



Energy and Climate Change Committee

Oral evidence: [Low Carbon Network Infrastructure, HC 613](#)

Tuesday 2 February 2016

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Members present: **Glyn Davies (Chair)**, **Rushanara Ali**, **Antoinette Sandbach**, **Julian Sturdy**

Questions 166 - 193

Witnesses: **Simon Moore**, Policy Manager, Strategic Infrastructure, Citizens Advice, **Phil Jones**, Chief Executive Officer, Northern Powergrid, and **Professor Keith Bell**, Co-Director, UK Energy Research Centre, gave evidence.

Q166 Chair: For the purposes of the record, can the witnesses who have come to help us—thank you very much for coming—state their names and addresses and the organisations they represent?

Professor Bell: I am Keith Bell. I am from the University of Strathclyde, where I hold the ScottishPower Chair of Smart Grids, and I am here today representing the UK Energy Research Centre.

Phil Jones: Good morning. I am Phil Jones. I am the Chief Executive of Northern Powergrid, which is the power distributor in Yorkshire and north Lincolnshire in the north-east.

Simon Moore: I am Simon Moore. I am a Strategic Infrastructure Policy Manager at Citizens Advice.

Q167 Chair: Thank you very much and thank you for coming. What we want to do today is talk about the energy network infrastructure, and specifically the UK's need for bigger, smarter energy networks. What I want to do is ask a general question of the three of you to start. It will be one for each of you and then a bit of a general question at the end, or at least a question that all three of you might answer. That is the sort of group of questions that I want to ask. We are told that innovation is key to meeting network challenges, and the inquiry has read and heard high praise for the Low Carbon Networks Fund. We need to know what worked well with that because it has had high praise. What are your thoughts so far on the Low Carbon Networks Fund successors, the Network Innovation Allowance and the Network Innovation Competition? That is one for all three of you.

Phil Jones: I am happy to go first. Perhaps I will give a little bit of context first, if that is okay. In terms of the answer, I would roll all of those mechanisms together. They do make a difference if you are running a regulated business, but fundamentally they amount to the way that the regulatory body—in this case Ofgem—decided that money would be made available to the network, to the regulated companies, to do things and for giving scope, in this case low carbon networks. The things that I can say about the LCNF, which is the thing that we have finished, in the sense that it prevailed for five years, from 2010 to 2015—it has now been replaced by those other mechanisms you just described, but, as I say, they amount to the same thing—is that I think it has worked extremely well. That does not mean there aren't tremendous opportunities in the future for it to continue to change the way that things work. It was never going to be a very quick journey, but there is significant credit needed to go to those people at Ofgem—if you go back far enough—who could see the need for that and could see their way to putting a mechanism in place that would address the legitimate concerns that a regulator ought to have about those kind of things: should customers be paying for the things that ultimately will create benefits for private businesses? How do we make sure there is equitable sharing? For example, some of the mechanisms in there that limit the nature of the proposals; to make sure that we are bringing forward things that are going to address problems that are realistic and are existing now, or at least are about to exist in the near future; the way that they test the costs that we are putting into those things. It is all part and parcel of the regulatory regime. It is geared to do that, to look at what we spend and see whether it makes sense.

On that part of the equation, we have always expected Ofgem to be able to do its job but what it brought to bear that was different in this case, for example, was an obligation that is very different from most of the other ways we run business. We are obligated to make all of that open source, effectively. We have to put all the information and all of the things that we learn into the public domain; it is not our private property. The intellectual property that goes with it does not remain with us. So it navigated its way through all of those things and, as a consequence, set in train some quite significant changes in organisations like mine to learn how to address those kinds of projects. They are different from things that we do every other day. For example, they require a level of collaboration with other businesses that ordinarily we don't have to, need to, or want to get involved in. Then, at the other end of the spectrum, it requires us to be prepared to open that up so that everyone else can benefit from it, because we run the largest project awarded under that particular scheme in DPCR5. The roughly £30 million that we spent on it was for the good of customers in the country as a whole and it is not true that the customers of Yorkshire, the north-east and north Lincolnshire should be the people to benefit from that. We were effectively doing it on behalf of Great Britain.

The big benefit there has been that it allowed companies to access money to those counties. Our settlements did not include it. Bearing in mind what the rest of our business is based on, it is a very aggressive—rightly aggressive—pressure on how to do what we have done previously for less money. Broadly, that is the incentive. What that does not do is encourage you to try the kind of things that need to be tried in order to change the future. There has been a very mixed bag of projects, and I don't mean that in the sense of good and bad. There have been a variety of things challenged, things like our projects in Low Carbon London, which are the two bigger projects. We were much more focused on blending the technology and seeing what customers did with that, whereas there are a number of other projects that were much more technology trials of new pieces of kit and

how they work. Its big benefit is the body of knowledge that it has put at the disposal not just of the network companies, but of people like these gentlemen, who I am sure could say that they have had a chance to see it, and it puts the customers in a position of knowing what to expect from the DNO. All round, I think it is a massive positive, but it is early days in the 20 to 30 to 40-year transformation that we are talking about.

Q168 Chair: Do either of the other witnesses want to add to that?

Simon Moore: Just a little bit. I would echo a lot of what Phil has just said. One of the biggest successes of the LCNF is simply that it exists. It would have been very easy for Ofgem and the networks not to try particularly hard in this area and to settle for an easy life. That they have recognised that this is an area where there are big technological changes coming on stream that they are going to need to be able to respond to, and the potential to make savings that can filter through ultimately to their customers, is something that should be recognised. That is not to say there aren't a lot of challenges and areas potentially where the programme can be improved in the future, but I think it has done well for the first round of the programme.

Q169 Chair: You have talked about the problem with the dissemination of results before. Tell us a bit more about that problem and how you think it might be fixed?

Simon Moore: One of the issues that we have encountered, in trying to assess what has come out of the LCNF, is that both the types of data being collected and the quantities of data being collected are very inconsistent between the different projects. One of the results of that is that it is quite difficult to compare the impact of the different things that are being trialled, especially when it comes to different groups of consumers. There is only one project—the Energywise project—that has gone into real detail on its impact on particular groups of vulnerable consumers. Some of the other projects have collected fairly superficial data in that area and some have not collected any at all. It is that consumer impact end of the programmes that we feel has been a little neglected in comparison to collecting technical performance data and more engineering driven outcomes.

Q170 Chair: Professor Bell, I cut off before coming to you.

Professor Bell: No, that is all right. The points that Phil and Simon have made are very good, I would agree with a lot of that. It has definitely been a good thing. It is one of the rare occasions when independents and people inside the industry would agree that Ofgem have done a good thing. Normally we kind of throw bricks at them. But, yes, it is definitely a welcome thing. It hasn't been perfect, as has been implied. I think what Simon said about the nature of some of the research, how it has been conducted and how it has been disseminated, not all of it has been done in a scientifically robust way.

Thinking back to something that Phil said, to a large extent the network licensees have had to learn how to do this. Following privatisation their investment in R&D—which is effectively what we are talking about—collapsed to virtually nothing, certainly in the distribution side in the first 10 years post privatisation. The challenge that we face now is that it is a disastrous position, even if it might have been the right thing to do at the time in terms of reducing the cost and doing what they are supposed to do, everyday business, as Phil has implied. It is not a good position for future consumers or for decarbonisation. So

they have had to relearn how to do this kind of thing. As a glass half empty, half full way of looking at that: it has not been done perfectly, but they are doing things much better now and they are learning from it.

They need continued support in that and we need to continue moving down that road. The comments that sometimes come out from Ofgem—for example, that they believe the culture has already changed enough, and that these sorts of incentives are no longer required—I would judge to be an incorrect conclusion. There is still a further road to be travelled down, in terms of changing the culture of the network companies towards innovation. Also, the innovation schemes could be rearticulated so that they are not just about exploiting opportunities. It is also about understanding threats, and I think that the way the funding is made available does not always appreciate that.

In a sense, changing from large, conventional power stations to lots of renewables does present a threat to the operation of the system. It can be done, but there are engineering challenges to be addressed. We don't know if it is going to be very costly or very cheap. We don't always know how to do it. It is about understanding what these threats might be. Gas is used for insulation of electrical equipment. SF6 gas is enormously damaging in terms of its CO2 equivalent effect in terms of greenhouse gas emissions. There is always this possibility that it will be banned, so what happens if it is? This is not an opportunity; it is a threat. That is the thing I suggest should be modified, but the whole thing continued and, yes, to make these sorts of improvements about the way things are captured that my colleagues have mentioned.

Q171 Chair: I think you have probably half answered the specific question I would ask, which is this: whether the distribution energy networks are risk averse and that the R&D expertise has atrophied since privatisation? You would probably say that that is the position. What is the problem? Are DNOs the right organisations to drive it forward now?

Professor Bell: You cannot do it without the DNOs. The DNOs and the transmission licensees fundamentally have a responsibility towards the safe, reliable supply of electricity, so those are not things that you want them to play games with. Their position, with respect to investors, they have a certain kind of regard towards it. By and large I think they are seen as being safe, unspectacular investments. There are a lot of reasons why we cannot expect them to suddenly become great innovators and great risk takers. Having said that, I think the culture is changing slowly. Is it changing quickly enough towards being open to new ideas? That is the nature of the business, to a certain extent. The assets are there for 40, 50, 80 years. Things change relatively slowly, and the changes that we were expecting that a lot of the LCNF projects have addressed—more electric heating, electric vehicles, the utilisation of flexible demand to help balance variability of low-carbon generation—we have not seen those to the volumes that would really sharpen the incentives on them. But you need to be ready to know how to do it when it starts happening.

Q172 Chair: Why do you think only 60% of the LCNF funding has been used up?

Professor Bell: That is a good question. It would be interesting to get Phil's response to that. My sense, from talking to a few people inside the industry, is that—as Simon implied—a lot of the projects have been kind of kit driven. There are a lot of engineers, technicians and fitters in there. That is what they know. That is what they understand.

They hear about new bits of kit and wonder how they work and what they are like, and how you can install them safely and correctly. That is all fair enough. There is a bit of a sense that they have tried the things that were there and looked exciting—in the sweet shop they have reached out for the first things that are there. The next step is, to a large extent, back to first principles, back to the concepts, back to how you operate the system as a whole and how you interact with consumers, as Simon said. That bit is particularly challenging.

Q173 Julian Sturdy: Are you basically saying that a lot of the low-hanging fruit has already been picked on this and that it is getting harder and harder?

Professor Bell: I would not necessarily say it is getting harder and harder. To some extent the value of a lot of these innovations has not been shown yet, because we don't yet have the extent of weather-dependent renewables on the system that we should get to. When we do, we really need these solutions. We are going to need electric vehicles for the decarbonisation of the whole energy system and we are going to need to know how to do it. A lot of the projects have been looking ahead to that, but are they going to push forward with it? Electric vehicles haven't grown to the same extent yet, but hopefully they are ready with some of the knowledge.

I think the next steps, especially the distribution networks—making more efficient use of the networks—are partly about the culture, the way of looking at things and the educational background of some of the people coming in. In their submission to this Committee, Northern Powergrid said something about this; about graduate recruitment and training. It is almost as if they have got as far as they can get with the culture as it is at the moment, so it is a bit of a push from the incentive and a bit of a pull from the way the energy system is.

We are in the position at the moment where we are expecting change to accelerate. You cannot justify, to any great extent, a lot of these technologies before all this change starts happening. For example, batteries: a lot of the projects have put batteries on the system. They are not cost-effective. They are enormously expensive. They don't really give any benefits in the short term. But this part of it is about driving the technology by creating a market globally. There is a push for the technologies to be improved, a learning on the technology to bring the price down, but also, as the energy system as a whole changes, the value of those things goes up, so you have a crossover where it does finally become cost-effective. I think we are in that transition at the moment.

Phil Jones: I don't disagree with anything Keith has said. I might characterise it slightly differently. I don't think it is a low-hanging fruit scenario. As you say, around £300 million to £500 million spent—60%. Does that represent a problem? Is it that there are all these recalcitrant companies who just could not be bothered? I really don't think so. I remember saying to Ofgem at the time, "Wow that is a lot of money, £500 million". I have a research background, if I go back far enough. You can do a lot of work for that amount of money. I remember saying at the time, "Success does not necessarily equate to spending it all. It may not be the right use of customers' money". I am not saying that there could not have been another £50 million, £60 million or £100 million for the project. We had one particular project that I felt quite sad about at the time that did not make it through. I think it goes to one of the points that Simon made, and it is one of our positions.

We will be answering Ofgem's consultation this week on what should happen, going forward, in this whole area.

The willingness to get into those areas that don't neatly fit inside the existing industry lines is where there would have been more spent. We would have had a project of around about half the size of the big one that we did, which was specifically looking at a reverse auction process for demand-side response. One of the problems Ofgem had with it—I am not here to throw bricks; it is just a fact—was that they could not easily see where the benefits would sit in the distribution pot. You might say that was a bit of risk aversion on the part of the regulator, but I would not want to accuse them of that. They are working within the strategy remit, which is to protect the interests of distribution customers. You have somebody with a legal duty looking at a proposal and they are saying, “Can I tell these customers that the benefits of this project will accrue to them?” We are sitting there saying, “The whole point of this project is we don't know where the benefits will accrue. It does accrue to the energy customer. I cannot guarantee it is going to accrue on the supply side, the generation side or the distribution side. It may delay some distribution reinforcement. It may delay the cost of building new generation. It might just bring the consumption down. We don't know”. At that point, a regulator is generally geared by their DNA to say, “I am not sure I am convinced by this. I don't think I can say yes”.

There were good, big projects that were bid for. We bid for at least two of them. One that Ofgem said they weren't sure the benefits were there for customers, we took it to the Technology Strategy Board—I think it is now called Innovate UK—who rated it as one of the best projects they have ever seen, and it is proceeding now with funding from that body. So there was a question mark about releasing the funding into the areas of the energy customer versus the distribution customer. That was one of our frustrations and one of the things we would like to see changed, so—dare I say it, as an engineer?—fewer technology projects, or at least more spend on the whole system projects that look at the effect of customer behaviour.

I am not sure that the project we ran in the first round, which was the biggest one awarded, would have got through the bidding rounds later in the process in years three, four and five, because the focus got increasingly tight with a regulatory mindset around, “This has to work for distribution customers”. Our project, the Customer-Led Network Revolution, was mainly about benefits to customers who might not be on the distribution side. Our position is a bit more relaxed about that; it is, “Well, who cares? At the end of the day we are trying to reinvent the industry.” But there were some quite tight guidelines there that we would prefer to see relaxed.

Q174 Chair: Northern Powergrid's written evidence claims that DNOs are accessing alternative funding sources to prepare for the eventual withdrawal of funding. Could you say a little bit about this? We are going to have to speed up a little bit. This is a general setting out of the whole session, so I have let my questions run on a bit, but we are going to have to move on fairly quickly now.

Phil Jones: Understood. I will be very quick for you, if I may. Ofgem have been clear that they do have this institutional question mark—I will not say reluctance—around the use of this kind of money for distribution customers. Right from the outset of any form of innovation funding they have always said, “This might not be here forever” and they continue—rightly, in my view—to say that. They ought to always be questioning whether

they are going to continue to do it. Our evidence refers to the fact that we know Ofgem are not saying that this innovation funding is there forever, so as a matter of strategic choice we have taken some of our projects to less lucrative—in other words, we have to fund more of a percentage of the project areas. We would rather see Ofgem continue with it, but we want to be ready if the day comes when that is removed. That is what we are talking about.

Q175 Chair: If DECC or Ofgem could do one thing to stimulate innovation in energy networks, what would that be? It is a question to all three witnesses.

Phil Jones: I would say get them to be willing to concentrate on system-wide innovation, rather than this having to be a distribution project for a distribution customer. I would broaden the scope.

Simon Moore: My suggestion maybe follows on from that a little bit. One of the things that has been quite rigid in the first round of the LCNF, which could potentially be more open, is to allow other non-networks to leave the bidding process for funds of money. It has been very network driven, even in collaboration with others so far. There are many ideas out there, which are not held within networks at the moment, which could have quite a strong bearing on the cost of networks over time.

Professor Bell: I would agree with both of the comments that have been made there. As regards the technology, finally the network companies have to have some kind of safety and reliability obligations, but there are physical facilities that are safe environments. There is the Power Networks Demonstration Centre up in Scotland that is open to vendors of equipment to go and test their equipment at a distribution scale. That is very useful, but in terms of the consumer engagement I think Simon is right; there are all sorts of trials and experiments that could go on, especially to test a lot of these whole-system regulatory and market frameworks. I think that is where there are major opportunities—let's put it like that—to move things forward and articulate the interfaces between these different entities that Phil alluded to.

Chair: Thank you very much. Can we move on to smart meters now?

Q176 Rushanara Ali: Thank you very much. DECC estimate that smart meter roll-outs will bring about £1 billion-worth of benefits to networks. Can you say more about what those benefits would be and whether the £1 billion sounds plausible? Perhaps Professor Bell could start.

Professor Bell: I don't count myself as an expert on smart meters; I just preface anything I will say with that. The impact assessment that DECC have published does go into a number of categories of benefits, as they see it. Consumer benefits may be one of the larger parts. This is from their publication about this time last year. They then also put supplier benefits as an even bigger number, so reducing the cost of going out and reading the meter and that kind of aggravation I suppose is a large part of that. They also pointed to significant network and system benefits and to some carbon-related benefits. I am not sure exactly how they accounted for that, but in principle that is correct.

As far as DECC's analysis goes, the consumer benefits seem to have come largely from reduction of consumption. One assumes that that is due to having an in-house display and

having a greater motivation to be more careful with your use of energy. Without having looked in detail at how they did the analysis, I am not sure about whether the benefits will be quite as big as they suggest, and I know other people who—

Q177 Rushanara Ali: Sorry, on consumers or networks?

Professor Bell: On energy reduction, the extent of that. There were some trials that Ofgem and DECC commissioned a couple of years ago that were based simply on in-house displays. To what extent that succeeded in reducing consumption—I think moderate reductions at best. Some of the results from CLNR, for example, suggested moderate at best.

There can be significant benefits from this: improving the ability of consumers to switch supplier, improving the trust that they have in the billing, and maybe reducing the cost of billing in the longer term. Those benefits are significant. Automated metering may be a better way to refer to it than smart metering, because they are not very smart. Where we have seen that in other countries, that is where the benefits have come through, and they have seen those benefits.

In the future system, when we have a much more variable residual demand—in other words, the difference between weather-dependent renewables and the underlying demand—the ability to manage that by shifting the timing of demand could be very significant. Genuinely smart control of energy, regulation of energy use in homes, commercial and industrial properties could be very, very effective in that.

Q178 Rushanara Ali: Mr Jones, did you want to add anything?

Phil Jones: Certainly. The first thing we can say about the number is that it will be wrong. All numbers like that turn out to be, so we don't know how right it will be or how wrong it will be. It is fair to say—and I think we are free to say those kinds of things because we were independent of it—it was a relatively bullish assessment and it was done by people whose task was to say, “Look, can we justify this?” When you make those kinds of assessments you have judgments that you make along the way. I would say some of those judgments appear to us to be optimistic. It does not mean they are wrong. Also, crucially, it does not mean that they have picked up every other benefit that will occur. I think the bigger benefits that we will see eventually we don't yet know for sure where they are, and they are notoriously difficult to pin down in a benefits case.

Let me give you a couple of examples. It was quite sketchy in the sense that, rightly and properly, for instance, it will shorten the duration of a power cut. The reason it will do that is we will get an automatic notification. We don't have to wait for people to telephone us. You can put an economic value on it. It does not mean that the bill goes down any; it just means that customers ascribe a value to that. We could all have our own view about how much we would pay to save a few minutes on a power cut, but a number has been attached to it. It is a very soft number; let's just put it that way. What DECC then did incorrectly—I think ambiguously—was assume that, because that notification period was shortened, so the overall period was reduced, that would reduce the cost of fixing the fault. Well, it won't change the cost of digging the hole and the joins in the cable at all. There were some straightforward assumption errors in there, which I understand have been sorted out in a review of that benefits case right now. People from my company and others, through the

Energy Networks Association, are working with DECC to review that and iron out some of those issues.

But let me be quick to say that, for me, I do not believe in a world where customers do not know what they are using in a commodity that is essential to their life and expensive. I think this makes sense anyway. It is only now, through things like the Customer-Led Network Revolution project, where we had a significant proportion, thousands of smart meter customers, that we could take a look at when people use energy. Don't forget that we don't know; we have always just had these spinning meters and a guess about when it peaked.

Q179 Rushanara Ali: If you were to put an estimate of your own, bearing in mind your critique, what would that be? Also, can you say something about the Consumer-Led Network Revolution?

Phil Jones: Yes, I can. We think the benefits are quite modest. In our business plan we are talking in the £20 million range, and in the £100 million range for the eight-year period that follows the period we are in now. We think we are in very shallow water in terms of those benefits. They are only just starting to roll it out. That has been delayed. Our view is that, in our part of the world, over the next 15 years there is maybe £10 million a year. It is of that order. Those are the benefits accruing to customers from our perspective. That does not take account of the things that Keith talked about on the supply side. It is our view of the impact on the network benefits of it.

The reason we say that is that we looked at a sample, and you highlighted the project that we learnt from. British Gas were a partner at the time. We chose them because they were the supplier who had gone out and fitted some of these, so we could get a real population of customers who had these meters. It allowed us to see exactly when customers were taking electricity. One of the key findings—it is not particularly spectacular when you say it, but it is hugely significant—is what we call in our industry the After Diversity Maximum Demand, which means everybody has a max demand in their house, but we should diversify that and say, “Well, the thing is everybody doesn't do it at the same time”. For our planning purposes, we assume a value that is quite low. It is less than 1 kilowatt. Switching on the kettle is not the maximum demand of a given house but, once you have diversified it, what we found is that the diversity in people's behaviours is much wider than was ever assumed. That is about half of what was being assumed when networks were built.

One of the things the project has told us is that the capacity, for example, for solar panels on people's roofs, is much higher on the networks than people ever thought. In 2006 there was a report that said that if 10% to 20% of customers had solar cells on their roofs, our networks would be full at low voltage. We conducted a study on a particular part of our network, in south Yorkshire—but be careful; one example is very nice but it is in isolation—and in that network in that part of the world, with the kind of climatic conditions that exist and so on, 137% of the customers, or 132% I think, could have had a solar cell. In other words, everyone could have had one and a third of them could have had another on their garage or something. There was so much capacity for several reasons: the houses face in different directions so they don't peak at the same time. People's diversity is much higher than we ever thought.

All of those planning assumptions then flow into the way that we run our network, and it is those kinds of things that drive benefits. We will reinforce less quickly. We will spend less money on stiffening the network up at times like that. Really, it is knowledge and insight. If I could give you one takeaway for this whole process as we approach low-carbon networks, it is the management of uncertainty. That is best managed by removing it and understanding it, and the smart meter process will do that for networks in a big way.

Q180 Rushanara Ali: Thank you. Northern Powergrid's written evidence notes the youngest and oldest consumers struggle to shift their load. Why do you think that is?

Phil Jones: I have my view. I will be careful to say I offer this respectfully. But the social scientist that worked with us pointed us to things like young families needing to feed the kids at a certain time and to do the laundry at a certain time; having less choice about those kinds of things. More elderly people, say, using heating load, they don't have those kinds of choices; they don't have that kind of diversity in life. It tended to be the more typical adult families, in those kinds of things, who could say, "Well, I will wait and stick it on in the middle of the night."

Q181 Rushanara Ali: What are your suggestions on how that could be mitigated, because it seems they will be at a disadvantage?

Phil Jones: They would under a time-of-use tariff scenario. By the way, what we did find was that people are quite willing to use time-of-use. People understand it quite well. It is a concept in life that, generally speaking, people understand. That is certainly a significant question as to how the most vulnerable in our society can still access those benefits when, in actual fact, they may not be in a position to contribute on that basis. Our view is that, generally speaking—I am not trying to kick it into the long grass or pass it someone else—those are issues of social policy rather than issues to be fixed through the network tariff. I think you are generally better making sure that we drive an efficient cost of delivery.

Q182 Rushanara Ali: Should there be a subsidy for them to overcome it, for instance, and what would it cost?

Phil Jones: Bear in mind that, network only, the whole bill is £100 a year; the whole cost. We may be talking about a slightly larger number, but we are not talking about thousands of pounds a year; we are talking about £100 for the whole year. That could be added, for example, to the winter fuel allowance, but personally I am more in favour of this worthy body, Parliament, deciding what level of support society is going to give to certain people and doing it through the channels that care for people who need support in society. Messing around with the bills does not have a great track record. Trying to direct public money through energy bills does not work easily.

Q183 Rushanara Ali: Mr Moore, do you want to add to that point?

Simon Moore: We share a lot of those concerns, particularly with regard to how time-of-use tariffs can be brought in in a way that avoids exactly those effects. I think the way that some of the schemes that have been trialled during the LCNF essentially offered a "you will be in whichever case is least bad", so if you are testing a time-of-use tariff and it puts you in a worse position than you would have been, you will be effectively reverted to the original. That is probably not something that is sustainable once this stuff is being rolled

out at full nation scale, so the question arises: how can you protect those groups instead? How can you ensure that they are not also covering the costs of networks, for example, where other consumers are moving to greater use of self-generated solar power and things like that and reducing the amount they contribute to network charges as a result? There are a few ways of going about that. I don't know that we are in a position to say definitively this is the one—

Q184 Rushanara Ali: Can you say what they are, in bullet points and very quickly?

Simon Moore: Yes, sure. One is to do exactly as Phil suggested and provide some kind of top-up or cash contribution. You can change the way that network costs are recovered from being the total consumption to something that is based more on the capacity that your connection is at, such that people with solar connections and so on would still be covering costs and would not escape paying that way. There are also different tariff structures that you might look at in future that don't have particular variations over time of use, which might be more suitable for those groups of society.

Q185 Rushanara Ali: Thank you. Professor Bell, in your organisation's written evidence there was a suggestion that DNOs rather than suppliers should be responsible for smart meters. Is that your position, and what would be the pros and cons of that bridge?

Professor Bell: Back to what I said earlier, we are better off seeing them as automated metering infrastructure. What is the primary job? It is to measure, securely and accurately, the power that is being consumed at a particular moment. You sample that or you accumulate it over a half-hour period in the current spec, rather than over a year or every quarter as has been the case to date. The smartness of it could be opened up much more to the market. There are various facilities that are available now through a phone, or whatever, to help manage energy and see what you are doing.

That kind of infrastructure of very simple, secure, remote metering and you should not have to do it very often. One of the problems with the suppliers, I suppose, is that they need to get their money back for the investment that they have put into this kit. You have a complication then if the customer changes supplier to transfer the ownership of this kit. I think there could be more of a focus on the basic, core functionality and then the other stuff that could be much more open to innovation.

Sorry, while I have the microphone, I have a couple of things to add to what we were talking about just now. Phil made a good point about heat in relation to older consumers, customers who need this heat all day long. That opens up a bigger question about the whole energy system. We have to be thinking about this much more broadly. The fragmented nature of the industry makes that very difficult to do. Some of the technologies promise to be quite efficient in delivering heat. Heat pumps—if they are installed correctly, and you cannot install them everywhere—as I understand it, don't offer the flexibility that is sometimes assumed, so there are two sides to that in terms of vulnerable customers. If they have these sorts of facilities in future, their costs should be well managed. On the other hand, the opportunity for anyone with that kind of technology to contribute to the flexibility is also limited. It is certainly true about families and their lack of flexibility: they need to get the washing done, get it through, get the washing dry, and so on.

On the other hand, some of the energy demand reduction studies that happened a couple of years ago indicated that some of the people who are going to benefit most by managing their energy consumption have the stronger incentive to do so, and there was some evidence that suggested that they did. I think a further point on smart meters is that, once they go out, there should no longer be any excuse for those on prepayment to be charged more. In my view, that is a kind of social injustice that should be got rid of as quickly as possible.

Phil Jones: I think it would be a disaster to change horses now. Although it was my very firmly held view, when the smart metering programme was being conceived seven or eight years ago, that it would have made a lot of sense for the distributors to do it, we are way too far down the line now to start saying, “Let’s stop and change horses.” Please write that down. I think it would be a disaster.

Rushanara Ali: Point noted. Thank you.

Q186 Tom Blenkinsop: How big a problem are ageing assets on the distribution network?

Phil Jones: I don’t regard them as a problem, because I love my job and I love what we do. I think they have done superbly well—they have had careers longer than most of us will manage. Slightly less facetiously, I think it is a very well managed situation. On investment in networks, our company is a good example. We are over the peak of investment now, and that peak for us was from 2005 through to 2015, so our average investment is still chunky—£300 million a year in our part of the world—but that is coming off the peak that we saw a few years ago.

The reality is that one of the great successes of the regulated network sector is that it has concentrated minds. Back in 2000, when the transfer schemes were executed through the Utilities Act, it created legal entities such as my own, with directors who only worry about those kinds of things. We are not distracted by supplier billing schemes and so on. That is our job. That was a very, very big day, and from 2000 to 2005—the early part of the “noughties”, as we say—people were really questioning, “These assets were built in the 1940s and 1950s. They were meant to last 40, 50 years. It is now 50, 60 years. Let’s get after them”. There has been a huge step of investment.

The good news about this—I always like to say to people and I hope you don’t think it is patronising—is that the big thing about peaks is the trough either side of them. That is always a fact. These assets are very long-lived, so they don’t all die on their 50th or 55th birthday. It is a design parameter. It becomes an example of innovation where we learnt skills about diagnostic techniques that didn’t exist 15 or 20 years ago, to say, “Look, this one is going to die early”. It is just like people, some of them say, “Well, this has aged very well. We can leave this a little longer”. It did need investment to arise, and you will see in all of the companies. Our own is just an example, as we saw that investment rise by 20%, 30% over the period I talked about. It is coming off slightly now, so I don’t think it is a problem. I think it has been very well managed.

Simon Moore: Just to add to that. One of the things that the new RIIO settlement has done quite well is to get companies to focus a bit more on the trade-offs between capital expenditure, building kit and managing it better. One of the ways that that plays out is through how and when they have to deal with the ageing stuff on their system. Ultimately, the benefits of that are hopefully that they spend less money and that their customers see lower bills as a result.

Q187 Tom Blenkinsop: But is that the case even with ageing infrastructure with, say, a transmission capacity and transmission costs with on-stream new technologies, namely renewables? Has that added fundamentally extra costs? Have you seen any problems with that in terms of transmission functions?

Phil Jones: We don't operate transmission, but we do get up to what in Scotland would be regarded as transmission voltage. But the straight answer is no, not really. That is not just because it is old. As I say, the design philosophy of our forefathers was, for very good reason—because all the power stations were a big, central despatched fleet—basically a fit and forget mentality. The networks were designed for a certain set of capacities and demand and so on, but lies at maximum capacity, to just be able to be put in and then left. It would deal with every eventuality. There was plenty of it.

As time moved on, as we discussed this morning, we have seen greater diversity—people don't all finish work at the same time, and they don't all have the same social patterns—so the actual peak, per se, has flattened. Now, overall, demand has grown, but we have more electricity in our lives so that has pushed it up, but the bottom line is that we have ended up being well served by some investments that were made in the middle part of the last century. I don't think there has been a blockage in the context of low-carbon infrastructure, and it is quite nicely timed that they have come to the end of their useful life in this couple of decades when we do need to put something technologically different in. The fundamentals of copper and transformers and so on are still the same; it is the control infrastructure wrapped around it that is light years different from what was conceived of at the time.

Professor Bell: I think the distribution networks would have been designed as “fit and forget”, but the transmission network never has been, and it was never intended to. It is not the cost-optimal way of doing it. In fact, one of the things that emerges—and it is beginning to be recognised as a result of some of the innovation projects by the DNOs—is that, for the future, “fit and forget” is not a cost-effective way of designing the distribution networks either. A more active management of monitoring and understanding what is going on in the network and adjusting the output of generation where necessary to stay within the limits is, in general, the right way of doing it. You have to find the right balancing point between how much you curtail generation and how much you invest in network capacity.

With respect to asset replacement, there are two pressures. One is the nervousness, as Phil has alluded to, that the end of design life has been reached: what is going to happen, what condition are these things in? A lot of work has been done to understand the condition much better, and it turns out that in many cases you could leave it longer than you thought. On the other hand, if you leave it too late, then your spare network capacity to be able to remove a bit of the system, to replace it while still serving the needs of everything else, becomes much more squeezed and that can be seen already on the transmission network.

We have seen this up in Scotland, where for a few years we have had limitations in the export of power from Scotland into England. Typically, one would take these construction outages and maintenance outages in the summer when the demand is lower; much more of them are happening in the winter, possibly at significant cost in terms of constraining the generation. We don't always have access to the cheapest generation. When you have finished the outages and those constraints go away, you have to stay at least a little bit ahead of the curve. It is not a trivial thing to do but, as Phil said, I think the impression is that the industry is more or less managing it as we go along, but I wouldn't say we are totally out of the woods yet.

Phil Jones: I think “more or less” means very expertly.

Q188 Tom Blenkinsop: You have touched on my next question in relation to the price control for electricity DNOs. Does ED1 allocate sufficient funds to replace and upgrade the ageing assets?

Phil Jones: Yes. There has not been a price control yet. Obviously we are in one now and you have to wait for the results. You have to be honest, and Ofgem would say, were they here, that companies have generally spent less than they were allowed. That is the process of revelation. You go into a situation, you have been asked—it used to be five years—how much money to run this network? Then it is a locked box and you have to put up with it. There is always a certain amount of uncertainty in there, and the incentives you can give for us to go and find ways to elongate their lives, as Simon explained, companies have always delivered within that amount. Reliability is 30% better in the industry, safety is better, all of the performance metrics are better and the expenditure levels are lower than was previously assumed they would have to be. Therefore, the bills are low for customers. So far so very good, I think. Looking forward to RIIO-ED1, generally speaking companies—yes, okay, we all get squeezed around the time of a price control—would always like a bit more. That is the nature of a back and forth like that, but the reality is that if you step back from it and say, “Look, in the scheme of things what are these investment allowances like relative to what people have been spending?”, you see that they are quite healthy. I think companies have every reason to say, “Okay, we are going to go and deliver to that now.”

Professor Bell: On the other hand, I suppose Citizens Advice's submission suggested that there is too much money being spent.

Simon Moore: One of the questions—not just in this area, but in a lot of the areas that are incentivised under RIIO—is whether the benchmark setting has been calibrated to the most efficient manner. In some instances—and this may be one of them—it looks like it is quite easy for the companies to meet the targets where they are being incentivised. I think the forecast is that everybody will to some extent.

Phil Jones: In relation to availability?

Simon Moore: In relation to—

Professor Bell: Expenditure. So at the end of the price control period you have always spent less than you said you were going to spend. Is that what you are suggesting?

Simon Moore: Yes, by quite a considerable amount. Returns over the past few years have been well above the mark that Ofgem suggests is appropriate for efficiently run companies and across the board is in the band described as extraordinary performance. These guys have done quite well out of the settlement so far and I think there is room to squeeze them a bit harder in this and potentially upcoming price control settlements.

Phil Jones: He will always say that and he should. No, he should. We will always say something perhaps a little different from that, and that is the nature of the back and forth. The question asked was: how do we feel about the investment allowances that are out there? We had disagreements with Ofgem. We appealed that price control and went and got a piece of it overturned, but you never heard us saying, “The lights will go out. We can’t run our network for this”. We took a view that some of the assessments were not accurate for the things that we had been asked to achieve. That is the nature of the process, and the customers are well served by that tension that goes on at those times. But to the fundamental question: is there enough money in the system for companies to deliver? If that were true, everyone should appeal the price control in a very different way. We didn’t appeal that aspect of our decision; we were happy to accept it. We thought it was a little tough, but we were happy to accept it.

Q189 Tom Blenkinsop: In relation to the written evidence from Ofgem, they estimate 11 gigawatts of distributed energy on the grid. Have you seen that? Did you produce evidence in the case?

Phil Jones: Until fairly recently, we were one of the most active parts of the country. That has changed a little. You only have to go up and down the country to see the amount of solar farms that exist in the midlands and south of there, so that has changed quite significantly recently. Yes, we have seen that but, again, it is patchy, certainly in our network. I know the guys in WPD and UKPN would say that they have seen almost a carpeting of parts of the network with solar farms. But for us it has been patchy. There are parts of the network that are “getting full or are full”. The east of our region is a good example of that, where there has been a lot of larger distributed generation connected to the network in the Humber area. But it is still a fact that around two thirds of our high-voltage feeders have capacity on them. It is not all full; most of it has room on it. From our point of view, the more distributed, the better. The more that is spread across the network, the more scope there is to cope with the load. Clearly there are always going to be pockets and points. The question is—

Chair: Can I just intervene for a second? We are going to have to move to as near as we can get to one word answers. We have a timetable. It is incredibly interesting and we have learnt a huge amount, but we probably now need to move to some fairly short responses to questions.

Phil Jones: There is plenty of money in that price control.

Q190 Tom Blenkinsop: Very good. Many written submissions to the inquiry have also called for Ofgem to allow networks to invest ahead of need. Do you agree?

Phil Jones: Not with those suggestions, no. It is not true that companies do not invest ahead of need, except when we are repairing a fault. We are always investing ahead of need; the question is by how far and on what basis. If by investment ahead of need people

mean, “Build it and they will come”, I am against it generally speaking. If it means making a balanced decision about a network that probably will need some reinforcement in the foreseeable future, that is exactly what we do now. Where investment ahead of need basically amounts to business customers, largely generators, saying, “Please will the great mass of customers build an energy network and pay for it so that we can connect our generator for free”, I am against it. I think you should be too.

Professor Bell: There is definitely a need within the distribution networks—perhaps less so in Phil’s patch than down south—to have a better recognition of the options available. In respect of the innovation, where we started off talking, there is this glass half full or glass half empty perspective on it. The half empty perspective is, “Why has it taken this to try to work some of these things out?” Some of these things look kind of obvious, or the results are what you would expect to them to be if you thought about it. But the half full approach is, “Well, at least they are doing it, checking it, getting the information and getting this into the business processes”. An example of that might be how to accommodate solar PV, which gives rise to voltage rise issues: how can you manage voltages on the network? Well, by managing voltages rather than putting everything in a fixed power factor control. If you have it at 11 KV and above it is obvious that you can do things better that way. So, in these sorts of things I think practices need to be improving. The good news is that they seem to be improving.

That then reduces the need of this big lumped investment in lots of network capacity, copper in the ground, aluminium in the sky, if you are making more intelligent use of the infrastructure. The things go together. Strategic anticipatory investment has been a debate. The debate seems to have cooled off a little bit, largely because of UK Government policy. There is a lot of nervousness and uncertainty in investment in low-carbon generation. I get the impression that the investment community are waiting to see what happens; they are not quite sure whether to commit. These debates go on in other countries as well. In the US there is a huge debate about—they have a more severe lack of network capacity than we have here—whether to unlock a logjam toward decarbonisation. There is a lot of debate about investment in networks to facilitate the generation rather than following.

Chair: We have a couple more groups of questions, but we are going to have to be very brief with these. Identifying the key points you want to tell us is what we want you to do now. Rushanara is dealing with the first group and then I will wind up.

Q191 Rushanara Ali: DECC recently expressed support for upstream technologies. Can you say what that means and what would count as upstream technologies?

Phil Jones: I am not completely familiar with the thing that you are referring to. By it I would mean the things that we don’t necessarily control. I think it is the kind of thing Simon was talking about earlier, around the innovation arrangements whereby people who are not necessarily the traditional distributors could get involved. I think that is what they mean. Storage would be a good example of that. If that was cheap enough people would put that in place of a network, so you would not necessarily build the copper solution. I will leave it at that because I don’t know exactly the document you are referring to.

Professor Bell: I am not familiar with the document you are referring to either, upstream technology. I have had some discussions with Innovate UK or with network companies about the sorts of electrical energy technologies that are required. There is a fair amount of

investment that goes in through, for example, the research councils. As I understand it, that is under review. I think it would be a mistake to get rid of that because there are all sorts of ways in which we should be working to meet the classic—it has become a bit of a cliché—trilemma. But maybe it is a quadrilemma when you bring into it social acceptability as well. So make the best out of the infrastructure: flexibility of demand; the different ways of accessing stored energy very, very quickly to manage the variability and faults on the network; and monitoring to understand what the limits really are. All of these things are under development and need further development.

Q192 Rushanara Ali: Thank you. Mr Moore, Citizens Advice warned in its evidence of unanticipated consequences of frequency and voltage control. Can you expand on this and how you think this could be prevented?

Simon Moore: A little. The concerns we had about voltage reduction trials in particular—there were two aspects—were: first, were customers simply aware that this was something that was happening; and secondly, was there much data being collected on what effect, if any, it was having on people’s appliances in their homes, and whether it would reduce their durability? It was one of those situations where there simply were no data, and we were encouraging the companies who were looking into that kind of thing to try to collect data on that.

Professor Bell: What you may have in mind is one of the innovation projects that Electricity North West have been leading, the CLASS project, which proposed, yes, that you can reduce voltages to give a reduction in power consumption, which helps to manage the variability of the total balance of generation and demand. That is a facility that, to date, has been there as an emergency measure for the system operator, National Grid. It is something that should have been researched some years ago to see how big it really is. There were some assumptions in the 1980s that are wrong now because the nature of electrical loads has changed. Whether it should be offered as an everyday service, rather than an emergency service, is something that I think should be debated.

Simon is right to raise questions about the quality of evidence. I think there are some researchers involved in that CLASS project who are looking at it. This is one of these things where multi-disciplinary research is important. It is not just about the consumer perceptions, it also about the nature of the technologies: how low can the voltage go before it stops working and what tolerances there are. There is also a little bit of work, I think, investigating that kind of question that some of the universities are involved in under a heading called HubNet. In fact, I think there is a workshop on that in a couple of weeks’ time to get a few different people in there to see what that seems to be meaning.

Simon is right to raise the concerns. What I have heard so far is that it is not a particularly serious concern. It does not seem to be causing a big problem, but the strategy—how much is every day and how much is emergency—should be considered.

Q193 Chair: I have one question that I want to ask. Although I want short answers, it is perhaps a longer question; it avoids having a whole pile of questions if I just ask one. With regard to the role of distribution system operators’ evidence and the move from the distribution network organisations, you could argue that giving National Grid more data is the best way forward, and it is the advantages and disadvantages of that that I am interested in. But how does a DNO become a DSO? Would it happen naturally over time as the smart grid

technologies develop, or does it require specific actions from DECC and Ofgem to do that? What do DNOs need from DECC and Ofgem to become DSOs? There are a group of questions in there but they are all related to each other.

Phil Jones: Let me say what it is first and then I will talk about how you would get there. We don't know for sure. That is the first thing to say. It is a journey, but the concept that has been described would mean that at a more local level, if you took it to its natural conclusion, the distribution companies like our own would have obligations to make sure that supply and demand are in balance in our local regions as opposed to just, as you say, allowing data to flow to National Grid and having them do it on a national basis. The idea is that, with a greater degree of local control, you would be able to cope with a greater degree of diversity and greater swings. A lot of that is starting to happen now.

It can happen naturally to a degree, with some of the things Keith has already talked about. New pieces of equipment on a network would start to contribute to that almost automatically and nothing else would need to be done. But there would come a point where if the obligation is going to shift from National Grid, where it very clearly rests right now, on to, for example, my own company for that part of the world, then yes, there would have to be some changes to licences and legislation presumably. Certainly our licence obligation would have to change, and the codes that govern the way the industry works would then have to change and adapt to suit it. There is some quite dry, regulatory work to do eventually. That is not stopping anybody right at this moment in time from doing anything, but it is a natural evolution that would put the distributors—we are in favour of this, by the way—in a position of being more engaged on a real-time basis with the people that are using our network to say, “There is a voltage rise in this part of Middlesbrough. We are going to call on some customers locally to deal with it.” And actually that issue never reaches National Grid because it is taken care of on our network locally. At the moment we allow that to happen and Grid would deal with it if it manifested as a problem at their overall level. Greater diversity means a greater level of control nearer the interface.

Professor Bell: I would say, in a nutshell, that it is no longer about distribution being “fit and forget”; it is about actively managing their networks. There is scope for some new kinds of incentives to encourage that. That might involve a budget that they spend and they get some rewards if they do it well or get some penalties if they do it badly. There is a key relationship that Phil has alluded to with the transmission system operator. As you said, Mr Chairman, it could be that National Grid have visibility of everything and control everything if they have the information. That is a way that it could be done.

The DNOs might still be responsible for looking after the assets, so it is a relationship analogous to National Grid for the whole of GB but you have Scottish transmission owners. You could do it that way. The alternative is to use the knowledge the DNOs have about their own local patches, about how it works and what the conditions are. Then the key is to define the relationship at the boundary, at the interface. I don't think it is just about self-balancing. It is about staying within some forecast limits and offering a service upstream. Finally, the whole system has to be balanced so it could be, for example, that every half an hour or every five minutes, whatever period it is, there is a projection of what the net transfer will be between distribution and transmission. There also has to be a forecast about the variability of that. Then if, for a system perspective, they need to

balance out that change, another thing that would be quoted is how much it can go up or how much it could go down. It would then be up to the DSO to enable that, to facilitate it within their own patch, to control things to be up or down, looking after the thermal limits and the voltage limits within their own patch.

In this model, where the key is defining the interfaces, the uncertainties and the transfer of information on a periodic basis could be made to work and, as Phil suggests, yes, some regulatory changes to achieve that. I think it would be useful to have some incentives to encourage the right kind of behaviour from a future DSO. To get there is also a cultural shift, as we have alluded to already.

Simon Moore: I don't think there is a hard dividing line between DNO and DSO concepts. The DSO concepts entail some of the things that DNOs are doing to a small extent already. In principle, the idea that DSOs would be more efficient seems credible and we are spending about £1 billion a year to balance the electricity system at the moment, so the prize out there is reasonably substantial if we can get better efficiencies as a result of this.

One of the potential risks that this model could entail is that you are potentially bringing regulated monopoly networks into areas that, up until now, have been market activities, DSR, potentially storage, potentially even power supply, and I guess there are risks inherent with having a company that has a monopoly basis getting involved in some of those sectors where others would not have those same benefits. That is something that would need to be thought about more carefully before we can say for certain this is the way forward.

Professor Bell: That is one of the issues you find with electricity as a commodity fundamentally. Because it is so expensive to store electrical energy, to convert it to something and then be able to convert it back to electricity energy, real-time balancing of generation and demand has to be done. Utilities around the world have learned how to do that. It is basically by making generation follow demand. When we have much more variable generation, we have to adapt that and try to facilitate demand to follow generation. We also have many more individual actors, individual small bits of generation. Flexible demand is a resource in that sense. So how to make best use of those resources to minimise the total cost of the energy supply is really the challenge, but when we have expensive or limited storage capacity—and it is going to continue to be expensive for a long time—then co-ordination at some level has to happen. Co-ordination suggests one party that has visibility, which brings up these risks about monopoly. The regulation of National Grid, for example, is an important task that Ofgem pays a lot of attention to.

Chair: As much as I would like this conversation to carry on—it is hugely interesting—we have reached the time when we have to bring the session to an end. Thank you very much indeed. It was very informative.