Energy and Climate Change Committee

Oral evidence: Energy Revolution, HC 175

Tuesday 11 October 2016

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Watch the meeting

Members present: Angus Brendan MacNeil (Chair); Rushanara Ali; Tom Blenkinsop; Mr Alistair Carmichael; Glyn Davies; James Heappey; Antoinette Sandbach

Questions 1 - 64

Witnesses

Barry Hatton, Director of Asset Management, UK Power Networks, Amanda Lyne, Chair, UK Hydrogen and Fuel Cell Association, Dr Nina Skorupska, CEO, Renewable Energy Association, and Dr Jill Cainey, Director, Electricity Storage Network

Yoav Zingher, Founder and CEO, Kiwi Power, Phil Sheppard, Director of SO Operations, Network Capability, National Grid, Sara Bell, Founder and CEO, Tempus Energy Technology, Professor Jim Watson, Director, UK Energy Research Centre, and Colin Calder, Founder and CEO, PassivSystems

Sacha Deshmukh, Chief Executive, Smart Energy GB, Simon Roberts, Chief Executive, Centre for Sustainable Energy, and Victoria MacGregor, Director of Energy, Citizens Advice

Examination of Witnesses

Witnesses: Barry Hatton, Amanda Lyne, Dr Nina Skorupska, and Dr Jill Cainey

Q1 **Chair:** Good morning. Thank you for coming to this morning's session. We expect this unfortunately to be the last public meeting of our Committee before the responsibilities transfer to the Business, Energy and Industrial Strategy Committee next week. We have a lot to get through this morning. We hope to publish our final report at the end of this week, so staff are working very hard indeed. Can I begin by asking witnesses to state their name and organisation for the record?

Barry Hatton: Barry Hatton. I am the Director of Asset Management for UK Power Networks.

Dr Nina Skorupska: Nina Skorupska, Chief Executive of the Renewable Energy Association.

Dr Cainey: Jill Cainey, Director, Electricity Storage Network.

Amanda Lyne: Amanda Lyne. I am Chair of the UK Hydrogen and Fuel Cell Association.

Q2 **Chair:** Thank you very much, panel. I will start by asking for just a short statement from each of you on why, if at all, you think that electricity storage technologies will help revolutionise the energy sector.

Barry Hatton: Storage is a very exciting technology. UK Power Networks have been involved in the installation of a new battery installation at Leighton Buzzard. It has been operational since November 2014. We have been able to demonstrate since that time a range of services that electricity storage can provide. It has also played a part in what was one of the original drivers for the project, in alleviating a capacity problem we had at Leighton Buzzard. We have been able to demonstrate the benefits that we thought we would get from the storage. Costs still have to fall a bit before it is fully economic but we believe that storage has a significant role to play, not only as a distribution network operater but also in the provision of other services to the market.

Dr Skorupska: At the REA we saw that energy storage would be an excellent complement for delivering energy security and low-carbon energy solutions for the deployment of renewables. Not only are renewables revolutionising the energy market, we think energy storage will also play that similar role. Over a year ago, we produced a report with KPMG looking at the different types of electricity storage and the cost trajections and have to say that report is almost out of date with regard to costs. Costs are coming down with deployment and we see that with the enhanced frequency response tender here in the UK, the UK is beginning to grapple with the excitement around energy storage but we have to keep our feet on the ground and deal with some of the simple,

but complex and complicated, things, like regulatory regimes to enable energy storage to play its further part.

One extra point is that it is a key industrial strategy opportunity if the UK can play a leading role here. From my travels overseas, I can see that energy storage is the hot topic. If the UK can show a lead here, it could probably take advantage of that and help other countries to solve their low-carbon energy problems too.

Chair: So, it is not just an energy solution but an industrial strategy opportunity as well?

Dr Skorupska: I think so, because the UK has always had the lead on developing and incorporating markets. We do have to do some simple catch-ups—I keep saying simple, but it is not, it is complicated—to demonstrate here in the UK because we have to catch up with the likes of California and Japan, who are really showing and demonstrating the use of energy storage, but after a recent conversation with people in Southeast Asia, they are really welcoming the understanding from the UK's point of view how business models, market models, and systems, can be incorporated at different scales for their solutions too.

Dr Cainey: Electricity storage has been shown in a number of key reports, particularly in the National Infrastructure Commission reports published earlier, and the Carbon Trust report, to deliver cost savings on operating electricity systems and those cost savings flow through to the consumer. Indeed, in the recent enhanced frequency response tender, National Grid said that would save the consumer £200 million on balancing the system. So, electricity storage can facilitate cost savings on the system.

Policy is critical in term of the regulations, in terms of providing clarity on who can own and operate and tidying up some little niggles on unfairness around the end user levies, which are a material cost to projects. We have seen what UKPN can do with a battery. In California, they support their utilities in a different model. They are less unbundled than we are. There is interest in Europe. We are leading the way but policy and regulations need to catch up.

We also need to develop services. So, even within our current policy framework and regulatory arrangements there was no shortage of interest in the enhanced frequency response tender and if we have new services that storage can deliver, developers will come, they will deploy, and our market will be a leader in the world in showing how you can use electricity storage.

Amanda Lyne: I agree with everybody here but propose or suggest that hydrogen is a way of working across the whole system so you are not talking about electricity storage per se; you are talking energy storage generally, and opening up opportunities to do cross-sector balancing between heat, electricity and transport in particular. I would reference a recent study, the Leeds City Gate project, looking at the opportunity to

use hydrogen in a heat role. I know this Committee did previous good work on showing what we need to do in decarbonisation. Equally, on transport, there is far more that hydrogen can do to help address the issues you highlighted in what we are not doing in transport decarbonisation.

My other point is the value of hydrogen as an energy vector rather than a specific part of those categories, the seasonality, the length of time, scale for storage—in America they already store hydrogen in salt caverns; you can also use pipelines to store it. One of our members pointed out that the curtailed wind that we have at the moment would create about 18,000 tonnes of hydrogen that would power 90,000 cars doing 12,000 miles a year. So, it is a way of equalling, in that final point—reducing costs or adding value, whichever way you want to see it—investment in wind that is not being used with a route to make sure that you can get useful value from it.

Chair: Curtailed wind would have a low marginal cost as well.

Amanda Lyne: Exactly.

Q3 **Chair:** Panel, presumably we will need a combination of large and small storage technologies to manage the network in the most flexible way. Do these broad categories of storage face similar barriers to deployment? The crucial bit for us is how should Government tailor its policies to provide adequate support for both large- and small-scale storage technologies? I think Jill Cainey mentioned the regulatory area, in her first answer, what Government can do and where the barriers might be so can I move to you first, Jill, on this one?

Dr Cainey: Nina Skorupska has talked about how the cost for lithium ion batteries has come down dramatically and you could argue that there is no need for much support in that area but equally, if you are trying to build pumped hydro projects, that is very expensive and we still have not delivered potentially 2 gigawatts already proposed to come on to the system. It is just waiting for the right economic conditions and some clarity. So, it depends largely on what the storage is. It is much harder to build large-scale storage and we are going to need some of that as well as the small-scale stuff.

There are other barriers around, for example, the end-user levies, which I think I spoke about last time I was here. It seems a long time ago. We still have them. They are still in place. That is just a facet, that our renewables incentives schemes were set up before storage and storage is not defined as not being an end user, so the electricity that passes through attracts that charge and then the end consumer pays it again. So, everyone pays double and that has a material cost to projects. APN have done a lot of work on that.

Q4 **Chair:** If there is a payment to be made, where do you think it should be made; at the beginning or the end of that?

Dr Cainey: Unfortunately no energy storage technology is 100% efficient so some part of the electricity will reside in your storage asset but everything else that is passed through should be paid by the genuine end user, not paid by storage and then paid again by the end user. That costs £14 - £20 per megawatt hour for the storage operator.

Q5 **Chair:** Do you advocate no cost to the storage operator?

Dr Cainey: How should we fund our incentive regimes? Are we funding them the correct way? We have a model that funds our incentives on the end consumer, which means that the householder covers that burden, but we should not be paying it twice because if the energy-storage provider is also paying it, they will pass that cost on to the end consumer or whoever owns and operates the storage.

Q6 **Chair:** So, storage therefore, for parking the energy, you are saying should not face any charges at all?

Dr Cainey: It should face appropriate use-of-system charges. If it is using the system, it should pay charges. If it is not an end user in our current incentive regime of electricity, it should not pay. Is that the right way to fund our incentive regime? That is a bigger and thornier question and I do not represent renewable energy.

Dr Skorupska: Jill is quite right. That could take a three-hour conversation, panel, I am afraid.

In our submissions to the other excellent reports that you have done we have said that it should be about consumption levies, based on the actual power consumed. Keep it simple. That has to then work for the organisation or the company, whoever it is, who is operating and maintaining the storage facility and based on their own project cost-recover mechanisms.

However, the barriers are wider than just that particular area. The only clear route prior to the enhanced frequency response tender that National Grid pushed out was the UK capacity market. We have had two auctions and that still failed to deliver a significant energy storage position so we have asked for some key changes to be made. Also, energy storage is still quite young in terms of the technology and the perceived risks around it. We have talked about duration of contracts—four years—where the capacity mechanism normal for a newbuild is around delivering 15 years—in order to be able to give the investor confidence in whoever they are backing on that technology. There is the thorny aspect of where storage sits within the UK legal and regulatory framework. It is unclear and because of that it adds to the perception of risk for investors because they cannot pin it down to particular codes. There is a lot of learning yet to do but we believe that if the new Government could launch their consultation as quickly as possible, please, because it has been pending, we could get some of these issues expedited.

Amanda Lyne: You cannot resolve many of the issues about a definition for storage because if you are going to treat it differently you have to

know what it is that you are treating differently. There is a strong argument in Europe—we don't know how much attention we are going to pay to European but the European Parliament recently adopted a motion that would see a new asset class for storage, so we would add storage to our suite of interconnectors, transmission, distribution, supply and generation, and that would provide clarity. It would certainly provide flexibility and optionality on who could own and operate storage.

Q7 **Chair:** So the brief to Parliament and the Government is to get the consultation going quickly, pronto?

Dr Cainey: Absolutely.

Dr Skorupska: Please.

Q8 **Tom Blenkinsop:** Why do you think the pace of change in storage regulation has been so slow?

Dr Cainey: Why is anything so slow? There have been a lot of warm words about storage and there is a lot of work in Ofgem and BEIS, and DECC before it, so there are storage teams. We did not have storage teams before and now we do and that is to be welcomed. They have been in place since 2015. However, it is complex and there are choices. Do you do a quick fix? Even a quick fix is 12 - 18 months and that is a modification of the generation licence to incorporate storage as a sub-class. Or do you go for primary legislation, which is a brand new asset class? That would take two, maybe three, years and require a great deal of political will and time in the House to get it in place. Then, of course, we have had a lot of complexity in the UK politically, which has held up this call for evidence, which was ready to be published in May, and the result of that call for evidence is an energy strategy. We would all welcome an energy strategy that gave us clarity about where we are going but because that call for evidence has been delayed, that clarity has been delayed.

Q9 **Chair:** I think the Government said in April that consultation was imminent.

Dr Skorupska: But it was over two years ago when we brought this to the table of Ofgem. You may have seen talk in our earlier reports about non-traditional business models and about changing from a centralised to a decentralised energy market model. I think that is quite scary but it was great that Ofgem did embrace that—I thought it was quite enlightening, being part of the sustainability development advisory group, to hear that—and it was pushing DECC to take their focus from a more centralised approach, the worry of where will the next CCGT come from, where was Hinckley Point C, where was everything. This is the transformation to the market that could make the difference, it really could, to a lower cost to the consumer. Ofgem believe that. NIC, who did the report, did believe that. We need to expedite that review.

Amanda Lyne: Certainly, when you look at the hydrogen technologies it is fair to say the market for hydrogen is a new technology market.

Therefore, help to create or develop the market in line with things they are doing in California and Japan or anything else would be important. However, to me the reason why it takes so long is ultimately that we are asking to do something very difficult, which is transform, decarbonise, and do things differently. In our case, take, say, a transport user—I sell to HGV commercial users—diesel is the competitive way to do it and we are asking them to do something harder and more costly and make behaviour changes. Ultimately, unless we take a whole-system approach, we will do it more expensively than we need to. Taking a whole-system approach is not a very easy thing to do at all and we have Ofgem as an organisation separate from other organisations involved in that system. Unless you can have a helicopter view of how you are going to do it, I am not sure how you could change regulation without designing inflexibility.

Dr Cainey: We are often asked should we have energy revolution or energy evolution. Evolution takes tens of thousands of years and sometimes it does feel like it is taking tens of thousands of years and perhaps revolution is too far out that way.

Q10 **Tom Blenkinsop:** Hydrogen fuel cell technology has been around since the 1970s. They have been debating it in Teesside since the 1970s, anyway.

Amanda Lyne: Hydrogen combustion, which is what my company does, equally, has been since when we first invented vehicles. Diesel and hydrocarbons in those sectors have been the most cost-effective way that we can do it and we are all trying to do something different.

Q11 **Tom Blenkinsop:** What regulatory changes would you concur on? What would you agree on? In a post-Brexit scenario, we now have BEIS, after DECC has gone, should we have a Minister who has personal responsibility for energy storage? Should we adopt the EU's changes in relation to seeing storage as an asset and adopt that over the next two years? Or, should we be doing something completely different?

Amanda Lyne: I would say there is something about somebody having the ability to look at the connections, at the places where you can make through value through integration. Ultimately, the technology might be a battery but it is providing a service to the energy system in some way. Power to grid is an opportunity. It would be something that if you valued it differently you would come out with a very different answer than if you looked at it as it having to plug into the grid and do something afterwards.

Chair: Enthusiasm among the panel is growing. Jill?

Dr Cainey: Nina has talked about the move from the centralised system to the decentralised system and that is essentially the system we have except that our large incumbent suppliers and generators are stuck in the centralised world. The transition of distribution network operators to distribution system operators would allow services to be offered at the bottom of the system, not just from the transmission system operator, and that is where we will grow the markets. So, there is that transition

and we have been talking about that for a long time but we have not progressed on that road either. The ESN believes that there should be a separate asset class, a definition for electricity storage, because without that you do not have the flexibility and the optionality to move forward. So, that is the longer-term, not-quick, solution, but that would allow different entities in the system, including suppliers as well as distribution network operators, to use storage.

Barry Hatton: We would support getting clarity on the definition, a classification, as quickly as possible.

The other aspect in relation to the question with regard to the speed at which things are moving, if we go back 18 months, yes, we had the battery operation at Leighton Buzzard but hardly any other interest. Since the EFR Inquiry came out, we have seen massive stimulation of interest from developers. We have had 69 developers come to us in our network alone. We have issued 568 formal applications and accepted 28, for 600 megawatts of storage. So, it has been a phenomenal change in a very short space of time. We must not lose sight of that and likewise, picking up the point around the four-year contracts, not get ourselves locked into a technological solution that is not at the lowest cost that it might be at this point in time.

As far as the ownership aspects of storage go, we would not want to be precluded from being able to utilise storage. We accept that there are lot of services and benefits that come from storage but if we were looking at it purely as solving a particular network problem and it was the most economic technology solution to provide that compared with a traditional solution, we would not want to be precluded from installing that because that way we can continue to keep the cost to our customers down. UK Power Networks already has the lowest cost per customer of the DNOs, a position we are proud of and one that we would like to continue to maintain. If we were precluded from being able to put those assets into helping those situations where it is beneficial, obviously that would have some impact on that cost. That does not mean to say that where the facilities are available from a third party, a developer, that we could not contract with them, if that is the appropriate solution at that particular point in time.

Q12 **Chair:** Before we go back to Tom, can I briefly check: does the panel all agree that there should be a different asset classification for storage? Is that a view that is held by the panel? Does anybody disagree with that?

Dr Skorupska: I am reminded of a cautionary aspect because energy storage comes in different guises and we could be falling into a trap. For maybe large-scale linked to the grid and providing particular services, there could be a clarity of that definition, but we are talking about energy storage behind the meter, combinations potentially of energy storage in different forms, linking it to heat and to transport. So how do you deal with—

Dr Cainey: We manage that with generation, don't we? It is all scaled. We would not argue that you need to regulate heat at this particular point. There are some consumer aspects around heat.

Chair: Grid-level storage, you would then say—

Dr Cainey: Electricity storage should be a separate asset class and have its own definition.

Chair: Everybody agrees with the point that Dr Cainey is making, yes? Okay. Thank you. Sorry, Tom. Back to you.

Q13 **Tom Blenkinsop:** That is interesting. Dr Cainey, you talked about ending the current regime, which makes the consumer pay twice, in effect, and what that system charge would be. What specific changes could be made quickly by the Government to end that double charging?

Dr Cainey: The double levy charge, certainly the climate change levy, is in the gift of HMRC to resolve. They are empowered to do that now. If anyone can tell me the individual in HMRC that I need to go and see, I will go and see them this afternoon, but it is very difficult to find that individual. The end-user levies for ROCs and FiTs are through BEIS, and it is a very complicated process. We have been talking about it for several years and it is just defining storage as not being an end user.

Q14 **Tom Blenkinsop:** So there is no quick stepping-stone that the Government could use, or is there one?

Dr Cainey: It should be quick to resolve. It is just issuing guidance—that electricity storage is not an end user—but it is not happening quickly.

Dr Skorupska: The capacity market is one of the key areas that could accommodate energy storage deployment but there are some constraints in the rules of the running of that market about removing the restriction around stacking of revenues for the energy storage projects. Different types of energy storage can provide the different services. That needs to be examined. In the same way, the capacity mechanism suddenly says nothing that receives a subsidy from anywhere else can be involved in the capacity market, it is a great overarching principle but that is such an old view as solar prices are coming down so much, if you add storage to it, it could play its part, but there is a perceived view that it is receiving a subsidy from somewhere else. So, all of those assumptions that were written and put into the capacity market many years ago have to be reviewed. That should not take too long to do.

Dr Cainey: No.

Dr Skorupska: It is an intelligent updating of a market that we are in charge of, essentially.

Dr Cainey: So, the capacity market requires capacity to be delivered at T-zero for as long as it is required. Obviously CCGT can do that, but storage, and perhaps demand-side, cannot carry on infinitely and deliver capacity. The Leighton Buzzard battery is delivering capacity essentially,

but it is targeted exactly at when it is needed, rather than coming on at some arbitrary time and then clattering away until it gets called off the system. That is just the way we have set up our capacity market warning and our determination of the stress event. The transmission system operator absolutely knows when it needs these resources and because storage and DSR can be quite quick responding, not like a CCGT, you can call it on at the point of need rather than waste it for several hours before you need it. That would be a relatively quick fix. We assess the capacity market rules once a year through Ofgem.

Q15 **James Heappey:** It just seems to me that the regulation of grid-level assets within the system level is easy or easier. The aggregated storage capacity across EVs discharging into the system to meet the evening peak, power walls or storage in the loft discharging into the system, that is much more complicated. I just wonder what your views are on how we make that system work.

Dr Skorupska: I think it is happening now. Some people have already taken the bold step of incorporating it, but find frustrations on a number of different fronts. The first thing we would be calling for is to help people understand the quality and standards of the equipment as they are moving forward to adopting all of those areas. I think the role for behind the meter is it is interesting to describe what that capacity could grow to and how much regulation should there be, because at the moment there would be no way of knowing from a DNO/DSO in terms of managing the system how much of this type of intervention on a prosumer level would be impacting the needs of the network.

Q16 **James Heappey:** But my instinct is that if we tie that in knots, because if you plugged in your car to a solar car port at work, you have gone home with a full charge and you know there is cheap energy available overnight, it may be sensible for the grid to draw on that sort of aggregated storage capacity from all those EVs plugged in in residential streets to meet the evening peak and then recharge them overnight. That is a vision that was sold to us quite enthusiastically by people over in California, but there is a danger that we over-regulate the storage market to make that very difficult to achieve.

Dr Cainey: Currently our generation below 10 megawatts is not licensed and you would see that same sort of structure—I cannot tell you what the actual numbers would be in storage—and we facilitate micro-generation, so there is no reason why there should not be micro-storage. The system does need to know that those assets are out there, because they do have an impact on the system. Part of the encouragement for people to notify their DNO that they have connected to such an asset is that there is some sort of reward by being able to provide services, so you incentivise the provision of services. Now, the difficulty with an EV battery is that it is designed to drive a car, it is not necessarily designed to provide system services. Certainly controlling the charging of an EV battery, National Grid have done a lot of work on using the charging, just turning it on and off when it is charging, to provide frequency response, but that is a service that the householder could provide to the system.

There is a difference between storage behind the meter, which I put in, which is for my needs and does not necessarily support the system, but at the moment we do not have the market for me as a householder to provide services to the system, so all I am going to do is try to avoid buying electricity, because that saves me money. So, how do you match up what the consumer wants and what the system needs?

Amanda Lyne: I am an electric-car owner and I am challenged personally by the idea that says my car is going to provide a grid service for two reasons: first, the points that the panel have already made, but I have to say I benefit from the fact that my electricity is already fairly cheap for my car and it is significantly cheaper than the petrol or diesel I would have had to put in. I think you would have to come up with quite a big incentive to make me want to give you the power back already on a vehicle that I know is compromised on the range that I would get if I get an urgent phone call overnight to go and drive where I want to drive.

For me, changing consumers' behaviour is something we all know in the energy sector is extremely challenging to rely on. Look at energy efficiency and us not insulating our houses properly. The system needs to be set up to take that away so that we solve it by bigger solutions. One of the reasons why today hydrogen fuel cell cars from the automotive sector are seen as being an option is that it does not require the consumers to change their behaviour very much. That is one of the key reasons why certain OEMs are invested heavily into trying to make that happen.

Q17 **Antoinette Sandbach:** I am going to go back to some of the practical steps we were talking about for the capacity market, some of the practical steps that Government can make to develop a competitive and hopefully innovative storage market. Should they set an electricity storage procurement target, and if so, at what level? Should it be for new storage or existing storage?

Dr Cainey: We do not have enough existing storage in the UK. If you look at the percentage of storage to the peak of generation we have, we do not have as much as some other countries. That is largely down to geography because most of our large-scale incumbent storage is pumped hydro. We are moving ahead with battery storage, but it is difficult to see how we can properly make that all work in terms of what scale we want our storage at and how we are going to bring that on to the market. We have shied away from targets. I know California has a target—their utilities are required to deliver a certain amount of storage—and that has certainly incentivised the market over there.

I would like to see a strategy. If you say we want a particular thing, what are you doing about the other things, the other technologies? I know when we say we have a technology-neutral approach, in our heads we want something specific. So, the capacity market is technology-neutral, but we wanted large gas generation. Yes, there is some merit in saying, "We want something and we want it for this" and I think that might even be enough of a signal. I do not know that you need to say we have to

have a target, but knowing where we are going with our entire energy system, not just energy storage, is far more critical than having 20 gigawatts of storage. If you facilitate the markets and you make it a fair market and we see it being truly cost-reflective, which the markets are not at the moment, then the solutions will come, whatever those solutions are.

Chair: Amanda, you wanted to interject there?

Amanda Lyne: I would agree. I think the challenge is that we are in a transition, we are trying to do something different and I do not know whether today we know how much electricity storage we need to cope with what we are doing. By the time we have considered the things you are going to consider later on, demand response and grid management and all the other exciting things that we could be doing with our electricity system, I do not know how you would work out what you need and then compound that by saying, "Use some in the heat and use some in your transport system". I am not sure how you could define a number. I think, focus more strongly on trying to enable change to happen in some mechanism and let the market and the technology providers resolve it, which is not the answer you want because you want something to be easier.

Q18 **Antoinette Sandbach:** We do not want any particular answer. So the tweaks are more around the capacity market than setting any particular targets; do you agree with that, Nina?

Dr Skorupska: Yes and no. If you had asked me this two years ago when we saw the Government starting to think and do that, I would have said, "Okay, let's just get the market sorted". The conversations we have with the investor community and with the extraordinary opportunity for renewable energy, we can see solar prices coming down even more so. Onshore wind: yes, please. Even offshore wind and the conventional forms of generation, all will benefit from having energy storage on the system. I say if we want to be leaders in this, have an industrial strategy. Let us put a goal out there, because the NIC have done a lot of the work, as have the Carbon Trust, as have my colleagues here from the networks, and they have said what the value is to them, how much energy storage could give to them in saving costs, providing different services and addressing our growing move to a low-carbon future.

Let us go for a target, let us say a range that we want to go for and at the same time do the whole system architecture and do it in a sensible way. There is nothing wrong with having both. Having just one, obviously slowly, slowly is not going to do it, because we have been waiting over a year for even this consultation.

Barry Hatton: With respect to a target, I do not think we need a target as such, because if we chase the target, will we be delivering the lowest cost to our customers at the end of the day? Someone has to pay for this and in chasing a target that is perhaps a little bit artificial. We could be increasing costs unnecessarily.

Q19 **Antoinette Sandbach:** There was talk about changing the length of the capacity market contracts to say seven or 15 years for storage. What other tweaks would need to be made—or they might even be bigger than tweaks—to the capacity market in order to bring that online if there is not a target?

Dr Cainey: So, interchange the capacity-warning mechanism and how the stress event is called on. If you miss the stress event, then you may attract a penalty and you do not want to attract a penalty because that impacts on your income, so for storage it is a big risk, because you may not hit that specific half-hour period or series of half-hour settlement periods, but storage can absolutely hit those settlement periods if it is called on at the time the system needs it. That is a big change to the capacity market, but you could develop a new service that provides capacity with those same contract terms of old, refurbished and new, with the 15-year contract for new, that would be very attractive to storage providers, so long as they knew that their capacity was being targeted at the actual system need.

Antoinette Sandbach: Do the others agree with that?

Dr Skorupska: On that very specific detail, yes, but it is about the restriction on the overall stacking of all the different revenue streams too, to understand the different types of energy storage, whether it is from a particular hydrogen service or others, how they can explain and work with the capacity-market rules to show that they can get additional value for the higher-value services that they can deliver.

Q20 **Antoinette Sandbach:** Is there any specific advice you would give to the Government on how to develop joint projects that could support joint renewable energy and storage projects?

Dr Skorupska: We talked long and hard with them about this. The other aspect for us is working on the CfD mechanisms as well to enable the hybrid approach, because the developers in renewable energy are a canny bunch—they want to deliver, of course, they are business people as well—and when they feel and hit certain constraints, maybe coming from the grid or from the Government's perceptions of whether we should have more solar or not, we look for ways of delivering what the energy system needs and having a CfD mechanism to enable a hybrid storage and renewables project would be a really great win.

Q21 **Antoinette Sandbach:** In terms of the network operators, do you think it is important that they are able to own storage or isn't it better if they procure it?

Barry Hatton: We would not want to be precluded from owning it. If there were situations where we could see that the provision of storage was the most economical way of adding some additional capacity to the network, we would want the opportunity to be able to own it in those cases. We would have no problem with procuring the service to provide that reinforcement that we want for the local network, so all we would ask for is that we are not precluded from the opportunity to partake.

Q22 **Antoinette Sandbach:** If you did own it though, would that risk you having particular interests and vested interests in a particular type of technology?

Barry Hatton: No, no particular technology. We are ambivalent on that. At the end of the day, it is about how do we augment our local network capacity to meet the needs of our customers locally, to keep the cost to all customers as low as possible. We are not particularly fixated on any particular technology. This is just another tool that provides an alternative vehicle to delivering that local capacity. Obviously once a battery is installed there are opportunities there for services to be delivered from that. Again, as we delivered in the Smarter Network Storage project at Leighton Buzzard, we worked with suppliers as to how they were able to exploit those services available from the battery.

Q23 **Chair:** What I think will be the final question—and it is always a risk to make such a declaration in a panel like this—but how much storage might you expect to be successful in the two upcoming capacity market auctions? I will throw it out and have a guess maybe. Barry.

Barry Hatton: I am not sure I can answer that question in terms of what it would be, but looking at the whole system, I think this is something that as a network operator we will work with National Grid to determine what would be the appropriate level there. I cannot at this point give a figure. If you like, I could come back with something on that, but it would be more an opinion than a fact at the moment.

Q24 **Chair:** If you came up with a figure, can you do it in 24 hours? Our time is short and the guillotine is hanging on us; it is a revolution that is coming your way. Anybody else got a feeling?

Dr Skorupska: The capacity market is different from the enhanced frequency response tender. We had 1.2 gigawatts of projects, equivalent, offering storage as a service to the National Grid. Not all of them were what the National Grid was looking for, because even some coal plants were thrown in there to provide those services too. I also say I do not know what that absolute number could be, but it would be interesting to see how that very specific tender is written to make sure that all of those opportunities like energy storage can participate in it and let us see that we get the value for money, because it is an auction and then we have to see that those projects are deployed. We will work, as the REA, with our members to make sure that they deliver.

Dr Cainey: Potentially—I am just going to randomly stick a number out—I would say maybe somewhere between 10 to 50 megawatts, but that would largely depend on the confidence of the developer on the intricacies of the capacity market rules and whether they can find a way around the penalties and also on whether they can stack their income with other system services. I think it would be a brave storage developer that would dip their toe in the capacity market certainly this December, perhaps next December we might see a bit more, but it was never designed really for storage.

Q25 **Chair:** So to Nina's point, it depends how the tender is written is a vital part in that. Amanda, do you want to add anything to that? You do not have to.

Amanda Lyne: The challenge we have as a sector is we are made up of a variety of early-stage, sometimes-big, corporates, but participating as a hydrogen solution within those markets is extremely difficult today. The only thing I would caution is saying there is quite a current opportunity to do something with hydrogen, whether it is related to heat or transport, so do not design investment into systems that preclude being able to do the alternative, that maybe we can work harder—there is a roadmap about to be published on what we think in the industry as to the different areas you could result on—and make sure that whatever investment we are doing has the flexibility to allow for hydrogen to come through afterwards.

Chair: Thank you very much. On that elemental call, then I will end panel 1. We are only running four minutes over time, so it is not bad. Thank you very much, panel, thanks for your time and thanks for being so succinct and for the amount and volume of information you gave us. It is appreciated, thank you.

Examination of Witnesses

Witnesses: Yoav Zingher, Phil Sheppard, Sara Bell, Professor Jim Watson, Director, UK Energy Research Centre, and Colin Calder.

Q26 **Chair:** Can I ask you again to state your names and organisations for the record, starting, as ever, on my left?

Professor Watson: I am Jim Watson, Director of the UK Energy Research Centre.

Sara Bell: I am Sara Bell, CEO of Tempus Energy.

Phil Sheppard: Phil Sheppard, Director of SO Operations for the National Grid.

Colin Calder: Colin Calder, CEO and founder of PassivSystems.

Yoav Zingher: I am Yoav Zingher, CEO of KiWi Power.

Q27 **Chair:** Thank you very much and good to see all of you again. Can we begin with a short statement from each of you on why—and the emphasis would have to be on short, with 45 minutes with the five of you—if at all, you think flexible demand technologies will help revolutionise the energy sector? I will start with Yoav on my right.

Yoav Zingher: It is a good question. It is our core business and we care about this stuff a lot. The challenge of balancing the grid has traditionally been met with power stations and the way that the grid has evolved in most countries, and the UK in particular, means that we find ourselves now short of traditional capacity and having to invest a lot of money to keep the lights on. At the same time, we have had just a revolution in renewable energy. The cost of producing power from sun and from wind has gone down dramatically, 90% to 95% since even I started and I am not that old. The challenge with balancing the grid when you are relying on the sun and the wind is much higher than when you can just tell a power station when to run.

The solution is flexible demand, to be able to switch on and off demand at the consumer level, at the industrial level, and the commercial level, to balance out the discrepancies in production. The way to do this is through intelligent software and intelligent hardware, so buildings that respond to temperature, pumps that respond to conditions, the grid, all this kind of stuff. That is what we think. We think that it is much cheaper and it is much cleaner and it is the way to run a grid in the 21st century.

Colin Calder: Just to add to what Yoav said—and I am a lot older than him, so I have been around a bit longer—as a company, we are focused on the residential sector, so we want to make sure that consumers get a fair share of the demand-side management market, so this is really important, about how we structure this industry. In terms of flexibility, it is quite apparent today that we have a tendency to build power stations rather than engaging consumers and commercial/industrial, in using their demand profiles to provide grid flexibility.

What we are arguing is that the daily load curve, which today on the left-hand side has all your peaking plants, which come down the merit order to your standard generation, we are arguing that the demand-side response position in the market should be to progressively take out the peaking plants. So starting at the top in the merit order, we push down, using demand-side response, so that we get better value for money by instead of building new peaking plants, we are using the demand-side mechanisms in the commercial/industrial and residential sector to deliver that same service.

What is really important is that we reform the capacity market so that it is not biased towards buying capacity, but it is biased towards buying three different types of capabilities in the network. One is storage, the second is demand-side response and the third is generating capacity itself. This is not picking technologies, it is about picking different capabilities in the market. Each of those capabilities is made up of many, many different technologies and we should not be afraid of setting targets for each of those for the simple reason that if we do not, we will not shift the market away from its risk-averse tendency of buying capacity.

Phil Sheppard: There is a huge opportunity, we think, for storage to play a role in smarter grids. In our future energy scenarios, we see up to

18 gigawatts being installed on the system, the whole system, by 2040. There are three areas that we talk about in terms of storage. We think there are about 18 different services that storage can provide to suppliers and network operators. The first of those is ancillary services, which our EFR tender falls into. The second one is network services, so something that Barry touched on earlier around managing capacity within networks. The third one, which is a huge opportunity, is system arbitrage, so that is moving energy around, as just described.

We would like to think we are leading the way in some of this. We have issued the EFR tender—I touched on that last time I was in front of you—and a successful 200 megawatts delivered a roughly £200 million saving to consumers over the four-year period. That is definitely a really good start in terms of developing that, but for the other two areas, particularly on networks and the arbitrage, there is a need to reform regulation and policy.

There are some barriers to entry that are avoiding having an equal playing field for storage to play a role in that smarter grid and smarter energy. Part of the activities we are undertaking as National Grid is through our Power Responsive programme, where we have a separate workstream now on demand side and a separate workstream on storage, trying to work out how we can facilitate, as National Grid and the rest of the industry, better access for storage on to the system.

Sara Bell: It is clear that as we increase the amount of intermittent generation on the grid, we need more flexibility. Flexibility can come from customers in the way that Yoav and Colin have described and it can come from storage in the way that the previous panel described, but it will come forward if there are real commercial opportunities for it to participate.

You asked earlier about why everything is taking so long. Transitions are hard because there are winners and losers and the losers tend to have very big balance sheets, and are very good at lobbying. We saw that very clearly in the capacity market. If we want to deliver security of supply at the lowest cost to customers, we need to ensure that those conservative tendencies to support generation are not allowed to take precedence over new technologies. That is definitely happening today. We are allowing support for generation to the detriment of support for innovation companies like the three that you see at the table today, so this is urgently needed to be built out, but it is not happening at the speed that it could happen if we committed to move forward.

Chair: Thank you, Sara. Jim, there might not be a lot left to add to that.

Professor Watson: I have two simple points. One is I think it can help meet the three main policy goals, so it can help to decarbonise while maintaining security, but crucially, do that at a lower cost than if you did not have the demand-side response there, so that is the first. The second is really—with underlining, because we do not know—engage consumers and potentially bring in a lot of new models and companies. We are

seeing that starting to happen, but I think that could be part of the revolution in your Inquiry's title, where we do see that coming through and demand side response may be part of that story.

Q28 **Chair:** I am looking maybe for a couple of answers here, but to what extent is immaturity of these flexible demand technologies a barrier to the widespread deployment of flexible demand technologies?

Sara Bell: I do not think it is the immaturity, it is the fact that it is very hard to come forward. May I give an example for something that has happened this year? It will take me a couple of minutes to explain, so please bear with me.

Chair: We will.

Sara Bell: In early February, SSE announced that their Fiddlers Ferry plant was going to come out of the market, notwithstanding their capacity market obligation. National Grid was naturally quite concerned about the reduction in capacity over the next winter, so started negotiating with Fiddlers Ferry to see how they could keep them in. In March, it was announced that more black-start contracts would be required and an industrial party came forward to National Grid and said, "We would like to provide this service". They had a very large CHP unit that supports their industrial process and is on 24/7, so it has 100% reliability. They were discouraged from bidding; "Don't bother bidding".

At the end of March, National Grid announced that they had signed two contracts for black start. The wholesale market plummeted by 5%. At the time the market thought that these contracts were worth about £10 million each. In May, Ofgem issued a consultation about these contracts, the appropriately-named BS consultation. In that consultation, it was clear that the total contract value was £113 million, so the industrial party made a formal complaint to Ofgem and said, "Hang on a minute. We wanted to bid. We would have bid £5 million instead of the £54 million National Grid has committed to SSE". Every party who responded to that consultation, except the recipients of the contract, objected strongly to that cash being paid.

It is very clear that those were capacity payments to make sure that the coal-fired plant stayed on in the winter. It is perfectly reasonable for National Grid to want to provide security of supply and be concerned about capacity. The National Grid is doing an extraordinary job of keeping the lights on, but there are means of obtaining capacity, such as store, that Yoav's firm can bid into, such as the transitional arrangements for the capacity market, which Colin and Yoav can bid into. If we allow misuse of services in order to support old technologies, we will not decarbonise at lowest cost to customers. Storage can provide black start capability; Germany is already using a storage unit to do so. That would mean that we create the business model to bring forward storage.

All of this is not about maturity, it is about whether there is a commercial opportunity here. Colin, Yoav and I are here to make money out of this revolution, to build economic development for this country. If there is not

a commercial opportunity because those commercial opportunities are being taken away, it will not happen and we will not get security of supply at lowest cost to customers.

Colin Calder: The technology for doing this exists and as a company we will not enter the electricity demand-side response market until we see a sensibly organised market with less risk, fewer policy change, fewer barriers. I want to just, though, tell you a little bit about what we are doing on district heating networks because we are addressing exactly the same problem.

District heating networks have peaks, which are very expensive to service. We have deployed all of our technology on district heating networks. Today we can unlock £130 worth of value annually for every consumer on a district heating network. That figure is very similar to the number that Goran Strbac quoted in his paper to the Infrastructure Committee. He believes that demand-side response for consumers could unlock somewhere around £110 to £120 of value annually for consumers.

In an unregulated market, we have developed the technology. We have taken it into the market. We are in deployment. We have no obstruction to accessing that value pool and creating a proposition for consumers. After eight years of running my company, we have not even moved the dial yet on getting anywhere close to being able to unlock the value that consumers should rightly have access to in the electricity market.

Q29 **Chair:** What is your view on what has to change and what Government can do? This, critically, is what we are trying to point at.

Yoav Zingher: If I could just add one more point, I completely agree with everything that Sara and Colin have said. We have been doing this in the UK for a number of years now, so I can probably give a little bit of insight into the maturity. I wrote down some numbers this morning from our system. Since July, so we are just talking in the last few months, we have through KiWi provided demand response 23 times to National Grid. That is 23 separate events where we have had shortages in the grid and our customers have provided demand response. That is across 601 sites and we have delivered almost a gigawatt hour of demand response. That is a very, very small amount compared to what we think that we could achieve if we had the market reforms that are necessary.

To give you an indication, I did a calculation. The saving of using our system compared to if the same capacity was being provided through alternative means like SBR is in the region of around £15 million just since July, just with KiWi. These are not small numbers we are talking about and this is not some kind of technology that needs to be developed in a further way to work. This works today; we just need to be allowed to scale up.

Phil Sheppard: I feel I should respond very briefly to Sara's comments around our black start contracts. It was purely for black start, not a capacity payment. It was an open tender. They are locational services

and as we go through the transition as coal plant is changing, black start becomes a much more difficult proposition, which is one of the reasons we are working on innovative ways of doing it, including using storage and interconnectors. The contracts are or were what they were and I think that the results of the Australian blackout three weeks ago demonstrate the value of having black start. Although it is a painful insurance premium to pay, it is a very important service that we need to provide to consumers.

Sara Bell: I completely agree. In fact, one of the units that Australia was paying black start for tripped when it came on. The unit that I have been talking about is never off. It would be physically impossible for this unit, which was tenfold cheaper, to be off so it actually would have provided fantastic security.

Phil Sheppard: If it had been in the right location.

Sara Bell: Which it was.

Chair: I can see there is an issue there. Thank you for that, both of you.

James Heappey: It is a great finale to our Committee's existence.

Chair: Yes, it is a whole area of inquiry that we will hand over to BEIS.

Q30 **James Heappey:** Phil, National Grid recently confirmed that it would not be procuring DSBR capacity for this winter due to minimal interest from businesses. Can you explain in more detail why you took that decision?

Phil Sheppard: Yes. We are very passionate, obviously, around demand-side services. I have just talked around some of the services we are procuring at the moment. The volumes we were looking for from demand side and trying to grow, so through our Power Responsive programme we are looking to get between 30% and 50% of our balancing actions from demand side by 2020. That is an ambitious target.

When it comes to DSBR, that is a one-year service. That was a service over the winter for securing capacity for the peak outside of the market. The level of interest we had was 37 megawatts and the cost for that was very uneconomic compared to other services. The reason that we did not proceed with that is that small number and the economic cost. What we have done, though, is work in with those suppliers. We think there are ways they can access the market for that 37 megawatts over the peak during this winter in any case, so we have not precluded them from entering into the market. They can still generate that but just not through that contractual mechanism.

Q31 **James Heappey:** To the remainder of the panel, what could have been done to make the scheme more appealing?

Yoav Zingher: I can probably talk about some specifics because we did not participate in DSBR and we support the National Grid in not procuring it.

I guess there are two issues. The first one is DSBR was badly designed. The technical parameters of participating in it made it unattractive to customers but, more importantly, it had a price cap. The amount of money that a customer could earn through DSBR was artificially limited to such a low level that it was not interesting, which is why we did not do it.

The second part is what National Grid did instead. The DSBR was supposed to be contracting capacity for this winter that is coming up and what ended up being contracted instead was something called SBR. These are great acronyms. SBR effectively is the same thing coming from power stations that are not in the market anymore, which is fine. The issue is that the SBR tender ran first and was uncapped in price. What ended up happening was some coal-powered—I think it was only coal—stations getting paid in the region of £150 million. The most expensive one was paid a capacity fee of £88,000 a megawatt, where DSBR was capped at something like £10,000 a megawatt and SBR was procured first. What happened was a bunch of money was spent on power stations and then there was so little money left over that nobody wanted to sign up to DSBR.

Sara Bell: How can you say that DSBR was less commercially viable when SBR paid more? It does not make sense.

Phil Sheppard: In terms of megawatt hours, but in terms of the volume we had had to buy to get access to that 37 megawatts, the costs were far beyond that. The important bit is that working with suppliers we still have access to that 37 megawatts for this winter.

Q32 **James Heappey:** I suppose there is a question of priority. You have a choice whether to prioritise the growth and the encouragement of the demand-side response market or to fall back on the old technologies. I am not convinced that National Grid's priority is embracing these newer technologies, these cleaner technologies. What do you say about that?

Phil Sheppard: SBR is a temporary product. It runs out because it was a stopgap between where we were and the start of the capacity market. SBR is now, after this winter, no longer a service or a product that is going to be used.

We would not set an ambition of trying to get up to 50% of our balancing actions through the demand side if we did not feel that was the appropriate thing to do. There are real benefits for consumers by having an open market. One of the reasons we launched Power Responsive is to understand what the barriers are to entry, how we can as National Grid facilitate removal of those barriers, and how we can lobby Government and the regulator to remove some of those barriers, because ultimately we want an open market between all forms of generation and capacity and demand side so we can find the lowest cost to providing that service to consumers. The more we can do to reduce the peaks, the less marginal generation we need and storage and other services just mean

we can shift demand into the troughs either side of the four hours of the winter peak, which is a much more economical solution for consumers.

Colin Calder: To get demand-side response into the market requires assistance. We know from looking at consumers' energy profiles and from research done by academia that, for instance, hot water tanks alone in the UK provide 20 megawatts of demand response capability a day. All white goods, if they were connected, by DECC's own numbers would provide potentially 45 gigawatts hours of capacity a day for demand-side response.

If we really want to provide consumers with value for money, which is the Government's top priority, there are two or three things that have to happen. First of all, this has to be behind the meter. If the demand-side response is in front of the meter, it will accrue to the energy industry. If it is behind the meter, it will accrue to consumers.

The second thing is if we want devices behind the meter to participate in demand-side response, we need to understand the economic model that makes that viable. Consumers are not going to pay for this equipment to be put in their homes. They are going to expect it to be free-issued but give up that flexibility in return for price benefits, which is exactly the model that should be applied. That is not going to happen overnight and it is not going to happen if we do not have a real focus by the system operator on enabling these technologies to come to market.

I would suggest that in the early days there will need to be some form of financial support in the form of subsidies. Right now, every other form of energy in the market is attracting subsidies, whether it be renewables or even building new power plants today. It should not be for demand-side response to be left to find its own way into the market without some form of support.

The final piece is this is not going to happen unless the system operator ultimately is required to procure a certain level of demand-side response. I go back to the daily load curve. On the top left, you have all your peaking plants. What we should be doing is progressively replacing those very expensive peaking plants with demand-side response. There is capacity out there. There needs to be a focus on purchasing a level of capacity, and whether that is three or four gigawatts to start with is for people to debate.

There needs to be a focus on helping people like Yoav and myself and Sara and others who are developing these technologies and have them ready to bring to market to get into the market and prove to the system operator that we can deliver reliable services that will stand up to the stress tests that are necessary to keep the lights on. I hear too often the comment, "But we cannot rely on demand-side response when the crunch comes and that is the reason why we are not going out and procuring it at the level that we could". We have to overcome that inertia in the market, which is a resistance you are going to come up against where people would prefer to take the safe bet of just building capacity. If we

overbuild capacity we will never, ever get the value from demand-side response, and there is plenty of research that has been done in the US on this. If you overbuild capacity, you will not have demand-side response; therefore, you are guaranteed to burden consumers with unnecessary costs for many, many decades going forward.

Q33 **James Heappey:** I want to ask about three specific barriers that have been reflected to us by the industry, but before I do, Phil, there were a couple of things that came out there about the willingness to accept DSR as an option. Can you, first, reassure that National Grid does absolutely see it as an option and what the timeline is for getting rid of peaking plants in order that that technological solution can be there instead?

Phil Sheppard: We are confident that all the services that we get at the moment from the demand side are reliable services. That is part of the contracting regime we go through. We are very comfortable relying on demand side to secure the system. The historical view that we only like large rotating plant has gone. We are using all sorts of different services and that is why we are so passionate about growing it.

James Heappey: The frustration from the rest of the panel is absolutely clear.

Phil Sheppard: Very clear, and part of that frustration is that it is not National Grid's position to choose technologies. We do not control the capacity mechanism. That market is all controlled by Government. It is a Government decision around where the subsidy should lie.

Sara Bell: But you designed store, you designed SBR, you designed DSBR, you designed all of them. You cannot blame the Government for that.

Phil Sheppard: But for a capacity mechanism, which was the point that we were coming to, around whether you want a longer than one-year contract, the fact that it is hard for storage or DSR to compete in the capacity mechanism, that is a Government policy change. That is not something National Grid can overcome.

Q34 **Chair:** Sara, what are your criticisms specifically of National Grid there?

Sara Bell: I agree with the capacity market. National Grid is an implementer of the policy, but that is not the case in short-term operating reserve, DSBR, SBR. It is fine to blame the Government for the capacity market, I join in on that complaint, but it is not okay to blame the Government for things that it is not responsible for. National Grid has a lot of scope and I know National Grid is trying to move in this direction, but it is like moving an oil tanker. If we want to decarbonise at lowest cost to customers, we are going to have to speed it up.

Q35 **James Heappey:** Three specific barriers, because I suspect the Chair wants to move on quite quickly. The first is Government has previously stated that there is no evidence to suggest DSR cannot compete effectively on a one-year capacity agreement. What evidence do you have as a panel that the contract's length does need to be extended?

Sara Bell: When you go and speak to a customer and explain the capacity market to them, explain all the changes they would need to make to their operation, to how they run things, to what they do, and then the revenue is only for one year, they tell you to go away because they are not in the business of securing the energy system. They are in the business of doing their business. If you want to make them be kind enough to participate in securing our energy system, they need to be rewarded for it and it needs to be more than a one-year contract. If the contracts were all the same length, we would immediately create a competitive market. The problem with the capacity market is the differential contract lengths.

Professor Watson: Just to add to what Sara says, I think there is sometimes a misperception that on the demand side you do not have to invest, it is the same energy efficiency policy, it is negative cost, and for DSR as well investment is needed in infrastructure or equipment sometimes. I would also make the basic economic point that if we are interested in least cost it seems crazy to me that we have this capacity mechanism, which is supposed to be neutral, which is simply not in its basic design. I am not saying necessarily demand side needs 15 years. We may have a compromise on seven or something like that, but it should be the same as the supply side.

Colin Calder: We absolutely need longer-term contracts. First of all, if you go to a consumer and try to explain to them what demand-side response is, they would not even understand what you are talking about. If we want to have consumers engaged in this market and sharing in the value pool, which I think is absolutely fundamental to getting best value for consumers, then we need to be able to free-issue equipment. To give you an idea, we looked at—and we are an approved enhanced frequency response provider to National Grid—delivering these services, a turn-up service through hot water tanks. We did all the calculations. We need a five- to seven-year contract so we can free-issue that equipment into homes, connect those homes, have them participate, provide a value proposition, but we cannot do that on a one-year contract. I think it is fundamental that we make these changes and recognise that demand-side response is not magically something that sits out there ready to be tapped into. It needs to be engineered. It needs to be developed.

Similarly, I have had numerous conversations with National Grid about the need to run some research projects around what the capability is of all the different assets in consumers' homes. We all have fridges, freezers, dishwashers. We may have electric heating systems, heat pumps and EVs coming. We need to understand what the capacity and availability is. What is the capability of all those assets? What could they deliver into the grid if we really put our shoulders behind this? What is the value that would unlock for the consumer? It is taking Goran Strbac's paper and turning it from theoretical calculation into reality. Grid should be leading research projects like that. They should be looking at how these things can support the market rather than sitting on their hands and not engaging with companies like ourselves.

Q36 **James Heappey:** Thank you, Colin. Yoav, I know you want to say something on that, but I am also going to throw in the bond as well, which I know you have bent my ear about previously. Why do you think that should be removed?

Yoav Zingher: I will probably be the only person here to say that you can get some demand response with a one-year contract. You can get more with longer-term contracts. We know because we deliver demand response in one-year contracts.

The issue is the way the capacity market has been structured. The biggest barrier and the biggest cost is the Government's own bid bond. Demand response is the only type of asset in the entire capacity market where we are required to put up a bond in order to bid, like a power station, but we only receive a one-year contract, whereas power stations get 15-year contracts. We are going through this right now. This week is when we need to launch our credit cover. We have to deposit millions of pounds with the Government in order to participate in the capacity market. That is more than we spent on any other line item in my entire business, more than staff, more than R&D, more than anything, is the amount of money I need to transfer to the Government to be allowed to participate.

When a power station does it, they have two advantages. The first one is they have 15 years to amortise that investment, which means a bank will lend them the money. They will not lend the money to me because we only have a one-year contract and the collateral is not good enough. That is the first part.

The second part is the cost of building a power station is in the region of £500,000 to £1 million a megawatt, so the additional £10,000 a megawatt for a bond is not such a huge distortion. The cost of delivering demand response for us is in the region of £1,000 a megawatt, so the bid bond makes up the vast element of our total cost base. The biggest cost to doing business is the cost of paying the Government to allow me to do business.

Q37 **James Heappey:** This is the final question, Chair. You have gone slightly further and said that you think the Government should exclude existing power stations from any reduced T1 auction. Wouldn't this result in higher costs for customers?

Yoav Zingher: I will give the context for that. This may take me 30 or 45 seconds.

Sara Bell: That is impressive.

Chair: I will have to stop interrupting you. Your time is going.

Yoav Zingher: The original intention of the capacity market was to procure power in two forms. One was four years ahead and one was one year ahead. The reason for that is because you cannot build a power station in under four years, so they procured or aimed to procure a vast portion of the total amount of capacity we need in four years to give

enough time for power stations to get built. The Government understood that this creates an inherent bias against demand response because convincing a customer to take an action four years in advance of the receipt of revenue, they say, "No, thank you".

So what the Government did, very wisely, is they split the auctions into two. They said we will procure the majority of what we need from power stations four years ahead and we will keep some portion of what we need for one year ahead, which was the right thing to do because power stations should make up the larger portion of the capacity pool in the country, but if you procure all of it upfront then you have nothing left for demand response.

That was all reversed this year. This year, they decided to more or less scrap that one-year-ahead auction, so it was reduced by 80%, maybe even 90%, and they have the ability to reduce it by a further 50% one year in advance. We have gone from the possibility of having that one-year-ahead auction for demand response to it going away.

What we are proposing is we would like to have that back. It was a good idea and it was a dumb decision to remove it. But if it is not going to be removed, then whatever portion is left over should not be flooded by existing power stations. The consumer is paying more because of this increased four-years-ahead auction. We should just have that removed and we should have more capacity one year ahead, but if it cannot be done, then at least demand response should have some space to participate. Otherwise, it will have zero market.

Chair: Jim, I think you wanted to come in as well.

Professor Watson: Yes, I was just going to come in on the point that Colin has made a couple of times about the potential for demand-side response behind the meter and my colleague Goran Strbac's work at Imperial College.

The thing to take into account as well as that study, which feeds through into the big number that the National Infrastructure Commission came out with, is that there have been a lot of trials on the social side trying to understand the social constraints to change in households in particular. There are particular activities people will move outside of the peak and particular activities that they will not. Cooking is classically one that they will not; dishwashing and laundry is something that they will.

There is quite a lot of evidence out there. As well as engineering evidence, we need the social evidence because I think you have to look at the barriers to this, particularly behind the meter, in three ways. There is the technical potential, and it sounds from colleagues that the technical issues can be sorted out. There is the economics of it, but then there is the social: how does this fit into patterns of everyday life for consumers in homes, for small businesses, and so on? I think those constraints are not talked about enough. I am not making an argument not to do this, I

am just saying we have to be a bit careful with some of the big numbers that are bandied around.

Q38 **Chair:** Thank you. Before we move to Glyn, just for clarity, the bond you spoke about it, your quibble with the bond is that the bond is the same size and also that—and correct me if I am wrong—the bond represents a massively disproportionate cost to your assets that you bring into the marketplace compared to what the generators bring to the marketplace?

Yoav Zingher: Precisely. For a power station, it is less than 1% of the total cost. For demand-side response, it is 95% of the total cost.

Q39 **Chair:** Can you give us an idea what these figures are?

Yoav Zingher: Around £5,000 to £10,000 a megawatt in each, but on the one hand you have a £500,000 to £1 million cost for a power station; for demand response it is more like £1,000 cost per megawatt. Demand response is a lot cheaper, which is why it is disproportionately larger.

Sara Bell: But this also goes to the different types of companies. The companies that build power stations tend to have very large balance sheets that can support these bid bonds. Innovation companies bringing these technologies forward are a totally different type of company and do not have that balance sheet, which makes it so much harder.

Chair: I see National Grid and everybody on the panel agreeing with that point.

Glyn Davies: I must say the first couple of questions I have in a sense are ground that we have covered before, but I am quite happy to go there. It is just that we could really have a half an hour speech from every member in terms of response to it.

Chair: He is basically hinting that he does not want that.

Q40 **Glyn Davies:** At least the Chair is hinting that. Whether Government can develop a better framework for a competitive and fair demand-side response market is what we are interested in.

Flexible-demand business models suffer because they do not fit into the traditional energy business models, and we have talked about this quite a bit in the last half an hour. How can this be overcome to encourage new market entrants? We have talked a bit about this, but what are the key points for helping new market entrants?

Chair: In an ideal system, what would you have Government doing?

Yoav Zingher: I will keep it very brief. I think it is two things. The first one is fixing the capacity market because it does not work, and that is the combination of things we talked about over here: equalising the contract lengths, making the bid bonds fair, and there are a number of other issues like that but put together that will go a long way.

The second one: I agree with my colleagues over here that if we do not set targets I do not think we will get success. The idea of technology neutrality makes an awful lot of sense and demand response is not a

technology as much as it is a way of doing business. If we do not have targets to do it, we will see that the rules and the modifications of rules will keep lagging behind reality. I think we have to set some targets.

Colin Calder: The transitional arrangement exists within the capacity market. It could easily be adapted, in my view, to do the job. I support totally what Yoav said that we need to set some targets. In order to make this work for consumers, we need smart meters rolled out. That is in progress. We need half-hourly settlement because without that this does not work. With those two fundamental changes and within the capacity market the reforms such as unbundling turn-up and turn-down services, you can turn a hot water tank up but you cannot turn it down. There is no need for these things to be symmetrical within a contract. They need to be unbundled. We need a little bit more thought to be given by the system operator to how consumers can properly engage in the market at a technical level, but we definitely need targets and a focus by regulators and policymakers to introduce the changes that are necessary to allow this market to flourish for aggregators like Yoav and myself, as well as consumers.

Q41 **Glyn Davies:** What targets specifically would you like to see?

Colin Calder: I would like to see a starting target of three to five gigawatt hours as a start in the market and that that then is progressively increased as confidence grows in building up the capability in the market.

Q42 **Glyn Davies:** The other point I was going to ask, because it seems to me that we are covering this at the same time as our reference to targets, is how Government policy can adapt to account for disruptive new business models and suggestions about how Government changes their approach as well to accommodate what we want to see.

Colin Calder: I had a meeting with Ofgem last week and I met with Dermot a couple of weeks ago. If you look at the way the industry is regulated, there are lots and lots of working parties, typically dominated by the big six. Start-ups like mine do not have the resources to attend those working parties.

Every one of those working parties ultimately is responsible for changing the way in which the industry operates, the way data flows, the way in which the system ultimately is going to operate going forward. We must have a change of approach by the policymakers and the regulators to specifically address the issues of how we introduce change that is not in the interests of the business models of the big six—and I have every sympathy with the big six; they have a fiduciary responsibility to run their businesses for the benefit of their shareholders, not for anyone else If they were not to do that, they would fail in their duties. We need to recognise, though, that disruptive technologies that people like myself and Yoav and others are bringing to market do not necessarily fit well into the business models of the incumbent players and, therefore, quite rightly, they will use every opportunity to slow down the progress of

change to fit their business and their transitional arrangements. That is not in the interests of consumers.

Q43 **Glyn Davies:** Thank you. Would anybody else like to come in on that?

Sara Bell: I would like to weigh in there. I realise I am somewhat out of step with the rest of this country at the moment, but I believe in markets and I believe the energy system should be operating as a proper, transparent market. The more we hold National Grid to account to tender in a transparent manner for services, the more likely it is going to be obvious when we are not doing the right thing from an economic point of view. Increasingly, National Grid is using bilateral contracts to provide services where there should be a transparent process. In some instances, where the regulation states they should be transparent processes and they should be tendered, bilateral contracts are taking place. There needs to be an increase in effort from Ofgem to regulate for consumers.

Q44 **Chair:** What can Government do? I am quite interested in what you think Government should be doing to deliver the sort of change that you want. What can Government do to support individual load shifting? Aggregators are telling us but how do you persuade individual customers, individual energy users, to change their use of power from peak time to non-peak time?

Professor Watson: I do not think you can just persuade them. It is often framed as a question of behaviour change: "If only people would change their behaviour, then we would be fine." People change their behaviour all the time for all kinds of different reasons. It is a matter of responding to incentives, it is a matter of getting a situation where you can have companies coming up with innovative ways to offer new things to customers, and I agree with Sara that it has to be done through markets. They will discover—by trial and error, probably—what consumers will do in response to particular types of offering, whether it be time-of-use pricing, which again has been extensively trialled and has shown that it does shift people's use from the peak under some circumstances, or whether that is combined with generation on site, which tends to increase the amount of engagement you get.

It is not a case of just talking at people and saying, "Please change your behaviour." It is a combination of all the infrastructures and then allowing the companies to come in and try new things that have not been tried before. It is going to be trial and error. Some will succeed, some will fail. Unless you open it up to allow that process to happen, you are not going to discover how much of that technical potential can be turned into real activity.

Phil Sheppard: Yes, transparency is really important. One of the things that regulators elsewhere in the world are doing is introducing time-of-use tariffs. By doing that, you expose the costs at particular times, which does change behaviour. That is predicated on having smart meters rolled out and half-hourly settlement, and a way of suppliers doing that.

The other activity I would say that helps drive some of this is innovation projects. There are innovation projects like the one that Barry touched on in terms of batteries. There are other things we can do through the innovation competition that look at encouraging the demand side and trying out different ways of either incentivising individuals or people behind the meter to have a different approach to how they use their energy and encourage demand-side response on a mass scale.

Colin Calder: It is very important not to get lost in this whole debate about consumer engagement. As a company, our focus is entirely on ensuring that what we do is under the covers for the consumer. Consumers do not want to be the energy manager. They do not want to be looking at the price of energy when they get home and deciding what they are going to do. The technology should be running the services for them.

The key point here is that if you develop the technology in the right way that says the consumer would like to take the benefit of savings, but they can opt out at any time because maybe the circumstances are that today they want to opt out, for reasons, that is the flexibility that you have to build into your technology platform. The platform deals with that issue because as an aggregator, you are just cycling different devices in and out of the pool to maintain your position in the market.

The one change we need from consumers is when they purchase something, they are doing to purchase a smart fridge instead of a dumb one, or they are going to purchase maybe a hybrid boiler instead of a gas-condensing boiler. What we are trying to do is create a market structure where we can see a take-up of devices that eventually builds out this flexibility. There are 13 million white goods replaced every year in the UK. Not one of them being installed today is smart and connected, yet the cost of that is a dollar. The chip to put into those devices is a dollar. It is not happening because there is no market. No one can see how to monetise this. That is a crying shame for consumers because they are not going to reap the benefit for many, many more years unless we do something to reform the market structures.

Q45 **Glyn Davies:** The last question I was going to ask you is about consumer protection issues relating to DSR; preventing abuses or potential abuses, anyway. Government is supposed to be consulting on this. What are your views on the best ways to protect consumers from potential abuse? Should there be legislation enshrining codes of conduct? How else do you think that could be done? You do hear that as being a worry.

Colin Calder: First of all, we must be very careful not to over-regulate the market before it even exists. I can see that coming because it would be in the interests of some parties to do that.

As a company, the approach we have taken first of all is around data security and protection of the consumer's information. We have adopted the standard security rules that apply to banking, for online banking. Even if someone hacked into someone's home they still would not know

from our system who that owner is because none of that tying-up of the telemetry data in the home with the customer occurs until you get into the backend servers, all of which run in Tier 1 data centres, which is the highest level of security in the industry: 128-key encryption across home area networks and wide area networks. As a company, we have adopted security standards that are similar to or the same as the banking industry. That is number one.

Number two, these are opt-in services. If a consumer elects to go on to a lower-rate tariff—and it is obviously up to how an energy supply company presents that proposition—then the energy company can deem whether or not they can opt out of that regime. We would advocate that there are occasions where consumers do need to opt out.

It is a bit like your mobile phone. You buy so many minutes and so many text messages. If you go over the minutes, you know you are going to pay a premium rate. There is absolutely no reason why the energy industry cannot offer a proposition in exactly the same way. I have contracted to operate or use my equipment in the home in this manner. I know if I opt out of that, I am just going to get a message that tells me I am going to be paying a premium price for electricity. That is the way other markets have addressed this issue and I do not see any reason why the energy industry cannot apply that same model. People want certainty, they want certainty over cost and they want control over what they are doing with their equipment. These things are not mutually exclusive with demand-side response.

Q46 **Glyn Davies:** You are telling us how you operate. Is that the sort of regulation you would like to see in place, so that everybody in the market is operating in the same way?

Colin Calder: There has to be a decision about whether the value that is unlocked from the market gets to the consumer via an established energy supply company or through an aggregator or a third party. That is a fundamental market-structure question.

Q47 **Chair:** Yoav, would you agree with that sort of standard? Quite briefly, if you will.

Yoav Zingher: We think about things in terms of commercial/industrial and then consumer, and the truth is it is probably too early for both. We have decided as an industry, a collection of myself and some other companies through the Association of Decentralised Energy, to put together a code of conduct so that we are not on the back foot on this because at some point this is going to be required. There is no question about it. We are trying to put that together now, as quickly as possible.

If we try to put too much regulation in at this point, there are two things. One is that Ofgem will definitely get it wrong and it will create more friction when we already have enough friction to deal with. The second thing is that Ofgem should really be looking at the markets. If they end up spending all their time on the regulation and do not fix the markets,

we have regulated nothing because there is not a wide-scale opportunity yet.

Q48 **Chair:** Thank you very much. Maybe Jim will give us an academic overview.

Professor Watson: I do not have a lot to add. It has to be subject to generic regulation for utilities and the market. Obviously, the data protection and data privacy part is newer and that needs to be treated very carefully. We have found in some of the trials that academics have been involved in that levels of consumer confidence have been quite high but that is because they are being treated as special in those trials and they are involved with trusted partners.

The code-of-conduct point is a particularly important one to take into account. You have to avoid having early problems with this because it could put it back for several years if there are. It does not need special treatment but certainly if it blows up it is not in anybody's interests.

Q49 **Glyn Davies:** What is Sara's view on this? You have quite a view on regulation and markets.

Sara Bell: I do not think Ofgem has demonstrated its ability to regulate the existing arrangements. It has not regulated National Grid over black starts. I went to see a barrister to examine whether I should judicially review Ofgem because they have not done anything about the situation. Consumers could have been paying £5 million. Instead, the cost of the contract was £54 million. I would have zero confidence in Ofgem getting it right to regulate for consumers when they are not even regulating the industry.

Glyn Davies: That is pretty clear.

Chair: On that note, can I thank the panel again for your lively contributions this morning? It is appreciated. The information was vast and legion. I thank you for taking this time for coming in this morning and doing exactly that. Thank you all.

Examination of Witnesses

Witnesses: Sacha Deshmukh, Simon Roberts, and Victoria MacGregor.

Q50 **Chair:** Thank you, panel, for coming in this morning. It is appreciated. Can I begin, as ever, by asking witnesses to state their names and organisations for the record? I will start, as usual, on my left.

Sacha Deshmukh: I am Sacha Deshmukh and I am the Chief Executive of Smart Energy GB.

Chair: Thank you, Sacha.

Victoria MacGregor: Good morning. I'm Victoria MacGregor. I'm the Director of Energy at Citizen's Advice.

Chair: Good to see you, Victoria.

Simon Roberts: Good morning. I'm Simon Roberts. I'm the Chief Executive at the charity, the Centre for Sustainable Energy.

Q51 **Chair:** Okay, straight in. Our first question this morning to you, panel. The fourth Industrial Revolution can be described as a shift from simple digitisation to innovation based on a combination of technologies. What do you think this might mean for the energy sector?

Sacha Deshmukh: You have summed up perfectly, Chair, the revolution that is about to happen to the energy sector. It is starting but we are only at the very beginning of that revolution. If you look at other markets —telecommunications, broadcast—we are at the equivalent of the early stage of the revolutions that they had in the 1980s and the 1990s. We are seeing that now happen in energy. I do not think you can underestimate how fundamental a shift from analogue to digital is, as far as a revolution goes. That revolution, in my view, entails a revolution in sustainability, a revolution in reliability, and also a revolution in the consumer/supplier relationship. We stand on the cusp of all three of those and it is digitisation that is the difference in that movement from the past to the future.

Victoria MacGregor: We would agree. Combining technological developments with new business models has the potential to change the way that energy customers interact with the energy market. Big analytics, smart data and demand for convenience from consumers could give rise to new pricing models, for example. The energy sector is also a key conduit, based on the rollout for smart meters, for smart homes and the internet of things. Broadly, we think these things should be positive for energy consumers but there are particular risks for vulnerable customers and those who are digitally excluded.

Chair: Such as?

Victoria MacGregor: Increasingly, already we are seeing that the best deals are only available through price comparison websites online so the 11% of homes that do not have access to the internet are already excluded from those best deals. Going forward, when you get new services, automatic switching and so on, they would be excluded from those as well.

Simon Roberts: I would echo the comment about what the exciting potential is but there is a real issue about understanding within the energy sector what sort of disruption we actually want and being clear why we want it. There are issues around the absolute need to reduce demand and the absolute need to increase the ability to map demand to supply to deal with more variable sources like renewables because they are low carbon, but there are also the opportunities Victoria mentioned to use that data and those techniques to improve support for more

vulnerable households by producing better-targeted support packages and so forth.

Those are the things we think we could achieve through the disruption and this revolution, but they are not inevitable. There is an assumption built into a lot of the discourse that progress is always positive and that markets will do right by consumers. We are working in a sector that is incredibly heavily regulated, controlled and rules-based. We are not in a world where Government quite understands how those rules affect the types of disruption that come forward, who gets to benefit from them and who gets to pay. Unless we open that up and start to get underneath the skin of that, we are at risk of not getting the apparent benefits that everyone talks about and we will end up with something that was not quite what was intended.

Q52 **Chair:** Markets are spaces that are governed by rules. I think the issue you are driving at is who frames those rules, what those rules will mean and who benefits then from those rules. The economist Robert Reich writes a lot about the United States of America, where these rules have fallen and where the balance is.

That leads to my next question. How prepared do you think UK businesses are, and consumers, because there are two differences here. There is going to be a bigger incentive for one lot to be ready versus the other. How ready are they for change? How prepared are they for change?

Simon Roberts: You just had some people on the panel who are very ready for change and are finding it a slightly frustrating process, but in terms of the energy sector, it is behind the curve.

We have a Government policy framework that is behind the curve, that assumes that there is somehow some sort of driver in the market that will make the digital smart stuff happen and happen in the interests of consumers, and that system benefits and financial benefits developed as a result of consumers changing their behaviour will flow through to those consumers, and that we have all the markets, regulatory frameworks and charging methodologies right to do that. We are way behind the curve in relation to that.

If you want something to happen in the market, you need to do things to make it happen. If you do not want some things to happen, you have to do things to stop it happening. We are not at that stage. "Let us see what all these working groups you were hearing about earlier come up with". We need to get a little bit more on the front foot and set frameworks and policies in place that create some drive in the market, particularly for the big six energy suppliers in relation to domestic consumers, to want to help their consumers reduce demand and create more flexible response. There is nothing in the market at the moment that does that.

Q53 **Chair:** Consumers are, almost by definition, very often reactive to what comes out there. There is always a job of work to be done to prepare consumers for what could be coming their way, what opportunities

coming their way, and what they might have to do by way of behavioural changes. Any thoughts on that, Victoria or Sacha?

Victoria MacGregor: Yes. We may come on it but one of the things we think is positive is principles-based regulation, setting a framework of desired customer outcomes in which innovative services can be trialled without exposing the whole market to detriment. From a consumer point of view, it is vital, particularly in a world where the boundaries between sectoral regulation, such as energy regulation, and wider regulation, so data protection, are going to become increasingly blurred, that consumers have access to holistic advice about what their rights are to help them navigate their way through these already complex systems.

Q54 **Chair:** What should Government be doing, as an additional question? Sacha?

Sacha Deshmukh: Picking up both elements of the question that you have just asked, first, in terms of consumer readiness, you are absolutely right that consumers do need support. That is both mainstream consumers, who can be encouraged and have support to understand the changing market but also, in particular, vulnerable consumers. Real thought needs to be given when markets are changing as to the immediate support that more vulnerable consumers require but also the longer-term support and the way in which, in a liberal democracy, we want a market to work for all consumers, including the more vulnerable.

My particular expertise is in behavioural science and behavioural change. In terms of the smart meter rollout alone, we at Smart Energy GB created this view, *A Smart Route to Change*, which I would urge the Committee to certainly have a look at. That shows that even within the smart metering rollout we want behavioural science best practice to be at the heart of supporting consumers in being able to engage in that and change their behaviour. The need for that is even more fundamental as the market changes more broadly.

In terms of the role for Government, I very much agree with the direction that Simon was talking about just a moment ago, which is that Government does deserve a pat on the back, a big tick, for making a revolution start—not all Governments do that and that is a very good thing—but, like all change you want to happen in an environment, where you want to make sure it benefits people and, in particular, the more vulnerable are also protected, that change needs stewarding. That is the word I would use to describe the depth of the approach that Simon was questioning, provoking or saying needs to happen. That stewarding needs to be quite intense and needs to be well scrutinised as well. That is the step.

The starting gun has been fired on a change that cannot be turned around, and that is a fundamental point, but like all races they can then go in a particular direction that can be stewarded or they could then go off in another one. There is a lot that has been done that is showing the direction of travel but there is also a lot more to be done to make sure

that all those steps keep moving and questions of vulnerabilities and others are addressed en route, rather than just at the beginning and then only tested again once we have reached the destination.

Chair: A man who always reaches the desired finishing line is James Heappey. James, I will pull you in at this stage.

James Heappey: Thank you very much indeed, Chair. This is probably the last set of questions I will get to ask on this Committee so I just want to say on the record what a pleasure it has been to serve on this Committee under your chairmanship, and with our brilliant staff, and to engage with so many wonderful energy industry stakeholders over the last year.

Chair: Thank you, James. Good comment.

Q55 **James Heappey:** It does seem to me that all of this stuff is a box of tricks under the stairs. It is being done to consumers by Government and by industry because we see a bigger picture that they may not. We need to sell to them an experience that is beyond simply savings under the stairs. We upgrade our phones ever year or so, not necessarily to worry about being able to make cheap phone calls. In fact, that is very often the last consideration. It is about the functionality and the wider experience of having it.

So, I just wonder how you think we sell this energy system that we know to be valuable from an energy policy perspective. How do we sell it to consumers to make it work for them and to give them a lifestyle where they see that stuff as being helpful to achieve?

Sacha Deshmukh: May I begin? I just wanted to bring in a point from our own consumer research, which partly agrees with you but also partly challenges an element of the premise of your question.

We have done considerable research and have considerable ongoing research with consumers to support our consumer engagement campaigns. Consumers are a lot readier and a lot more able to see the future than sometimes policymakers realise. The common sense of consumers when they are looking at a market that is not working and picturing what they want is often quite deep. In the case of the research that we have done I have spoken to consumers around the country who are by no means energy experts, not energy policy wonks at all, and some of them have painted for me a picture of the market that would very much resonate with the kind of picture that you have painted for me in the past and that other policymakers paint.

The big issue in energy has been how much consumers have, to date, not believed that anybody is ever going to deliver that for them. When you provoke them and you say, "How would you like this market to work?" essentially, when they are forced to think about it, they say, "I want it to work in the way that I recognise most things in my life are served, where I am at the centre of the marketplace and that links in with other elements of my lifestyle, I believe that people are trying to offer me the best price and I believe that people are trying to help me to get the best

price". Indeed, consumers, even if they do not have a vulnerability, by and large say, "I want to make sure that, if something is fundamental to people's lives, the more vulnerable are protected and can still access it, even if I may access it through a more mainstream market". When you ask them about energy, that is what they have said to me.

They have almost then said, "That seems like common sense. Why does it not work that way? Why is there such a barrier?" Some have then even gone on to say, before I have even said a word, "But when you think about it, it is analogue. Everything else is digital". With analogue, the industry is stuck, the consumer is stuck and everyone is trying to build bridges between the two, but those bridges end up like the staircases in Harry Potter. You just keep moving them around to desperately solve that day's problem. They are never really a coherent link."

Consumers are ready to be served by a marketplace that works a lot better. I am not saying that they will not want to be engaged by it. I am not saying that there are not going to be steps to help make sure that consumers realise things are changing and I certainly think that there will need to be both policy protections and engagement intensity for the more vulnerable.

Q56 **James Heappey:** Do you not think that the level of switching that does not happen is rather indicative of the fact that consumers do not really engage? If this is, "There is your smart meter, now change your energy consumption habits in order to save yourself a bit of cash," some will—probably the same people who switch—and a lot of other people will not. Surely there has to be a wider experience, connected to the whole internet-of-things thing, in order to make this something that people engage with.

Sacha Deshmukh: To slightly challenge what you are saying, switching is not a goal in and of itself. Being confident that people are getting a great deal is a goal in and of itself, of which switching can be a mechanism. I absolutely agree that at the moment, the gulf between a large number of people and them getting a great deal is the sense of switching being a hassle, and indeed in an analogue world the sense of whether you know if you are switching to something that makes sense. Some people try and help you but we know that that help is less good than it should be because there is no real data to power it.

One of the consumers in the research that we outlined, when we talked to them about switching and how smart data can enable switching, used an analogy that is quite interesting. They said, "I go to the same supermarket every week". I will not name the brand but it was one of the big supermarkets. "I am happy going to the same supermarket every week because I believe that that supermarket is trying to get me the lowest prices, and indeed when I get to the till instantly they give me a receipt that fesses up that I could have gone somewhere else and it would have been cheaper but that they are trying to match that". That consumer said to me, "I do not feel the need to switch because I feel confident that someone is delivering me the best deal".

I believe that consumers will be able to engage in the same way in energy when it is digitised. Energy, in and of itself, is nothing that we all want to buy. It is not a lifestyle choice, it is an enabler. I believe there will be a marketplace where energy is much more closely aligned with other elements of our lifestyles and consumers will engage in that more deeply. Until that time, lots of people are doing their best to help consumers to engage in an analogue market. That is a good thing—it is not good to have a load of people stuck on deals that are not great—but it is only ever going to be suboptimal until it is digitised.

James Heappey: Victoria, you were trying to come in?

Victoria MacGregor: Yes. You are absolutely right, the levels of engagement are low and there is a real risk that as we move forward, you would see the benefits of the new systems just going to that engaged minority. We would want to make sure that we are guarding against that.

Sacha touched on it earlier but placing behavioural insights at the heart of the way in which we develop the new system is a much better way. Fundamentally, the energy market does not work with the way that people actually think and make decisions. If we can see policymakers and regulators using more behavioural science and behavioural insights in framing these new developments, that will make it much easier for consumers to make better choices.

Q57 **James Heappey:** I am just going to interrupt you because you are saying some buzzwords that are in my next question. May I throw into your answer—Simon, you want to come in as well—what engagement you have had with the Behavioural Insight team in the Cabinet, or the nudge unit as they call themselves?

Victoria MacGregor: We published a paper with them last year on using behavioural insights in regulated markets. We thought it was a very useful contribution and we would be very keen for them to be more involved in consumer policy going forward because we think it is valuable to help markets work in a way that people actually think and act.

James Heappey: Simon, you wanted to come in on this?

Simon Roberts: Yes. We need some behavioural insights into the way companies and energy suppliers act. The opportunities are immense and they are really exciting. The smart meter rollout is a fundamental building block. It is not an end in itself, it is the infrastructure we need to put in so that we can digitise the energy system.

There is that world, but the counterfactual is that of a large number of energy suppliers basically doing a little bit of stuff for their tech-savvy, hipster customers who have a smartphone and want to do stuff, but where the bulk of that opportunity is left standing. That, I believe, is what is going to happen at the moment, in spite of all of the understanding of the opportunities that are there, because there is no policy driver in the market for those energy suppliers to do something different except where it might benefit themselves.

The foot-dragging that is going on at the moment in the working groups that suppliers have that are creating models, and regulatory frameworks, and all the rest of it, is immense. We proposed a policy where suppliers had an obligation to reduce their average customer demand. I think unless you have some driver like that in the market this lovely idea, the kind of counterfactual of what will go on otherwise—we really need to consider that, otherwise we create this lovely picture of what could happen and meanwhile end up with something, again, where we are behind the curve. Something that is not quite what we intended happens, and we then have to play catch-up for the next five or 10 years.

Q58 **Mr Alistair Carmichael:** Victoria's right, there was a lack of engagement; Sacha is right there was the lack of confidence. But in fact, this is not all the fault of the consumer. It is down to the fact that the energy companies, the big six in particular, have—forgive the vulgarity—taken the piss for years. That is why you do not get the engagement and that is why you do not get the confidence. The behavioural science takes you so far, but taking that approach risks putting the responsibility on to the consumer.

Simon Roberts: I do not think we are saying that behavioural science is the answer. I think it is just that when you are designing programmes, and rollout, and all the rest of it, you should absolutely embed all of that understanding into it. There are a lot of different versions of behavioural science, and we tend to end up with a behavioural insights team with a rather rational-choice model, where you basically give people more information and encourage them to engage, and they sort of will, rather than some of the things—if I were showing that to you when you were asking questions, aside from wondering who the hell I was to judge your questions, you would probably think, "Yes, he thinks that is a good question." Right? And if I show you that one, you think it is not.

But the point is not whether those things work; they do work. If you give people who are using less than average energy consumption that on their bill or on their feedback, they tend to stay using less. If you do not put it on and you tell them they are using less than average, they tend to increase their consumption because they have a bit of headroom. Those sorts of things really work; we need to build all that in. The question is: who the hell is going to put that into the market and drive that energy-reduction programme, that flexible-demand programme, that working-for-fuel-poor-households programme that all that digitisation could do?

Q59 **Chair:** On that very point, should there be a demand-reduction obligation that provides incentive penalties, and maybe smiley faces or unhappy faces—

Simon Roberts: You could do it for suppliers.

Chair: —to ensure energy companies will act on this?

Simon Roberts: I think if they had an obligation they would. But it has gone into the policy-making mix, and the suppliers have all found reasons why it probably does not need to be done.

Q60 **Chair:** Do you think there should be a demand-reduction obligation there?

Simon Roberts: Absolutely. It is an idea we originally proposed on the basis that you need something in the market that drives the energy companies to think about how to use all this technology that we are all paying to fit in to help their consumers reduce demand.

Victoria MacGregor: I cannot comment on the specifics of a reduction obligation, because there is a much wider policy mix around energy efficiency and things that I would want to understand how it interacted.

Sacha Deshmukh: I think what you are talking about, and we have also worked with a behavioural insights team, is behavioural science has upstream and downstream interventions. Typically, lots of conversations focus on the downstream; what the consumer does with what you give them. This market I think absolutely needs upstream, whether it is that as well, or whether it is what you just outlined there, or other things that have been mooted. Let me just give you one: at the moment if your energy company realises that they got something wrong with your bill, they come and chase you for the money. There is a whole structure that tries to protect consumers in what happens in that situation. Here is an idea. How about if the energy company makes a mistake, and it is in the consumer's favour, the consumer can always get that money back. If the energy company makes a mistake and it is in the energy company's favour, they have a month to notice it, but beyond that month, caveat vendor in that particular case.

I am not throwing that out as a concrete idea, there may be pluses and there may be minuses. The reason I say it is it shows, perhaps, the need for quite a fundamental move on from the way in which the market has worked previously, which I think has perhaps assumed quite a paternalistic view of the players within the market. There are good people who work for energy companies by the way, I want to say. It is easy to demonise everyone who works there. A lot of people I know who work in there absolutely believe they go there because they want the coldest, most vulnerable person in the country to not be cold and to be able to cook. That is what motivates them. But the marketplace has been created as a marketplace, and perhaps still has the structures and players designed for a previous era. Then some of the way in which regulation and policymaking has worked has played to that, rather than thought 10 years ahead. I think now is a moment to think 10 years ahead.

Chair: Thank you. Sorry, I am just pushed for time. I am going to go briefly back to James, then over to Alistair.

Q61 **James Heappey:** Thank you. I can see a danger that all these technologies come into a home, and if they are not all speaking the same language to each other the consumer experiences a system that does not work, that, therefore, falls at the same hurdle. I wonder if you have given any thought to whether the Government should seek to encourage that a

certain type of operating system works from smart meters and smart thermostats. We visited Nest, one of the Google companies, and clearly that was a consideration for them, that things need to be able to bolt into their system to give the consumer the experience, then it all sort of accelerates in its own right, as we have seen in the phone market. Do you have any views on that?

Sacha Deshmukh: I think one thing to remember in relation to smart meters and the data from smart meters is the smart metering system, in some ways, I always say, is very simple, but very comprehensive. The data that comes out of a smart meter can communicate with all number of different things. I do not think there is quite the sort of operating-system issue you are talking about when it comes to the data from the meter.

Q62 **James Heappey:** No, but smart thermostats in an IoT enabled home is a big issue.

Sacha Deshmukh: Absolutely. If you take the example that Simon has talked about earlier, and some of your previous witnesses also spoke about, which is the smart home. I would not necessarily say there needs to be enforcement of an operating standard by the Government, but I do think that there needs to be greater encouragement of the market of those smart appliances starting, and the most effective operating system then tends to take the lead. I recently looked for smart appliances, simply for myself, and found the experience that has been described, where you have a choice between almost supporting domestic supply and crossing the world to try to get something and yet we have a very vibrant market of people upgrading appliances in this country and upgrading homes. It is a big culture in this country of upgrading your home. It is something we do in this country. I think trying to enforce that market to take on a smart nature will also then help the right operating systems to take some market strength.

Victoria MacGregor: Robust protections are in place around the smart-meter rollout around data privacy and interoperability, but that does tend to fade away as you start moving into the smart home. We think that interoperability and interchangeability as principles are absolutely vital for consumers, because it stops existing monopoly companies taking advantage. Then we do get quite a lot of consumers contacting us with concerns about data privacy. Transparency and consumer control over their data—again as key principles as we move to a new system—whether that be in regulating or in policy, are things that we think are absolutely vital to give people the confidence to move to these new services.

Q63 **Mr Alistair Carmichael:** Seeing the opportunities, can I touch for one minute or two on some of the constraints? If, to use Sacha's term, Government are going to be responsible for stewardship of this, what should they be doing then to ensure that you get the right balance between encouraging this digital innovation but still protecting the privacy of the consumer at the end of the day?

Sacha Deshmukh: Shall I just start with a few thoughts? The first point, I think, is to have a clear vision. If you have a clear vision of a much smarter economy, smarter homes, and smarter lives, and smarter businesses within that, that helps you to understand the parameters of what you are looking for in there. I think there is a lot of thinking that has happened on that; we have done a lot of thinking about that.

Mr Alistair Carmichael: It all sounds a bit hipster.

Sacha Deshmukh: No, no. It can, but if we talk about some of the thinking that we have done around a smart city, for example, we talk about a framework that we call REAL, reliability, efficiency, accessibility, and supporting lifestyle. It is not necessarily a complex structure.

Q64 **Mr Alistair Carmichael:** Okay. 30 seconds for each of you, one thing that the Government should be doing in developing a competitive and fair digital market then? You can start, Simon.

Simon Roberts: I think the first thing I would like to see is a clear incentive within the market for the energy suppliers who are the primary holders of the data outside the consumers—consumers will not understand that they have it—to have a clear, direct incentive to make that data work in the interest of consumers, and then they become the people. We could either not do that and hope the market will open up to others, or we take some steps to not assume the market is going to be perfect, and drive it in the easiest way we know how, which is to make the energy suppliers think differently about that data and how they use their consumers.

Victoria MacGregor: I think setting a clear framework with the desired outcomes, particularly focusing on vulnerable consumers, so moving from the principles-based regulation we are currently seeing in the retail market to a wider approach along with that that very much puts the protection of vulnerable customers within a framework of innovation.

Mr Alistair Carmichael: Textbook.

Sacha Deshmukh: I agree with Simon and Victoria, and I would say in addition, if Government sets out this overall vision—ironically Government are putting a lot of pieces in place—it can confess to its own strengths a little bit better by now taking this moment to be even clearer about what 10 years hence looks like and the roadmap in a number of different areas that does require stewardship by regulation or by policymaker.

Chair: Thank you, Alistair. Thank you. That brings this morning's session to a conclusion. As I mentioned at the beginning, we expect this to be our last public session—the handkerchiefs will be passed around later—before our responsibilities are transferred to the Business, Energy and Industrial Strategy Committee next week. We are, therefore, aiming to publish our final report before the end of this week.

Can I thank the panel here this morning? Can I thank the witnesses

generally over the last year-and-a-half for the quality of information they have provided, like the panel here this morning? Very useful, very informative, very detailed. Can I thank the staff of the Committee, who have been absolutely fantastic?

Mr Alistair Carmichael: And an all-nighter still to do.

Chair: And an all-nighter still to do, as my colleague from Orkney and Shetland points out. They have been fantastic. The clerk, Farrah Bhatti, has been immensely brilliant over the last year-and-a-half.

Can I thank my MP colleagues on the cross-party Committee that this is? We have seldom, if ever, been cross. I had to get that pun in there.

Our work has been done and helped by the co-operation of the energy community, and I hope the energy community will continue to engage with Parliament and its Committees as much as they have been in the last year, especially with the new committee with such a big remit. We hope they do indeed have energy for energy, and they give decent and reasonable response to demands that will be made by the energy community over the coming time.

I am aware that Alex Salmond pointed out to me he was on the previous Energy Committee that ended sometime in the 1990s, and it was not too long before they had an Energy Committee coming back again. We hope it is not for any crisis reasons that the press or whatever are calling for the reintroduction of an Energy Department at Westminster, but we are aware of the engagement we have had from the energy community and the concerns and the intricacies of those concerns. It is okay when the lights are on, and the job that the energy community do to ensure that happens is seldom appreciated.

Generally from the Committee, we would just like to say a big thank you to you all. We will have one more Committee meeting in private tomorrow, and a short, brief session after this, too, to discuss the shape of our report that is coming out.

Thank you, and thank you all for your time.