HOUSE OF LORDS

Revised transcript of evidence taken before

The Select Committee on Science and Technology

Inquiry on

THE RESILIENCE OF ENERGY INFRASTRUCTURE

Evidence Session No. 5 *Heard in Public* *Questions 53 - 68*

TUESDAY 4 NOVEMBER 2014

10.45 am

Witnesses: Mr Mike Calviou and Mr Tony Glover

USE OF THE TRANSCRIPT

1. This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Members present

Earl of Selborne (Chairman)
Lord Broers (co-opted)
Lord Dixon-Smith
Baroness Hilton of Eggardon
Baroness Manningham-Buller
Lord O'Neill of Clackmannan
Lord Patel
Lord Peston
Viscount Ridley
Lord Rees of Ludlow
Lord Willis of Knaresborough
Lord Winston

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Examination of Witnesses

Mike Calviou, Director of Transmission Network Service, National Grid, and **Tony Glover**, Director of Policy, Energy Networks Association (ENA)

Q53 The Chairman: Welcome to this evidence session. We are most grateful to you for your help. I should just note that we are being broadcast on the parliamentary television channel and webcast. That might be relevant. First, I would ask you to introduce yourselves for the record, and if there are any words of introduction you would like to make before we start with our questions, do feel free to do so. Mr Calviou.

Mike Calviou: Good morning. I am Mike Calviou. I am director of transmission network service at National Grid. I work in the system operator part of National Grid that looks at balancing supply and demand in all timescales and planning the future network.

Tony Glover: I am Tony Glover, director of policy at energy networks association, the trade association for the gas and electricity network operators, both at transmission and distribution level.

The Chairman: Thank you very much. Are you content for us to go straight into the questions?

Mike Calviou: Yes.

The Chairman: Let us do that. You will know that we have taken several days of evidence about the capacity margin, and indeed National Grid has recently published its assessment as to where we are. The long and short of it is that we know that the margins are rather tighter than they have been in the past although, to be fair, the record over the last 30 years or so has been perfectly respectable. Nevertheless, the capacity margins are now tight. Would you like to say whether you feel that this will affect the resilience of the electricity system? What, in an ideal world, would you think the de-rated capacity margin should be?

Mike Calviou: It is important to say that we at National Grid spend the whole time planning for resilient operation of the system, looking at what might go wrong and trying to make

sure that the really high levels of resilience that we have traditionally enjoyed are continued. We are facing tighter margins in the coming winter than in the last few years although, if you look over a longer term, we are still at levels that are higher than they were, for example, in the early 2000s. Even though levels are tighter, we feel that, given the action that we have taken, margins look manageable for this winter. We are not complacent. We spend the whole time looking at risks. There are some risks this winter, which is why we have purchased the additional supplementary balancing reserve for this winter, but overall we feel we have the right tools in place to continue to manage the system at a very high level of resilience.

The Chairman: Mr Glover, would you like to comment?

Tony Glover: I have nothing to add to that in terms of what Mike said for the National Grid.

Q54 The Chairman: I would go back to National Grid then and ask whether you feel that you are sufficiently well informed by the generators. Of course we recognise that the generators themselves have problems because with the distributive system of generation now, with a lot happening in a way which is not the traditional pattern, that does add a complexity to the procedure. To what extent does that cause concern to National Grid? Are you satisfied with the information that you are receiving?

Mike Calviou: We have a lot of tried and tested procedures in the industry for communication, particularly under the Grid Code. Generators are required to submit declarations of their availability for coming years but also, particularly as we get into a winter period, they are giving us weekly forecasts of their availability and when they might have plant on maintenance. We are very happy that the information we get is of sufficient quality and accuracy for us to plan the system. Effectively, all of that industry information is what we then use to provide real-time reporting to the market as well as providing the basis for the recent *Winter Outlook Report* that we published. We also do a lot of consultation with the industry, so if people have particular issues or identify risks, they have opportunities to raise that. We are continually dealing with large amounts of information but generally we think the information flows work.

Clearly, we are always dealing with the risk of unexpected events. When we talk about margins they are what we call “de-rated margins”. They allow for a typical level of breakdowns, but what we always have to assess is, “Could we have an atypical level?”. Obviously, in the last few months, we have had a number of incidents happen on the system that have led to some concern but we think, having assessed all of those, that we have taken the appropriate action given the risks that those events have presented.

The Chairman: Last week, we took evidence from Professor Dieter Helm of Oxford. When we asked him what the capacity margin should be, he said, “10% at the very least but perhaps not as much as 20%”. You appear to be quite content with a figure that is much reduced from that. Do you think he is right?

Mike Calviou: I do not know exactly what he said, but I think you have to be clear on what definition of “margin” you are talking about. In the past—certainly in the 1990s—we used to talk about gross capacity margins. Back then almost all the generators we were relying on to generate electricity had the same typical reliability rates, so we tended to talk about the gross margin of total gross capacity and a figure of around 18% to 20% was the number the CEGB tended to plan to under its generation security standard.

With the change in plant mix that we have seen in the past 10 to 15 years, particularly the growth of intermittent renewables, that methodology did not work anymore so we have moved to what we call a "de-rated margin". For all of the generators attached to the system we have a "de-rating figure" that basically allows for a typical level of unavailability, due to breakdown or due to the fact the wind is not blowing or the sun is not shining, depending on the type of renewables. When we now talk about de-rated margins, an average amount of breakdown is already effectively taken into account. That is why we now tend to talk about margins of around 5%. For this coming winter, the market has delivered a 4.1% de-rated margin. We have taken action with our supplemental balancing reserve purchases to increase that to a 6.1% margin, and we think that is a level that we can manage the system with this winter.

I do not know whether Dieter was talking about a gross, net or de-rated number. I think over 10% on a de-rated basis would be a very, very comfortable margin, which I would be surprised if the market was consistently delivering because at that level there would be some generators that would probably never run.

Q55 Lord Rees of Ludlow: Your projection for next year is tighter than this year already and, given that we have tightened the margin this year by nearly 3%, does that not make you even more worried about what might happen next year?

Mike Calviou: For the last couple of years, we have been flagging that there is definitely a challenge coming. We have been spotting the 2015 to 2016 challenge coming for a number of years, but this year it came a year earlier because of some of the events I have mentioned. Ultimately, what margin the market delivers will depend on decisions that a number of generators will take, but we know that there is a certain plant that will be closing because of emissions legislation and so will not be available next winter. Because of that, we have already opened a tender for additional supplemental balancing reserve for next winter, both demand side and generation. We have just opened a tender for that now, which gives us the opportunity, for example, to contract plant to bring it back from mothball for next winter if required. We are going to do one tender with a 12-month notice with the possibility of then running an additional tender much closer to next winter, probably some time over next summer or autumn. So there are some challenges for 2015 to 2016, but we have the tools to manage them. I am not complacent, because we would never be complacent with these things, but at the moment it looks manageable.

Lord Rees of Ludlow: If I could follow this up and go back to Dieter Helm's view. Perhaps he is concerned about this because in many areas we find that the high-consequence, low-probability events happen unexpectedly and more often—in the financial sector and with nuclear accidents and things like that. Given that this does seem to be a non-zero risk, would it not be better to have a slightly larger comfort margin?

Mike Calviou: I think that is a great question. Ultimately, it is government policy that sets the parameters we work within. The Government have set a LOLE—loss of load expectation—of 3, which forms the basis of all our decision-making. For this winter, once you count our additional supplemental balancing reserve, LOLE is actually 0.6, so it is quite comfortable. The key thing to say with that, though, is that LOLE is effectively a measure of how often we would have to get into emergency measures which we cannot count on.

We have a number of ways of managing the low-probability, high-impact events: we can call on what we call "max generation" from generating plants; we can call in emergency assistance over the interconnectors; and we can work with the distribution networks to manage demand down, either via voltage management or ultimately by some sort of load control. We have all those tools there to manage the emergency events. We clearly do not want to be doing that too often but we feel that, if those extreme events do happen, we know what we are doing and we plan for them. That is a core part of our role.

Q56 Lord Broers: I have two points, Chairman. First, on that particular issue, Professor Helm was suggesting that the low margin drove the price up and that it would actually mean much lower cost if we had a broader margin. Do you agree with that?

Mike Calviou: I guess he is right fundamentally: in any market, if there is less supply, then you would have thought the price would go up. We run a market-based system for electricity generation and demand. As National Grid we will only intervene once we have seen what the market delivers by itself. Ideally, the market should find some sort of equilibrium between supply and demand. If there is the very large margin that he talked about and the price goes down, what you will then find is some generators struggling to make enough money to stay open, pay their staff and pay all the other fixed costs of keeping a generating station open. The reason the margin has come down is because the economics of some of that marginal gas and coal plant have been very unfavourable. We know that there are generators out there running at a loss, and that is clearly not sustainable.

The price will go up and down as the margin goes in the opposite direction, and that is what you might expect with a market in anything. Given how important it is that we have a resilient electricity system, it is important that we have those tools that I have talked about, in order to manage it if the market does not deliver quite enough capacity. We try to do that in a way that does not distort the market too much but recognises how important electricity resilience is to society.

Lord Broers: I have a point of clarification. In some of your literature you refer to the overall generation capacity as 71.9 gigawatts and yet in your report you refer to 86 gigawatts. Is that 86 the un-derated number?

Mike Calviou: Yes. That is probably the total growth capacity, including all the renewables.

Lord Broers: The non-derated renewables? On the third page of your report you refer to 86 gigawatts as the growth generating—

Mike Calviou: So 86 would be the total amount of large generation capacity—either connected to the transmission system or sufficiently large that we are notified about it—in embedded generation.

Lord Broers: That is a huge difference.

Mike Calviou: Yes, but that would include a number of gigawatts of wind that we would then be de-rating by—

Lord Broers: If there was a 5 gigawatts turbine in the 86, you would count that as 5 rather than a fifth of that?

Mike Calviou: Yes.[1]

[1] It emerged after the evidence session that the literature referred to by Lord Broers was actually written

Q57 Lord Dixon-Smith: I think I have a reasonably clear picture of the management on what I would call the supply side of the business, but an increasingly important part of managing supply is actually going to be demand management. Could you explain in a bit more detail how demand-side management works now and how you see that developing? Given the intermittency in growth that is going to happen and that sort of thing, this is going to become a more and more significant aspect of your work.

Mike Calviou: You are absolutely right: demand side is really important, particularly for managing some of the future challenges. We have always looked to buy services. We procure a number of what we call "balancing services" to help us manage the grid: some of those services are for a response within seconds, some within minutes and some in longer timescales.

One of our key services that we buy is something called "short-term operational reserve", and we have been buying that service from demand side for a number of years. Currently, we have around 2 gigawatts of what we call "non-balancing mechanism" providing that service—that is, not traditional generators that are obliged to play in the balancing mechanism. That will be onsite demand reduction but it could be some onsite generation as well. We are very used to dealing with demand side—that can be steelworks or cement works; in the past we have done a lot with aluminium smelters—so we are very familiar with putting in the arrangements to use that sort of large industrial load.

Going forward—and we have seen a bit of this with our new demand-side balancing reserve—we would like to open that market up and make it more available. Clearly, new technology offers a chance to give us more access to commercial load. There is a lot of load out there—for example freezer load in supermarkets—which feels as though you could be able to actively turn that down at the requisite moment and, for not much impact on the customer's business, they might be able to provide a useful service. We have been working directly with those customers and with aggregators that are very enthusiastic about developing this area. The demand-side balancing reserve for this year was a pilot; it was the first time we have done it. We have about 300 megawatts of new additional demand side, but we see that as a first step and we would like to develop a lot more.

Going forward, looking at the capacity mechanism, we would want more demand side to be able to play in that. There is a lot of discussion going on with the Government about how to make the capacity mechanism rules sympathetic and help facilitate demand side to play. There have been some challenges and some debate and I think we will probably see some of the rules around demand-side participation evolve over time to help them come in.

Once you look at the longer term, looking at various smart grid technologies, we would hope and expect to use the ability of smart controllable technology to continue to grow that demand side. Ultimately, in the future, if we could have access all the way down to domestic demand—whether that is electric vehicle demand, fridges and freezers in people's homes or whatever—and the ability to switch and profile that as a service, then that would give us a great tool with which we could help balance the system in the future. Some of this is probably getting five or 10 years into the future.

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evidence submitted by the UKERC, not a National Grid publication. National Grid's 2014 Winter Outlook Report sets out that the un-derated generation capacity available for this winter is 71.2 GW (page 6).

Q58 Lord O'Neill of Clackmannan: On the 5% margin that you suggested, it was put to us last week that, at the moment, we are more dependent on coal than we have been for a long time and therefore there are gas stations lying idle. What was not clear from last week's evidence from Helm was whether or not the gas-fired power stations, which traditionally can be fired up relatively quickly, are being kept at a state of maintenance that would enable to come into the system very quickly. What is the quality of the evidence you have to suggest that that would possible? Are we perhaps not looking carefully enough at this gas issue?

Mike Calviou: Both coal and gas, if they are available on the system, can be very flexible and can provide a very similar flexibility service to us. You are right that, at the moment, the economics mean that coal tends to running ahead of gas and so a number of gas stations are not running a lot. That leads to some of the economic challenges that we spoke about. For example, Barking combined cycle gas turbine announced its closure earlier this year. So, yes, there is some gas-fired plant that is effectively struggling to make its way. We get some information from those generators about what it would require if we were to effectively require them to come back under, for example, an SBR contract. If a generator closes this year, bringing them back quite quickly is relatively straightforward; if a generator closed two or three years ago, clearly the odds are that they will be in a less good state. There are other what I would call first-generation CCGTs that have closed and will probably never come back. I think the key thing, though, is that the capacity mechanism is, in the long term, the mechanism to deal with all of these challenges. The capacity mechanism is the route for us to make sure there is enough flexible capacity, whether it coal, gas or whatever, available on the system against the Government's required standard.

Lord O'Neill of Clackmannan: Do you have the information to enable you to be comfortable with a 5% margin, taking into account the problems that you would have with the gas sector, which has not been fully operative? I think that is the point.

Mike Calviou: We have full information on everything in the 5% margin, or the 4.1%, plus the additional SBR, and we know it is ready to run. On the SBR, we will be doing regular test runs to make sure it is fully able to run. The stuff that we would have a bit less information on is the stuff that we are not counting in the margin, which we might want to bring back in future. We are fully confident that any stuff that we are relying on is able to run.

Q59 Lord Peston: I must say, as background, that the more evidence we take in this area the less I understand, but that is another matter. I am still trying to work out how this market works. I understand that you sign contracts with the generators and that these are a variety of different contracts depending on what they are committed to for you. Is that right?

Mike Calviou: The bulk of the market is nothing to do with National Grid. Effectively, energy suppliers, who buy electricity on behalf of their customers, will be contracting with the generators and 95% of the market will be through that market mechanism and that—

Lord Peston: Just to interrupt you, does that not go through the national grid then?

Mike Calviou: It physically goes through the national grid—

Lord Peston: Yes, physically, that is what I mean.

Mike Calviou: However, contractually it is nothing to do with us, effectively. We rely on the market to do that. When National Grid acts, what we do is we buy specific services to help us balance the network in real time. We make sure that, if a number of generators all have a

technical problem at short notice, we have enough reserve that we can use to deploy in those situations. We buy the balancing services and various types of operational reserve to help us with that. What we have now done for this winter, because of the tightening margins that we have discussed, is that we have bought some additional reserve to ensure that we are resilient for this winter, given the fact the market appears to have delivered a margin that is lower than we were probably ideally comfortable with.

Lord Peston: If your decision-making then turns out to be erroneous, who is responsible? Who has the finger pointing at them and who gets the sack? You are not perfect. You must make errors.

Mike Calviou: We do, but ultimately we work within parameters set for us by the Secretary of State. The LOLE equals three parameters, and we will make decisions within that. We probably always try to slightly err on the side of caution—that is why we enjoy a very high level of resilience—but ultimately we are accountable for balancing on the day, in the short term, within the framework that has been set out by the Government.

The Chairman: Lord Peston, your question is bringing us toward the balancing services, which is what I think Lord Broers was going to ask about.

Q60 Lord Broers: You have talked a lot about this but I would like to put the question anyway. How will the new balancing services work and will they be sufficient to balance supply and demand over the next two winters? Further to that, given that these services have not been tried and tested, how certain can we be that the new balancing services will be effective? Has National Grid needed to procure additional balancing services in response to the recent power station outages, including the most recent at Didcot?

Mike Calviou: We are feeling reasonably confident about the new balancing services. If we divide them into two, first, there is the new SBR, the supplemental balancing reserve, which is existing power stations that would probably otherwise have closed. It is a new service but it is ultimately known technology. As I said, we will be running the plants to make sure that they are technically able to run. You never rely 100% on one generator, on but we take that into our calculation.

The new demand-side balancing reserve, of about 300 megawatts, is new. It is less tried and tested, but we are not overly relying on that. We see that as a pilot but, because we have experience of other demand-side services, we know that when we instruct demand side we actually see a measurable effect. We are pretty confident about that.

The only thing I would say is that although we are set up in a good position for this winter, I cannot be as confident for next winter yet, purely because we have not actually bought all of what we are probably going to need for next winter. At this moment, I cannot be quite as definitive about 2015 to 2016 because we do not know how much we are going to have to buy and exactly what we are going to buy. But generally, whenever we bring in a new balancing service, we do it in a way that takes into account how reliable it is. The whole way we achieve very high resilience is to have lots of options and lots of optionality.

Lord Broers: Did you have to bring them on for Didcot?

Mike Calviou: Didcot, the fire at Ferrybridge and the concerns around the availability of the nuclear stations at Heysham and Hartlepool, are all factors that we took into account that ultimately led to us buying the supplementary balancing reserve. The good news on Didcot is

that it is two units of about 700 megawatts: one unit was not affected by the fire at all and the unit that was affected by the fire has already come back at half load, and we understand that it is likely to be able to increase its output over the winter. So even though Didcot was a very high-profile event, its actual impact was probably overstated.

Lord Broers: The downside of all of this is it costs money, does it not? Have you made an estimate of how much it is going to push people's electricity bills up?

Mike Calviou: The additional cost of the supplemental balancing reserve this winter will be less than £1 per customer on their bills.

Lord Broers: What is your assumption of what the bill is?

Mike Calviou: That is against the standard—I cannot remember what it is.

Lord Broers: It would be much more useful to have it.

Tony Glover: It is about—

The Chairman: Mr Glover, would you like to comment on that one?

Tony Glover: Sorry, yes, forgive me, Lord Chairman. About 20% to 25% of the bill comprises network costs, so the £1 is in that context of that.

Lord Broers: I wish you would not give numbers like "£1". That means nothing to me; I want to know the percentage.

Tony Glover: It is about 38 pence a day. That is the total cost to the network.

Lord Broers: That is even worse. I want to know what percentage change there is going to be in somebody's electricity bill.

Mike Calviou: The standard bill that we tend to work off on electricity I think is about £600-and-something a year, so less than £1 a year is less than 1% a year.

The Chairman: All right. We can do the maths on that I think.

Q61 Viscount Ridley: Can I move you onto the capacity market? The medium-term plan is to make sure that there is capacity available to keep the lights on; not necessarily operating but in the background. One of the concerns that has been raised—and I think we are going to hear more about it in the next session—is that there is a risk here that we become too generous, that we procure too much in the way of capacity and that, as a result, we end up with an oversupply of capacity in the background. What is your comment on that?

Mike Calviou: I think there is a risk. Clearly, whenever you are buying stuff four years ahead, you need to make some sorts of assumption. I think the particular risk that people have highlighted is that in the first capacity mechanism we have had to make some assumptions around interconnectors and what the interconnectors to other countries will be doing. We believe we have made some sensible baseline assumptions, but the key thing to recognise is that in all our modelling, we look at sensitivities from quite high exports across the interconnectors to quite high imports. You would expect—I think this is probably what some people have said—in a period of system stress on our network, to get higher imports into this country but we also recognise that some of our neighbouring European countries may also be short at the same time. So it is trying to make a balanced judgment. I think the right answer in this is that the Government are currently working on a mechanism to allow interconnectors to participate directly in the market rather than us having to just make an

assumption about what they are going to be doing. They are working on that at the moment. We hope for that to be in for the capacity mechanism that runs for 2019, so it is really an issue for the first capacity mechanism in 2018.

The other thing to say on that is that we have designed it so that there is a small amount of capacity that has not been procured for four years ahead and is being left, basically, for a one-year-ahead supplemental auction. That allows for some fine-tuning nearer the event. In particular, if we have been too conservative, and it is clear by then that we have been, that can be adjusted for. I do not think there is a very significant risk that we are overprocuring. Given all of the risks we are talking about, it probably makes sense at four years ahead to, if anything, err on the side of slight caution.

Q62 Baroness Manningham-Buller: I would like to turn to you, Mr Glover, and ask you about the resilience of the networks. Obviously, we have had a certain amount of flooding and storms, and I would like to ask you a twofold question first off. What are the lessons you learnt from those, if any? If you have learnt the lessons, what changed as a result? In other words, what was implemented as a result of those lessons?

Tony Glover: There are two aspects to that, as well as perhaps something around how we dealt with the situation at the time, which was an incredibly challenging situation, and a national picture if you are looking at the Christmas storm in particular. One thing to bear in mind, against the backdrop of what was a very bad time for a lot of people, is that over Christmas we saw about 750,000 homes impacted.

Baroness Manningham-Buller: You mean they had no power?

Tony Glover: They had no power, but about 95% were restored within 24 hours. Obviously a large number of people were affected but the vast majority, 95%, were restored within 24 hours. It is against that backdrop of a national picture of a problem that was cutting right across the country. Usually, these weather events—which you can say it is climate change, but they are just bad weather events that will happen and which we cannot necessarily predict—do not impact in the way it did at Christmas, across the whole country. That was quite an issue in terms of the procedures that we would normally have around mutual aid such as where, if you have the south-west of England impacted, you would have Scottish network companies coming down to help and vice versa. With the situation we had, of a moving weather front, in fact distribution network operators were not able to help each other. Of course this was coupled with a serious flooding issue as well. Given that this happened right in the middle of the Christmas period, you then see the nature of the difficulty. I wanted to identify that and talk about the reality of what actually happened, in terms of who was restored and who was impacted.

The lessons learnt were twofold, and we experienced only in February this year a repeat, to some extent, of some of that bad weather impact. Some of them were very short-term lessons around communication, which we have put into operation. That is an absolutely critical issue. At the end of the day, network engineers can only work as fast and as safely as they can work. To be absolutely clear, these were people from their local communities; people themselves who were actually without power. In fact some of them were restoring others when they themselves were without power. So there is no question about the commitment of the industry itself. The issue was around communicating to the public what

the situation was and how long they were going to be in that situation. That was a challenge, I must admit.

Baroness Manningham-Buller: I am sure communication helps, but were there enough resources and enough people going to help restore the power? What you describe in the past could happen again next year.

Tony Glover: Absolutely.

Baroness Manningham-Buller: Will you have more people able to restore the power, at least in practice?

Tony Glover: Absolutely. In terms of what the companies have done—and bearing in mind that this was a particularly difficult time, being Christmas—what has happened is that all the DNOs have a process now that absolutely ensures that there are enough resources available in order to do what is necessary.

Baroness Manningham-Buller: People?

Tony Glover: People. Just to repeat, that is against the a challenging backdrop: no matter how many people you have, you cannot, for instance, restore power to an area that is badly flooded, for obvious reasons. There are lots of challenges there that are impossible to deal with and you can only give people information, and then you can only give them so much information. So there is the communication aspect. Something that will be brought in at the latest by April 2016 is a single national emergency number. This will be the third such emergency three-digit number brought in since the police and the NHS brought in their own. They took nine years to bring theirs in; we are hoping to have ours in within two years. That will help because anybody faced with a power outage situation will be able to phone up, and they will be put straight through to their distribution network operator who will be able to tell them exactly what the situation is. That is another big learning point.

Baroness Manningham-Buller: Looking ahead to further unexpected events and possible climate change, what have you thought about and what have you planned for improving the resilience of the transmission and distribution services?

Tony Glover: A lot of work has been going on well in advance of these recent weather event. Work is ongoing with the Department for Environment, Food and Rural Affairs, the Environment Agency, the Climate Change Committee and others, looking at adaptation, looking at how we make the network more resilient in terms of flooding and—particularly appropriately with the Christmas winter storm situation—looking at wind patterns as well. Wind patterns are not particularly looked at in terms of climate change but, nevertheless, they have a serious impact on the network. We have been working with the Met Office on that and also with the University of Newcastle to look at what wind patterns are likely to be and making some predictions about where we need to build more resilience into the network.

Baroness Manningham-Buller: What are those predictions? Give us a few of them.

Tony Glover: It is more geographically located, I think, and about the type of wind we might face. Potentially, it is going to get windier and we will have to make the network more resilient where that is the case. Indeed, in parts of the United Kingdom—in Scotland, for instance—the network in parts is more resilient at distribution network level because of the nature of the weather that they experience. We will deal with that where it is appropriate,

but of course we have to see this against the backdrop of having to do this as efficiently as possible and being very much aware of the impact on customers' bills. Dare I say it, as I speak to you now, in another place there is an inquiry currently going on into the cost of networks and questioning how much our networks actually cost. We have to see it within that context.

Q63 Baroness Manningham-Buller: I have one final point. One of the things I have learned about in this inquiry is a thing called local resilience forums, which I was completely unaware of. What is their value?

Tony Glover: We work very closely with the distribution network operators. National Grid works very closely with the local resilience fora and has been now for a number of years. They were brought in under the Civil Contingencies Act, I think 10 years ago or so. The very positive side of them is that it is about communication with the key local stakeholders—local authorities and so on. It is about that communication with police, with the hospitals and the other emergency providers, the category 1 providers as they are described. That aspect is very good.

The challenge that we sometimes face with them is the particular localised geographical location of the fora. Sometimes, for more of a regional network operator, it would be useful to have more of a regional view as well. That is something that we would like to see but, in terms of being a very positive addition, yes, there is a lot of work carried out on particular scenarios. One big area for us, and something that was very much on every network operator's mind during the recent winter storms, is the impact on vulnerable customers and identifying vulnerable customers. For instance, working with the NHS and working with local hospitals to understand who is currently in their home, and who may be temporarily very vulnerable, that we might not necessarily know about. That is absolutely critical so that we know what happens in an outage situation.

The Chairman: One plea I would make, as one of the 5% who was not connected within 24 hours, is that you do learn lessons on communications.

Tony Glover: I am aware of that, Lord Chairman.

The Chairman: There is no excuse nowadays for not texting up-to-date information, and to have information that is 24 hours out of date is exacerbating a problem. I think there is an awful lot of good will from consumers if they know what is happening: they know it is Christmas and they know you are stretched, but it is quite unacceptable to have information that is out of date.

Baroness Manningham-Buller: Can I just add to what the Chairman said? Recently I had a power cut at home and I was told within two minutes of it happening how long it was going to last for. The fact it lasted for an eighth of that time made me a very happy customer, not a cross person because my kettle would not work. People will put up with a lot if you communicate, and that system that works where I live should be national.

Tony Glover: Just to echo that point—I completely accept what you are saying, Lord Chairman, and indeed I have spoken to a number of people who were in a very similar situation to yourself—communication is absolutely at the heart of this. We cannot necessarily get you back on as quickly as perhaps some might hope, but we should be able to tell you what the situation is. We cannot always tell you how long but we can give you some

sort of indication, particularly in very difficult circumstances. But your point about getting that information to you as soon as possible is very well made.

We are doing a number of things. This is not just about providing a single national emergency number at a point in the next year or so but also gathering and garnering as much information as we can from the suppliers about your communication details so that, when we have contact with you and when we can get hold of information about your telephone number or your mobile number, we will then be able to text you. We are keeping that information and making sure that we can use that to get back to you when we need to because you are absolutely right.

Q64 Lord O'Neill of Clackmannan: Part of what we are looking at is the changing character of generation. Obviously decarbonisation of generation is going to be of considerable significance, and part of this will be interruptible generation or distributed generation. When you have been looking at your various scenarios in National Grid, how has the network resilience factor been accommodated in the models that you have created in the light of the scenarios that you have painted?

Mike Calviou: We create these future energy scenarios in order to try to spot these challenges coming and give us a way of thinking about the future. You are certainly right that the changing nature of generation in a connected network does create some potential future challenges, particularly intermittency. However, there will also probably be less plant that has heavy inertia on the system, so there will be rotating machinery that has the ability to absorb distortions to the system.

With that, on the back of our future scenarios, we have produced for the first year what we call a system operability framework, which we have just consulted on. It is effectively a document that says, "In these future scenarios, these are some of the challenges we would have in operating the system and, therefore, these are the sort of services we might need to help us". In scenarios with a mix of very large, inflexible nuclear plant and lots of intermittency, we will probably need a lot more balancing services that are probably from non-traditional sources, whether that is demand side, storage, increasing interconnection to other countries or some other solution that someone will come up with that we have not thought of yet.

The idea of our system operability framework is effectively to flag these things coming five, 10, 15 or 20 years in the future and to allow the market to respond and bring these things forward. We do not see anything on the immediate horizon we cannot manage. We do see challenges in the 2020s and 2030s that could emerge in different scenarios, and what we are trying to do is flag those early enough that the market can respond.

Lord O'Neill of Clackmannan: As far as distribution is concerned, we are going to have changes as a consequence of heat pumps, electric vehicles and the like. How well placed are the distribution companies to meet these challenges in terms of the capabilities of their staff and equipment?

Tony Glover: Potentially you are looking at a doubling in electricity demand over the next few decades. The impact of that obviously is quite considerable on the distribution network, so we need to think differently about the network. Network companies are working together collaboratively where possible, given the regulatory framework, to look at how we deal with the challenges of electric vehicles and of increased electrification of heat. At the same time,

obviously, we are looking at microgeneration in increasing amounts, whether it is local community-generated energy or in individual homes through things like solar PV, and the impact that that has on the network. Not only are we looking potentially at a big increase in demand, we are looking at the impact of new sources of generation on to the network, making it a far more active network at distribution level, something I know you will be very familiar with, Lord O'Neill.

On top of that, we have to think about distributed generation, so renewables connecting directly on to the distribution network. How do we deal with all that? How do we do that without just putting in lots more wire and, therefore, adding to the cost to the customer? The way we do that—and it is a much mis-bandied word—is to think about it in a smarter way: having smarter networks, using ICT, using remote access and looking at how we can think about the network in a way that we have not done or had to do in the past. Something that has helped drive that, support it and facilitate it has been the Low Carbon Networks Fund, which is something that was brought in by the Government and Ofgem. There has been £500,000 of investment in projects, looking at a whole range of things from storage through to how we manage new distributor generation, how we deal with the customer and how we can deliver real reductions in demand in the community. For instance, one of the projects in the north-east has seen a 10% shift in peak demand by the families and local households that have been part of that project. That has big positives for the network itself in terms of the impact in the peaks on the network and the load, but also it means that we can facilitate demand-side management for the future, which plays up to Mike's level and helps support that. There is a lot of work going on on that. We are working through the Smart Grid Forum, and the Energy Networks Association leads on a number of those workstreams. We are also sharing that information. We had a major conference last week in Aberdeen, with about 800 people attending from among the energy community and people interested in community energy groups. We are disseminating that information and getting as much learning as we can.

Q65 Lord O'Neill of Clackmannan: Yesterday's *Financial Times* had a very encouraging report for the car industry about new lithium batteries. Obviously this is about headline grabbing, but it could be a game changer. Given the glacial speed at which the use of electric cars has expanded in the UK, would we be capable of meeting a demand that could be created in a relatively short time for this kind of battery-charging facility? Could we do it if we were called upon?

Tony Glover: Could we facilitate electric vehicles?

Lord O'Neill of Clackmannan: Yes, on a big scale. At the moment there is a natural hindrance to them in terms of charging and the life of the batteries.

Tony Glover: Absolutely. There are a number of issues. There are also safety issues as well, which is something absolutely at the heart of everything we do. We have been working with OLEV, the government body responsible for electric vehicles, with the Department for Transport and with the industry itself— the SMMT, the manufacturing organisation—to look at the safety issues and how we can help facilitate this. I will be quite frank with you that there are still a number of issues. But is it deliverable? I think in the longer term it is.

In terms of some of these technologies, as Mike said earlier, we are currently going through the electricity distribution network price control review, ED1. We are probably looking out to

ED2, in the mid to late 2020s, before we see some of the benefits of some of this type of technology.

Mike Calviou: The only thing I would add to that is we probably see as much opportunity with electric vehicles as challenge. If there is a sharp kick-up in electricity demand, clearly that would require investment throughout the chain, in networks but also in new generation capacity. We would expect to see that coming with enough notice that the market could respond. Electric vehicles offer quite a few exciting opportunities for controllable demand side that we can then use to manage some of the other challenges. I see electric vehicles as both a challenge and opportunity.

Lord O'Neill of Clackmannan: One last point: the increasing dependence on the networks will obviously make it attractive to potential terrorists through cyberattacks and what have you. What are the network companies doing to counter these risks? Obviously we do not want you to tell us all your secrets but could you maybe give us some reassurance?

Mike Calviou: We take all types of risk to our network very seriously, including risk from terrorism or cyber. We work very closely with the Government and, as you said, there is probably some detail that it would not be appropriate to share. We have done physical investment, in terms of resilience against our key sites, and we absolutely look at all of our key systems and work with the Government and with other organisations in high resilience areas, such as the banking and defence industries, to share best practice techniques to deal with this. There are obvious things you can do about having separable networks and making sure there are no single-point failures.

There is an entity called E3C, which is the Energy Emergency Executive Committee, which is a collaborative forum for the energy industry sharing best practice around all sorts of resilience. It set up a committee around cyber that National Grid chairs. Effectively therefore, we are leading the group working across the energy industry that is looking at all these risks and sharing best practice. It is a challenging area and certainly, as grids become smarter in the future, there will be more challenges, but I feel as though we are set up to manage them.

Tony Glover: Just to reiterate that from a distribution network perspective, as Mike said, they are working very closely together. In fact there is a project under the LCNF that is looking at this very challenge.

Q66 Lord Patel: My question relates to the recent Ofgem settlement for National Grid. What effect do you think that is going to have for network companies' ability to maintain system resilience or, for that matter, plan for the future?

Mike Calviou: We accepted the RIIO price control from Ofgem. Whenever a price control like RIIO is negotiated inevitably we will put forward our view of what we need to spend in the future and our regulator rightly will challenge us. They did challenge us to make more efficiencies than we originally proposed. We ultimately felt we could manage those and deliver on them, so we feel confident that we have the right resources. Ultimately, however much Ofgem fund us, it is our obligation to meet our licence requirements and to make sure we have appropriate skills and expertise.

We have recently been heavily recruiting apprentices and engineers in both electricity and gas because, given the amount of investment required in the network, we probably need more resources. It is something we spend an awful lot of time thinking about. We certainly

worry about this country not producing enough engineers, and we do have to do quite a bit of overseas recruitment, but ultimately we realise that it is our job to make sure we have the right resources in place, including the right people, and we think that we do at the moment.

Lord Patel: From what you say, the efficiency savings related to the settlement have not resulted in a manpower loss because you are recruiting. So where have you made the efficiency savings?

Mike Calviou: We were always planning to recruit a lot. We have probably found some ways of recruiting less but still recruiting. We have also made efficiencies in our supply chain. We do a lot of our investment working with construction partners, demanding efficiencies of them. We are making process efficiencies. There are efficiencies in a number of areas and ultimately our obligation is to always find better ways of doing what we require. In some areas, we have identified that we do not need as many staff and some people have been let go, but in other areas where we have new challenges we are recruiting. We are trying to continually update and refresh our workforce.

Q67 Baroness Hilton of Eggardon: Just one final question. The Institute of Engineering and Technology suggested there was a need for a systems architect to help you make the transition to a whole new scenario in the need for electricity. What is your view about that suggestion?

Mike Calviou: We have been involved in those IT discussions. We certainly agree that there are increasing whole-system challenges, as you might call them. Traditionally, the transmission system has tended to run as quite a smart active network and the distribution networks have been much more passive and managed at the interface, but they have not had to look into each other's areas in too much detail. Increasingly, there are a number of issues where, with a lot more distributed and better generation across the network, you have to look at things on a whole-system basis. So we absolutely agree with that part of the IT analysis.

Is the answer a systems architect? I honestly do not know because no one has fully explained to me exactly what that is and what their responsibilities would be. We think we need to do something in this space. It could be by a better institutional framework. For example, at the moment, there is no formal linkage between the Grid Code panel, which deals with the transmission technical rules, and the Distribution Code panel—it may be something to formally bring those together and have a more joined-up approach. We agree there is an issue that needs looking at, so we are working with our colleagues in the ENA and with our colleagues in all the distribution companies on that. Is a systems architect the answer? I am not sure and more work needs to be done to find exactly what that means and where it would fit.

Baroness Hilton of Eggardon: Do you see National Grid as fulfilling that particular strategic role or not?

Mike Calviou: We already do a lot and clearly our role has evolved in recent years with the EMR. Ofgem are currently proposing that we do more in terms of an enhanced system operator role around planning both the onshore and offshore network including interconnectors. I think the distribution issues that it has been suggested a systems architect would look at are beyond our current expertise. So, as I said, it is not obvious to me that you need an entity to do it. There are some challenges, but I would prefer to solve them by

correct frameworks rather than setting up yet another body that just confuses accountability.

Baroness Hilton of Eggardon: Mr Glover?

Tony Glover: National Grid is a member of the ENA. As I said at the beginning, we represent both gas, electricity transmission and distribution network operators, so we very much have a whole-system view of the energy system from a gas and electricity point of view. I have two observations. First, as Mike says, we are working very closely together. It has become very clear over the last few years that that is the way things are going. We are doing that and there is that level of communication, thinking about some of the issues that we were talking about earlier. That is happening, I can absolutely reinforce that.

I have perhaps one last cheeky observation about a whole-energy system analysis. I know this is about the resilience of the electricity network but we are looking obviously at the potential future wealth of gas, and one piece of work we carried out was in the area of heat, out to the 2030s and 2050s. Our message here is that we believe that there is a potential role for gas heating way beyond where some have originally seen it and that that, in itself, would help to ensure the resilience of the electricity networks.

There needs to be this whole-system thinking about the electricity network and I think we need to think about gas and the role that gas can play, not just at a generation level but in terms of that whole energy system analysis.

The Chairman: Good, and a last question from Lord Broers.

Q68 Lord Broers: There seems to be evidence that our electricity is more expensive than in a lot of countries in Northern Europe, and certainly more expensive than in America. Do you look at that and try to understand why that is the case?

Mike Calviou: We do look at it, although it is quite confusing whether you are talking wholesale or ultimate end customer. I certainly see numbers across Europe that suggest we are not the cheapest, but we are certainly one of the cheaper countries across Europe. There is no doubt that in the US shale gas has had a massive impact. The price of gas is probably half or less than that in Europe, so shale gas is having an impact. National Grid does have business in the US and we have seen a massive impact from shale gas in driving down gas and electricity bills. There probably is something systematic there that, ideally, the global gas market will resolve with an increasing ability to export some of that cheap shale gas from the US, but that is probably still some years away.

It is quite a complicated picture. I do not think there is any evidence that we are systematically more expensive than most other European countries. However, when the wind is blowing and the sun is shining in central Europe—particularly in Germany, given the renewable resources—we do see that the continental European wholesale price tends to be quite cheap, and that is when we tend to see quite large imports across the interconnectors.

The Chairman: We have had some rather conflicting evidence on this and if you do have any hard evidence that you are able to share with us on comparative prices, whether wholesale or retail, whether in Europe or North America, I think that would be very helpful. I accept that we have had some information but we do need to get a better understanding as to where these figures are coming from. If you have figures that we have not seen that would be helpful. This session must now close. I am most grateful to you for having helped us in our

inquiry. We will be sending a copy of the transcript for any minor corrections that there may be for the record. Once more, thank you both for your help.