We have to make sure there are enough SMETS 2 meters available for the SMETS 2 system. All the evidence suggests there are. We have to make sure there are enough installers to put them in. These are the sorts of everyday issues that we are looking at. I am not seeking to minimise the security of the system and the possibility of hacking in, and it is something I have been keen to look at, as we all have. I think we have put up appropriate protections for that; it is something that we look at very carefully, but I would not put that as the highest risk by any means at the moment.

Q110 Derek Thomas: I would like to understand a bit more about the benefits of smart metering of gas as well as electric. We grasp the opportunities that are available if we put in smart meters for electricity. Is there such a thing as a smart grid for gas, and what would you say the benefits of metering gas will be through smart technology?

Lord Bourne of Aberystwyth: Essentially, the benefits of smart metering for gas on SMETS 1 are very much the same as the benefits for electricity customers on SMETS 1. It will put an end to estimated bills. It will give a reading of what the person's actual consumption is. It will put them in control of their energy use, and they will be able to tell exactly what they are spending on it. Again, the evidence that we have seen so far is that people are not just saving on their electricity Bills, but saving commensurately on their gas bills. There is a very obvious benefit there.

In relation to SMETS 2, I suspect that new tariffs will come forward and people will be able to make their choices as to what the most appropriate tariff is. I would have thought, again, that that benefit is going to be there on SMETS 2.

Gas and electricity are not the same, but they have some great similarities in terms of what we are seeking to do. The point is sometimes made that gas can be stored, so it is not quite the same as electricity. That is true up to a point, but that misses the interaction with the consumer that we seek to achieve from the system that we are introducing, where the consumer is able to see what their energy use is and shop around for different tariffs as the system progresses into SMETS 2 from early next year onwards.

Daron Walker: The smart system benefits are that there is upside from what we are trying to achieve through smart metering. We have not tried to monetise those in our business case. If you imagine having smart electricity meters but dumb gas meters, you would still have to have all your meter readers; you would still have estimated bills; you would still have all those costs. There are massive synergies in rolling them out together, and then you start to get those benefits. About £9 billion of the benefits go directly to the suppliers, which are then passed on to consumers. The business case stacks up without all the smart system stuff, and that is upside for the future when the broader landscape evolves and you have half-hourly settlement. The synergies are just so obvious for the operations of the two sets.

Q111 Derek Thomas: Given that gas is mainly used for heating, certainly in domestic use, would it make more sense to supply customers with smart thermostats as opposed to smart meters? I hear what you have just said, but if you are trying to help people reduce their bills and use their gas more efficiently, is it better to give them smart thermostats?

Lord Bourne of Aberystwyth: I do not think that enables them to have the same interaction that we think is desirable to know what their usage is and how they could save money on SMETS 1 through energy efficiency measures. It may be better than nothing, but I do not think it achieves the same ends—not with the same clarity, to be honest.

Daron Walker: In a way, to add to what the Minister is saying, there may well be a case for smart thermostats. Some of the evidence that was submitted to the Committee talked about the benefits of those, but this programme is about upgrading and updating dumb meters to smart meters. It is about modernising the way energy supplies record and provide data on electricity and gas use. That would probably be a different programme, and whether it is appropriate for the Government to subsidise or drive that kind of thing is a different policy question.

Q112 Derek Thomas: Given that we are concerned about people in winter, particularly older people who might turn their heating down if they thought it was costing a lot, particularly around smart meters on gas, how would we ensure that people do not put themselves more at risk, because they have the information that might put the fear of God in them?

Sacha Deshmukh: The first thing that is key is to understand the level of risk that exists. Groups that do a lot of work with the more vulnerable are right to ask whether this will become a future fear. If you talk to them and you look at some of the studies that have been done, I am sorry to say it is an existing fear already with analogue meters. There is a term that I had never heard before I came into the world of energy—self-disconnection. It makes it sound terribly abstract, terribly safe and terribly administrative. It means people turning off their heat or not cooking when it is cold. That is what it means in real terms, and it happens right now. One of the major drivers for it is the fear of the bill. It is being driven by the lack of information. That is causing a huge problem already.

The second thing is that, when people have information, some do have a fear. I spoke to a woman who told me she was not cooking her family fish fingers in the evening at the end of the month because she was worried about what the bill would be. She was working, by the way; she was a teacher. Hopefully, she would be in a position to manage and not have a fear, and she would not make that kind of self-disconnection. But there will be others who need greater support than just information in order to know that that cost is something they can manage.

Smart will finally give us a chance to break through with that. It would need consumer consent for the data; that is absolutely right. But organisations such as Citizens Advice, some of the age charities and some of the more vulnerable charities—even some of the energy suppliers themselves—are looking to see how they could develop a relatively simple algorithm that would allow you, if you wanted, or, let us say, a parent if you were caring for them, to have data matched against temperature. If the data indicated they were not heating at the time when the temperature was dropping to show that they should, you

can either speak to them directly if you are the care service or speak to their designated carer. That can all happen very speedily, and that is one of the reasons why gas is so important in this and why gas data in a good time can be helpful. It does not need to be instant. The temperature does not tend to drop 20 degrees in five minutes. It tends to happen over a day or two rather than in that kind of instant. But it could finally mean that we can get information support and advice for people to say, “Don’t turn your heating off, or, if you have run out of money, we’ll solve the money problem but in the meantime we don’t want you to freeze to death or end up in an NHS hospital,” which costs us all a lot more rather than targeting some of that support.

Q113 Victoria Borwick: I have a couple of questions on that point about helping the vulnerable before we move on to businesses. My understanding is for those people who are on those sorts of lists that we do know who they are, and therefore the energy companies already have an obligation to look after people on those sorts of lists. How can we combine that information with what you have just said?

Sacha Deshmukh: You are right. I think you are currently talking about the priority services register, which looks at a number of different characteristics or life situations. It certainly looks at a number of very important drivers for why people might be more vulnerable. With the best will in the world, while the system has been analogue, I do not know how many of you get a bill that says something like, “Dear householder” or “Dear bill payer”; I suspect some of you do. That is an indication that, in an analogue system, there is a lack of information as to who the more vulnerable are, even with the existence of the priority services register. Smart finally gives a chance for that to be addressed. The installation moment helps spot the more vulnerable who could or should have been pre-identified but have never had any engagement with their energy company, and then in an ongoing way changes that into a more digital system. It offers a really important opportunity for that to happen.

Daron Walker made the point earlier that a smart meter is a very comprehensive system, in some days doing a relatively simple thing, which is providing data. I would say the opportunity for the goal that you were seeking, which is to say, “Let’s use that data and make sure that it is being used to support the more vulnerable of lots of different types,” absolutely creates that opportunity, and it would be a relatively straightforward thing to build on as we get to the kinds of levels of smart penetration that we are talking about. It gives us a unique chance to do that.

Q114 Victoria Borwick: I hope the Minister found that interesting.

Minister, you mentioned briefly earlier that people could choose what sort of meters they had in order to make sure they were accessible to the vulnerable. You referred to larger typefaces and such. I had understood from the earlier session that people could only have the meter that was supplied with their particular supplier; in other words, there was not a choice of what in-home display you had.

Lord Bourne of Aberystwyth: As I understand it, you have the one given by the particular supplier, but we are working to ensure that for those who have particular difficulties—I

have certainly been told that those who have poor eyesight are one example—each supplier has those available.

Daron Walker: That is right. The energy suppliers have been working with RNIB to create an IHD for people who are partially sighted, and for other types of vulnerability. I think that is what the Minister was describing there. More broadly, for the average consumer, we set a minimum level of requirements for the IHD, and then we are quite keen for the energy suppliers to innovate and try to create products that—

Q115 Victoria Borwick: We were told at the earlier session that each energy supplier has chosen one supplier, and each of the machines is different. There was even a doubt that they would communicate with each other. So, if you did switch, maybe your in-home display would not work with your new energy supplier. There is all this talk about making switching easy. That may be easy but it will not be easy if you still want to have an in-home display.

Lord Bourne of Aberystwyth: There is an element of truth certainly in that in relation to SMETS 1. In SMETS 1 they will not necessarily be interoperable where you are switching from one supplier to another. When we get to SMETS 2, which, as I say, we will be rolling out from—

Victoria Borwick: August, you said.

Lord Bourne of Aberystwyth: That is absolutely right. When we go live with the August date, they will be interoperable. There is the difference between the earlier system and the—

Q116 Victoria Borwick: That will also affect people with vulnerabilities: those who are unable to hear or unable to see; those with difficulties with accessing and small fingers, or arthritis—all those sorts of things.

Lord Bourne of Aberystwyth: We are looking at that to ensure that we do protect those with all those particular difficulties to which you have referred. At the moment I am only aware of action in relation to partially sighted people—people with difficulties with their eyesight. But I understand there is a group that is looking at this to make sure that we protect all those groups with vulnerabilities.

Q117 Victoria Borwick: Some of the concerns we are receiving correspondence about are people feeling this is going to be forced on them; they are very concerned about the monitoring and the accessibility, and what is going to happen when it is at its coldest. There is all this talk about help that is going to be given, but there is tremendous fear—heating, not eating; and eating, not heating. I do think you should give some extra time to consider those points.

Lord Bourne of Aberystwyth: Thank you for that. Wherever you have a system involving change of a fundamental nature, as we have here, I can quite understand that there will always be some unease, but, again, I can offer some reassurance about the monitoring that we do on the Smart Energy Board. Citizens Advice is represented there. We have thorough discussions on these issues. Smart Energy GB, as part of its mission, has to

protect the vulnerable, and Sacha is never slow to raise these issues. But thanks; that is absolutely right. We do need to monitor to make sure that we are protecting the vulnerable, because it is fundamental to what we are seeking to do that the vulnerable, above all else, will benefit.

Daron Walker: The early learning project that was talked about earlier found that, as well as delivering savings through IHD, vulnerable consumers and people on pre-payment sometimes need additional support. There is a research project going on right now looking at what kind of additional follow-up support might be appropriate for those kinds of consumers. That work is due to complete by the summer and is very much driving towards some of the concerns you raised just then.

Q118 Victoria Borwick: Thank you very much. I have a final quick question. Is there anything you want to say about the small businesses and what the potential impact is for them of time-of-use tariffs?

Sacha Deshmukh: I would absolutely like to talk about small businesses. It is an important part of the roll-out. In absolute numbers, there are more households in the country than there are businesses. That is just the nature of the country, but it is a very important part of smart metering. It is a very important part of Smart Energy GB's work as well. I am independent of Government but I do think that Government have made some policy decisions that are right. I know it is not necessarily fashionable to say that, but Government sometimes get it right. Aligning the micro-business and domestic roll-out was important, because about 42% of micro-businesses are run out of a domestic premise, and there is a huge amount of overlap. There are many, many millions of micro-businesses but a huge amount of overlap of the motivation and communication for behavioural change in the domestic setting and in a micro-business setting as well, given the nature of the size of the groupings in there and some of the ways in which you often have a family running businesses. I am sure you are well familiar with this from your constituencies.

We have published another document "Smart energy for business", which sets out our analysis of the micro-business group. It is an unusually diverse group in and of itself, reflecting the general population. We designed our campaign from the very beginning to work in both a domestic and non-domestic setting. I hope you love Gaz & Leccy, but, love them or not, one of the key points is that they are not just a domestic family in a domestic setting. It allows us to run and develop our micro-business campaigns. We find very strong engagement with micro-businesses.

The drivers and what people take out as behavioural difference can be very different. I was at a conference in Glasgow the other day and did a round table with a number of small businesses. I was with the leader of the Scottish Association of Convenience Stores, who had been talking about using the meter in his own particular store. He identified that the freezer and fridge that had been given to him promotionally by a large cola manufacturer and a large ice-cream manufacturer were incredibly inefficient and were costing him more than it would have cost him in two years to buy his own refrigeration. He was an evangelist solely from that experience. Next to him was an accountant who talked about the value of the data they got out in a more abstract way, but it was an illustration. There might be different motivators and we have to get that right in our engagement, but they can be very strong if you are talking about the right context.

Victoria Borwick: That is really interesting; thank you very much for a very valuable input.

Chair: Thank you all for the time you have taken to give evidence to us. You have given us evidence for more than an hour and 20 minutes, and I know you had to wait for some time before you came. We will not detain you any longer. I know that there are votes in the Lords. This is an important inquiry for us. It not only has potential to affect our energy infrastructure in the UK but, as we have heard, consumer interaction with the way in which we use energy. We may have some follow-up questions on technical details that we did not get time to go into today, but, as you can see, we are very interested. I hope that you will be generous and write back to us on those points. In the meantime, we are going to adjourn for five minutes while we clear the public gallery and get in our witness for our informal session.