Joint Committee on the National Security Strategy

Oral evidence: Critical national infrastructure and climate adaptation

Monday 13 December 2021

4.36 pm

Watch the meeting

Members present: Margaret Beckett (The Chair); Sarah Champion; Baroness Healy of Primrose Hill; Baroness Hodgson of Abinger; Darren Jones; Lord King of Bridgwater; Lord Laming; Baroness Lane-Fox of Soho; Baroness Neville-Jones; Bob Stewart.

Evidence Session No. 1 Heard in Public Questions 1 - 19

Witnesses

I: Sir John Armitt, Chairman, National Infrastructure Commission; Professor Richard Dawson, Adaptation Committee Member, Climate Change Committee; Dr Will Lang, Head of Civil Contingencies, Met Office; Dr Swenja Surminski, Head of Adaptation Research, Grantham Research Institute on Climate Change and the Environment, London School of Economics (LSE).

Examination of witnesses

Sir John Armitt, Professor Richard Dawson, Dr Will Lang and Dr Swenja Surminski.

Q1 **The Chair:** I welcome our witnesses to the committee today. This is a hybrid meeting on the part of the committee as well as on the part of the witnesses. If you want to give a supplementary answer on the back of another witness's answer or to join in with something, please raise your hand or wave at us. We will keep an eye on the screen and try to make sure that we do not miss that.

Thank you very much for coming to give evidence to us. This is the first formal evidence session for our new inquiry into the critical national infrastructure and climate adaptation. We hope to get some insight into a number of issues today, particularly the possible impact of climate change on the critical national infrastructure and the way in which those

risks are being managed, whether by the Government, regulators or individual operators of infrastructure. That is our approach.

We are looking for an understanding of how we stand with resilience and business continuity for these key areas of national life. Fortuitously, although unfortunately, we had a very good example recently in the impact of Storm Arwen. One can see that that shocked a lot of people in this country. People will not have been surprised by it having such an impact but by the sheer scale of the impact and the length of time it has been taking to respond to it and deal with it. That one event on its own reaffirms the questions that we have to have about the resilience of our power network to extreme weather.

How typical do you think Storm Arwen was, what will we face in the future, and do you have any indication of how frequent you might expect such events to be? Dr Lang.

Dr Will Lang: Good afternoon. I am the head of civil contingency services at the Met Office. That means that I lead on our national severe weather warning service and our general advice on severe weather to government and the wider resilience community.

My background is in operational weather forecasting. That is very much the day-to-day weather concerns such as the recent storms but also things like flooding and summer heatwaves. I represent the Met Office at things like lead government department meetings and at COBRA for weather events. Increasingly, climate change is having an effect on those shorter time concerns.

Some brief words about the Met Office. We are the national meteorological service of the UK. Our purpose is to help people make decisions to stay safe and thrive. We are a public sector research establishment and an agency of the Department for Business, Energy and Industrial Strategy. We deliver the public weather service on behalf of government, so we deliver weather warnings and support to resilience that we mentioned. We also work closely with other partners on related natural hazards. We work, for example, with the Environment Agency in our joint flood forecasting centre on flood risk. We cover both weather and climate. The Met Office Hadley Centre provides services and the underlying science on climate change to government and industry.

I will get to your point about Storm Arwen and how unusual that might have been. Storm Arwen was on 26 and 27 November. It was the first Met Office red warning for wind since Storm Gertrude in 2016. In a big storm like Storm Arwen we will usually see winds of 70 miles an hour or so across many parts of the UK, and events like that are not that uncommon on a UK scale, the last being Storm Ciara in February 2020.

However, what was different about Arwen was where it happened. A wind gust of 98 miles an hour was recorded at Brizlee Wood in Northumberland. That is exceptional for north-eastern parts of the UK—north-east England and east Scotland. It is much more usual to have the strongest winds in the west of the UK. Indeed, we saw gusts of 70 to 80

miles an hour only last night across the far north-west and extreme north of Scotland, which had little effect. It happened in an area that was more unusual and perhaps more vulnerable to the impact. No doubt the unusual northerly wind direction related to Storm Arwen rather than to the usual westerlies tended to exacerbate the impacts.

It is worth noting that if Arwen had occurred a week earlier or a week later, it would have coincided with spring tides rather than the neap tides that it coincided with. If that had happened, we could have also seen some serious coastal flooding problems. I hope that sets the scene.

The Chair: Yes, it does. Dr Lang, and anyone else who wants to join in, what are the key lessons that we should learn, first, from the impact, and, secondly, from the potential impact if, as you say, it had coincided with strong tides?

Dr Will Lang: I will see if any of my colleagues wish to come in first.

The Chair: I was thinking about the lessons that CNI operators or public bodies ought to take away from what we have seen.

Sir John Armitt: I am chair of the National Infrastructure Commission. Our job is to look forward 25 to 30 years and assess the infrastructure needs across the country and across the six key physical types of infrastructure. Energy is a primary one. The others are flood defence, which has just cropped up in the conversation, water supply, digital, and transport.

The reality is that we recognise that these extreme events will occur. Therefore the operators recognise that and the regulator will recognise that. There needs to be a degree of preparedness. You probably cannot prepare for the absolute extreme, because that will occur so infrequently, but fundamentally you have to assess how frequently these high-risk events will occur and what their impact will be. In a sense, it is the classic risk assessment of your low-probability but high-impact events and how you prepare for those.

The National Infrastructure Commission recently said in a report on resilience which the Government asked us to produce that the starting point should be that the Government establish what standards they expect. That would have to be done with industry, clearly. That becomes what standards the public expect and what level of resilience we regard as adequate and are prepared to live with, and that will carry a cost.

Fundamentally, it is about what standard you are prepared to meet, and to what extent the regulator can see that the companies have put protective mechanisms in place for that and have stress-tested those mechanisms regularly to ensure that they will be able to maintain a service in those circumstances.

The Chair: Thank you. Professor Dawson.

Professor Richard Dawson: Thank you. I am based at Newcastle University, about 30 miles south of Brislee Wood, which Will mentioned, where the highest wind gust was recorded. I am also a member of the Adaptation Committee of the Climate Change Committee, so I am an independent adviser to government on climate change policy.

We saw some substantial impacts with Arwen. The one that we have heard most about is the wind bringing down the powerlines. It was also a snowfall event, and many powerlines experienced icing, too. This all added to the general challenge of response. Furthermore—and I know a number of people who this happened to—the loss of that power did not just stop people being able to switch on their lights. It led to loss of heat, loss of water supply in some areas, and loss of all communications—here, we are talking about loss of mobile communications and landline communications, the latter being a result of switching of some of the old copper phone lines to a purely digital service in some rural areas.

One of the big lessons for me was that it exposed the increased interconnectivity between our infrastructures. It is not just about power any more, it is not just about electricity, but about all the services that support and back up. As we transition our infrastructure to a net-zero, reduced carbon emissions setting, we have to ensure that we do that in a way that does not enhance these challenges and that we are mindful of this increased reliance on electricity for powering all these critical services.

The Chair: Dr Lang, you were nodding. Do you want to add anything?

Dr Will Lang: Just the same comment that I had written down about the interconnectivity risk and taking a holistic approach, seeing them all in the round. Previously we might have considered risk too separately and in isolation, and we have realised that that this not the way the world works any more.

The Chair: I well remember those points being made when I was supposed to be in charge of responding to the Millennium Bug. Everybody you asked said that they could provide continuity of service, provided that all the others were working.

Q2 **Lord King of Bridgwater:** There is a considerable development, Dr Lang, in the performance of weather forecasting. The sense is that it gets steadily more accurate, but does it get steadily better at forecasting further ahead? Is there an increase in advance warnings that can make it possible to take some steps to prevent the worst damage?

Dr Will Lang: That is a very good question. The big Atlantic storms have been at the forefront of Met Office science research probably since 1987, since the Great Storm, and we have put a lot of effort into that. One of the things that we do well, not just here in the Met Office but around the world, is identify big storms developing several days out, and the potential for impacts has progressed over the last 10 or 20 years or so.

Lord King of Bridgwater: When did you spot Arwen coming?

Dr Will Lang: We were able to start to talk about a potential development at the beginning of the week when it occurred. We put the warnings out initially on the Tuesday. At that stage, it was not clear exactly where the strongest winds were going to affect. We knew that it was going to be somewhere in Scotland, but it could have been the north-west side or the north-east side. In the two days before that, we started to ramp up our warnings. We issued a few amber warnings and then the eventual red warning, when we were able to highlight this area of particular risk in an area that is not used to getting winds of that strength.

Lord King of Bridgwater: When did the red warning go out? How soon?

Dr Will Lang: On the Friday morning.

Lord King of Bridgwater: How many hours before the event?

Dr Will Lang: I cannot quite remember the timings now. I will have to clarify that, but it was a good few hours. It was in the order of 12 hours or more.

The Chair: Dr Surminski, I think you were about to come in when Lord King wanted to intervene.

Dr Swenja Surminski: Thank you very much and good afternoon. I am the Head of Adaptation Research at the Grantham Research Institute at the London School of Economics. I was also author of the business chapter of the *UK Climate Change Risk Assessment*.

I want to reiterate, and Storm Arwen underlined this, that what we are experiencing and what we will see more often with climate change is what we can call a closed cycle of extreme events. Some of these communities experienced flooding just when they got their power back, and they were impacted on.

When we talk about infrastructure, the infrastructure providers are one thing, but it is also about the infrastructure users—the local councils, a whole range of stakeholders, that also need to receive that information and know what to do. Unfortunately, this is where really good forecasting can only go as far as what we then do with the information. That is a really important lesson, which unfortunately we see after flash floods, when we have actual warnings. Do individuals, businesses, the local councils know what to do, and do they have the resources and the skills to act? That is an important point in our Resilience Strategy.

Baroness Neville-Jones: Do they get informed? It is all very well having a network for warnings inside government or government departments, even inside local councils, but are you happy with the warnings that go out to the wider communities, which themselves need to take precautions and put up hoardings or sandbags or whatever it is? Does that work properly?

Dr Swenja Surminski: We see on the flooding site that more and more people are signed up to flood warnings and receive information, but what can they do then? Do they know what it means, where to go and how to behave, and do they receive the support? I do a lot of work with SMEs, and I think that receiving a warning is one thing, but taking action and having a plan ready is another. That is where we see big gaps.

Baroness Neville-Jones: Being signed up should mean something.

Q3 **Lord Laming:** My questions follow on very well from that initial discussion. I will address my first question to Professor Dawson, because he has indicated that he is a member of the Adaptation Committee. It is to do with the long lifespan of infrastructure—we all know that it has a very long lifespan—compared with the relative speed with which the climate is changing. Is this being addressed?

Professor Richard Dawson: Thank you. That is an excellent question. If you do not mind, I will start with some general context from our most recent *Climate Change Risk Assessment*, which was published this summer, so not that long ago. We publish these risk assessments every five years, and our latest risk assessment said that our infrastructure is not yet ready or well adapted for 2-degrees sea warming. This refers to the global mean warming temperatures that we hear about and which we heard a lot about during COP 26 and so on. You will recall that, even after the commitments at that summit, our expectation is that we will exceed that level of warming. We are not ready for 2 degrees, and we are still likely on course to exceed that at the moment.

Our risk assessment looked across 60 risks in multiple sectors. Those that we identified as the priority risks to infrastructure were: network cascading failures, along the lines that I alluded to earlier; coastal river and surface-water flooding—we heard about a near miss on the coast during Arwen; disruption to transport from slope and embankment failure; disruption to transport from temperature extremes of the heatwaves and the cold; risk to public water supplies from reduced water availability; and risks to business from disruption to supply chains, as Dr Surminski just mentioned.

Overall, in the last five years, our assessment showed that that risk has increased, partly as a result of our improved understanding of how climate change is changing but also because of an adaptation gap in that our actions to adapt are not quite keeping up with that accelerating risk.

On your point about the long lifetime of infrastructure, as we are putting things in the ground that in some cases may be expected to last 50 to 100 years, we absolutely have to ensure that we are designing for the future climate. It is important to recognise that some of the actions that we put in will limit risks but they will not entirely disappear, as we have already built in flood plains and we have infrastructure that we are unlikely to dismantle entirely and rebuild in some other configuration.

Lord Laming: Thank you. Sir John, do you agree? If so, could you say a

bit about what risks are being generated by this difference in lifespan?

Sir John Armitt: Yes, thank you. We carry out our long-term assessments every five years, which we are required to do by Parliament, and we report every five years. It is interesting that the regulators set the financial parameters for the operators every five years and Parliament is re-elected every four or five years. We have a five-yearly cycle in which we have the opportunity to address this. We can look out and say that there will be a 1.5 degree temperature rise, or maybe more, by 2050, but what do we do as a consequence?

Sea level rises are perhaps a relatively more straightforward thing to measure, and it is therefore relatively more straightforward to set in place the investments that are needed to deal with that. You can deal with that in different ways. It is not just about raising barriers. It can be about floodplains, about the acceptance of sacrificial areas of the coast where you will not be able to do anything about it. You can draw up that long-term plan.

We have argued that every five years one needs to take the latest evidence on board and readdress that, and clearly set out what is expected during the next five years. It is a challenge with the long-term infrastructure assets. They are typically designed for a lifecycle of anything from 50 to 70 years, which would be a more normal lifecycle for most infrastructure assets, and they take 10 years or more to plan. It can be 15 years from the time when you conceive something to the time when any substantial piece of infrastructure is completed. In a sense, your decision about whether it is the right one or the wrong one is foisted on you, but once you set off on your journey to deliver, the parameters are set. There needs to be a constant revisit. The Government need to recognise that perhaps they should set new standards as circumstances change.

To resist all this, the public will have to pay for it. Therefore, there is always the underlying issue as to what we think we can afford to pay, what we are prepared to pay, and the level of tolerance that we have for failures. We probably do not expect to be protected against absolutely every instance. It would be interesting if this debate were taking place in America today. What do we do, what could we do, about those sorts of tornadoes, and how would you design against them? There will be limits, and we have to find the right balance between what we as a society are prepared to accept, what we are prepared to pay and what can be delivered in a sensible timeframe.

Lord Laming: The tornadoes are a vivid illustration of the degree of risk that we are having to face. I imagine that you would agree.

Sir John Armitt: Absolutely.

Q4 **Lord Laming:** The committee would be grateful to be advised by the witnesses as to whether we are right in thinking that the degree of risk is getting greater because of the difference in timespan between the

infrastructure and the climate change. Are we facing greater risk than we have done hitherto, and is it something that we ought to be taking very seriously indeed?

Sir John Armitt: It is something, clearly. It would seem to be an interesting contradiction that we are designing for a very long time but the rate of change has accelerated. Given that the rate of change is accelerating, what do you do? Do you say that we have to be more adaptive and more flexible in our solutions? A very simple one would be to ensure that you design a sea defence or a flood-defence barrier in such a way that it can be relatively easily changed and increased in height as you see the changing parameters in the future.

At the moment, in the Thames Estuary, there are presumptions made about the point in time at which it is believed that another Thames barrier may need to be seriously considered and then built. On the current forecast, 2050 is the point in time at which that needs to be very seriously considered, and then built in the 10, 15, 20 years after that. Circumstances in the next 10 years may be such that that date has to be brought forward, so in a sense one has to be constantly measuring on the alerts and forecasting. Some of my colleagues here today, who are more expert in this than I am, would be the ones saying, "Here are some forecasts that need to change the infrastructure plans" and for government to work with the regulators and the various companies to deliver that.

Lord Laming: To what extent do you think the operators are mindful of these risks and are doing something about it, rather than thinking, as you have just said, of 2050, which seems to me to be a terribly long way off? We have had examples, as the Chair has indicated, in just the last few weeks. That seems to me—I may be wrong—to require quicker action than 2050.

Sir John Armitt: It is not an operator that has that particular ball in its court; it is the Environment Agency. Every private sector company, as a matter of course, does regular analysis of the key risks that are facing the business. The company providing the water supply, or telecoms, or electric energy systems will do that and will assess all those risks.

The real challenge is the lower-probability but very high-impact risks that appear up in the top right-hand corner in bright red. You ask, "What is the impact of that on our business, our reputation, our customers, and how are we going to deal with it?" Pretty well all utility companies are looking over their shoulders at the regulator, who will also be taking a view on that.

You could argue, and some do, that for the last 20 or 30 years the regulator's key focus has been on making sure that these guys are super-efficient and are keeping their costs down. There is growing recognition that considerable attention needs to be given to their investment programmes in the future and what they are doing to ensure the resilience of their systems.

Q5 **Baroness Neville-Jones:** What confidence do you have in the low probability, given that a lot of this ranking is based on historic record? It seems to me that if climate is changing, the likelihood of low probability is not going to be so low. How do you take the impact of recent events into account in assessing probabilities?

Sir John Armitt: I would argue that you can only take the best information that is available at the time. As a company you would be looking to organisations like the Met Office, and sitting down with its experts and taking its interpretations of the views looking forward. There is a host of people with views and a whole variety of experts who any organisation can sit down with. You choose the ones who you particularly want to take note of. Your own experts, your own risk assessors, will be doing much the same as an insurance company, which looks at all the risks and at the best data and information available to it, as to the changes that you are likely to face in the next three to five years. That would be typical for most companies. These are very long-term decisions for somebody who is a major owner of an asset that has a lifecycle of 60 years and takes maybe 10 years to build.

The Chair: The insurance companies have been in the forefront of this.

Professor Richard Dawson: I completely agree with Sir John, but I would add another element: stress testing. We have to look at plausible scenarios that we might not be able to ascribe probabilities to but that we know could happen. That allows us to look at things that we may not have seen before.

Dr Will Lang: A key source of information is the Met Office's UK climate predictions. The headlines from that, alongside warmer and wetter winters and hotter and drier summers, is that we see an increase in the frequency and intensity of extremes. We are right that these will probably remain high impact, low probability, but that probability is increasing. We can see that through all the recent events, not just the recent tragic tornadoes. There were a whole host of severe catastrophic events throughout the world this year.

Q6 **Baroness Healy of Primrose Hill:** I think all the witnesses agree that things will probably get worse more quickly, but recent research suggests that we may be closer than we had hoped to key tipping points in climate change, such as changes to the Gulf Stream. To what extent can we expect our infrastructure providers to prepare for the more drastic potential effects of climate change in the long term, and even in the short term? Without further action by the Government, or by regulators, or by the critical national infrastructure providers to improve resilience to climate change, what sort of incidents could you expect to occur by 2030, and how do we counter short-termism in this situation? You will all probably have something to say on that, so I should start with Dr Surminski.

Dr Swenja Surminski: Yes, there is a general problem with climate change, because we all fall into the trap of seeing climate change as a

gradual process. Particularly when you look at risk assessment, you take the information and you look at different scenarios but you think that this is an orderly process. You look at the long term through a long-term lens. What we all need to learn, and then change our decision-making processes on, is that climate change is hugely volatile. What might seem impossible and even implausible can happen, and it can happen tomorrow.

Without scaremongering, I have started a process, particularly with businesses and communities, of looking at different options—stress testing is a good way of doing that—looking at several events happening in close proximity or being interconnected, and not looking at this through just one lens.

We have become much better at preparing for single events. When it comes to infrastructure, we often think it through for flooding; there is a risk of coastal flooding and you can prepare for that. But there is very little when it comes to a holistic response. That infrastructure might be safe from coastal flooding but not from extreme heat or surface-water flooding. That is another dimension of climate change; it becomes much more interconnected. There is a lot that the science community can offer, but we also need to get better at communicating and turning that into decisionable information.

Professor Richard Dawson: I am not the best-placed person to comment on the tipping points in the climate system, but there are a number of important thresholds in our infrastructure's ability to cope. It is quite difficult to assess them, because often we do not have sufficient information about the condition of all our infrastructure assets across the country. One example might be older railway lines, which are usually less well able to cope with extremes of heat. They are more prone to buckling, and, consequently, above a certain temperature threshold, trains have to run more slowly and possibly even stop using that line entirely.

These are tipping points of performance and relate to designing infrastructure to historical climates as opposed to thinking ahead. As we see more times at which these particular temperature thresholds are exceeded, the performance and reliability of things like older railway tracks diminish. That is where we can start to tackle that, but it is not the only example of a threshold in the performance of infrastructure. There are many others across most of the sectors that could be exceeded, too.

Baroness Healy of Primrose Hill: Thank you. Sir John, I am sure you would like to comment, as you advise the Government on this critical subject.

Sir John Armitt: Yes, and having been responsible for railways buckling in the past. The point is that if you are an owner of infrastructure, you will have a lot of data about that infrastructure and you will understand where your risks lie. You will then, inevitably, in an allocation of budgetary resource, have to decide which of those risks you will apply the most funds to and how you address them.

You then have to sit down and agree with your regulator what you will do, and where the balance will sit between maintenance expenditure, for example, and long-term new capital expenditure. He will hold you responsible for what he regards as an efficient operation, but he will also have regard to the impact which that new investment and those costs will have on the costs to the consumer, the passenger. The outcome may well be that you do not invest as much money as you think you need to.

That is where I come back to saying: who represents the voter? Ultimately, it is the Government. The Government will have to grasp the nettle and ask: what are the resilience standards that we regard as acceptable, or that we think would be acceptable to the public? Equally, what do we think will be the acceptable cost consequences to the consumer, who will pay as the taxpayer or at the point of use?

One challenge as we face the climate change consequences on our infrastructure is that we may have to face up to some unpleasant realities, one being that if we want a very high level of resilience and reliability, it will cost us more and we will all have to pay. That requires a conversation. We need a conversation with the public about the risks to help them to understand the potential consequences. I would argue that there needs to be a very clear, well set out and statutory conversation between the Government and the regulator and between the regulator and the operator.

Q7 **Lord King of Bridgwater:** I was Member of Parliament for Bridgwater, which included the Hinkley Point nuclear power station right on the coast, and of course it had the Somerset Levels as well. On the issue of climate change, am I wrong in thinking that the world or the globe is becoming a bit more unstable? One nuclear power station has been destroyed by a tsunami. Is there a greater number of volcanic eruptions taking place?

Would any of our witnesses like to comment on whether the world, and the earth, is becoming a bit more fragile? We never thought that we would have tornadoes in the UK, but, with higher sea levels, are we going to face the risk of tsunamis as well?

The Chair: I think we will face the risk from sea levels.

Dr Swenja Surminski: On that point, we look at a wide spectrum of risks. Usually, we need to look at it through the lens of there being a hazard, which is the climate, which naturally can be vulnerable, but also human-induced changes. We see that having an impact across the board with heat, sea level rise, storms and so on. The other important components are exposure, where things are, where we continue to build, and vulnerability in the way our systems, our processes, are not geared towards these drastic impacts.

It is fair to say that things are getting worse on all three fronts—on hazards, exposure and vulnerability. Together, that is a toxic mix and it creates dramatic events, such as with nuclear power stations, where you see that playing out along the coast. You only need to see where most of the infrastructure assets are located. That is an important point to think

through in our Resilience Strategy. What can we do about hazard, exposure and vulnerability? Only if we get all three in good shape are we on the right track with resilience.

Q8 **Darren Jones:** I have some questions about policy development in government. Dr Surminski, you mentioned the Resilience Strategy just now. I am conscious that that is one of a number of policy documents within different departments across government. At a planning level and a risk assessment level, do you think that we develop policy in a coherent way with a clear position of policy leadership, or do you think that it is too disaggregated and that it is not clear who is doing what?

Dr Swenja Surminski: For a long time, we had this notion of needing to mainstream climate and climate adaptation. It is a topic that needs to be integrated across different branches of government, across different policies. That would be the right approach. I do not think that is happening. It also creates a lack of ownership and responsibility. Often, when you look at past lessons learned, you see that we are quite quick at pointing out where the gaps are and why there were failures or even gaps between layers of government, local to national. This integration and ownership could be supported. For example, the idea was floated recently of a resilience secretariat and some form of co-ordination with the different stakeholders.

That is an interesting component, but we also need to keep in mind whether those in charge, particularly at the local level, have the skills and resources to do that. We have seen this with local councils and planning policy. A lot of them are also struggling with the resources to follow through on planning decisions and on checking whether new buildings are built in a more resilient way. That is an important point: seeing how these rules are implemented.

Darren Jones: You said that the embedded policy development approach is not working. Why is it not working?

Dr Swenja Surminski: Ownership is one question. There is also often an overreliance, even sometimes a false sense of security, because it is perceived to be someone else's job to manage that. I have seen this in different contexts and different discussions.

What could also be an issue is that climate risks are often still seen as a hindrance or an additional cost. Particularly at local level, resilience is often seen as an added cost rather than an investment. That creates the notion of delay: "Maybe we can postpone action and turn to more immediate issues". These trade-offs often lead to decisions that might put us on a trajectory that is not resilient.

Darren Jones: Thank you.

Professor Richard Dawson: There is fragmentation in tackling a lot of these risks across government. Defra is typically the lead organisation for climate change, but the Cabinet Office has the lead in things like emergencies. In our most recent risk assessment, we identified that

pretty much every department in government has some key action or responsibility. Defra might be able to drive action and improvement in flood risk management, but if our planning policy contradicts that, our risk will still go up. There needs to be joined-up oversight, because a lot of the risks are in danger of falling through some of the gaps.

To be explicit about this in the critical national infrastructure space, the biggest gap is the cascading risks—who owns the interdependencies between different operators. Some co-ordinating body might have an important role to play in that. Our risk management is often geared to some of the shorter-term, high-impact incidences, but we are less well integrated when it comes to thinking through long-term chronic events or the interconnecting risks where climate change is so important.

Q9 **Darren Jones:** Thank you. Sir John, we have heard in the past, including from your Climate Change Committee, that at a policy level government is not getting on and preparing for the outcomes which the policies say it needs to prepare for. Why do you think that is? Is it a lack of ownership? Is it uninterest? Is it because the cost looks too big? Is it all those things?

Sir John Armitt: It is a little bit of all those things, but generally one has to recognise that these are very complex issues. Any of us who are there to provide advice and guidance will provide those recommendations on the basis of an analysis of various experts' opinions. Even then, having presented that, there may well be others who will say to a Minister, "We don't think that's quite right. We recommend something different. We think this is being overemphasised" or "This is being underemphasised". Industry will clearly have its own perspective. The time taken for government to develop a new policy could be a year or two.

Often my criticism is that things tend to stop; that there is the waving of the magic wand of policy. Great, but that policy will not deliver anything unless there is a very well thought through delivery mechanism or delivery structure, a whole plan that looks forward to the 10 years that will be necessary, and continued ministerial pressure on delivering it. In the past, we have seen Prime Ministers of different hues get frustrated by this and set up delivery units because they think things are not happening fast enough.

The challenge here is that these are very complex issues. There is the whole issue of co-ordination and collaboration across government departments. Government departments inevitably are not well renowned for being any better than individual divisions within a company. They are led by individual managing directors, individual Secretaries of State, who are judged on their performance as their division in a business or their particular department within government. You get more brownie points for succeeding as a divisional boss than you do for co-operating across your colleagues. There is the perpetual problem of incentive schemes within organisations and how you balance it out between the individuals, the division and the department across being seen to deliver for the whole of the company, the whole of government.

You inevitably get more and more discussion, more and more debate, more and more push and pull, more and more trade-offs, more and more compromise. The more people involved, probably the lower the common denominator of the decision. I do not think we should be surprised by what are essentially traditional government challenges and failures. We can try to learn from them, and I argue that there is a lot of evidence that we are not very good at learning from them.

There is no simple answer, but we are in a better place today. If you were to ask the public, and surveys that we have done of the public, about levels of satisfaction with their infrastructure, you would find that it is quite high. The one they are the most uncertain about is flooding. They are very confident about their water supply and their electricity supply. Their digital communication systems work pretty well most of the time, and we forget fairly quickly when something goes wrong. Overall, I would say that our infrastructure resilience in the UK is pretty good.

As ever, you get one-off issues—this comes back to our main point about how frequently these one-off issues occur—that cause a massive rush to have another report, another commission and another committee to be established to look at it, another set of recommendations. Sir Michael Pitt produced 92 recommendations from the 2007 floods, which government accepted. Not all of those will have been implemented, that is for certain, because as time goes by things tend to get pushed to one side in the interests of cost, very often, or a difference of views as to how best to interpret a recommendation.

I do not think we should be totally disheartened. As I say, by most international standards we have a high quality of infrastructure in this country, but clearly people will react to extreme circumstances like Arwen. We then have to ask what is the likely frequency of that and what we prepared to do to minimise the impact of those high-impact incidents, while recognising that we are not going to solve it in the short term. There has to be a long-term plan, which, as has already been said, can come only by setting out our standards and getting those implemented by operators and stress-tested regularly, in exactly the same way as happens in the financial community.

Q10 **Darren Jones:** Thank you. Dr Lang, my last question is more about how we respond, and please respond to the others if you wish to. I am conscious that the Met Office is the risk owner for five relevant risks in the national risk register. I am interested to understand how the policy works and how the Met Office is able to escalate issues, either to critical national infrastructure providers themselves or to the Business Secretary.

Dr Will Lang: I will start by echoing Sir John's comments. A lot of good stuff happens with the way our resilience system works. We do things pretty well on the whole. We should recognise that our resilience structures and the national security risk assessment process are internationally renowned. The process is highly effective in most cases in picking out the likelihood and severity of risks and their impacts. It brings in the wide range of experts that it deserves.

That brings me to the second point about the risk process itself and about risk ownership. The Met Office is heavily involved in the NSRA process, the recent review of NSRA methodology and how that plays out in the wider Resilience Strategy. As you say, we own several risks, most of them traditionally weather-related, but there is also space weather. It is our responsibility to come up with the sound evidence base of the meteorology and other underlying science and then work with government and other partners to assess those impacts to come up with the reasonable worst-case scenarios that underpin the NSRA. That is the process that we are going through at the moment with the latest iteration.

Darren Jones: How do you make sure that those organisations do what you want them to do, having done your risk assessment?

Dr Will Lang: The key role of the Met Office, as a risk owner, is to supply the underlying science. Then, we almost leverage the government departments to help us ensure that the risks are understood. There is a lot of working with the Cabinet Office. We also work closely with Defra on the flood risks, for example, and with various other departments. We are very closely involved.

The Chair: Lady Neville-Jones, I know that part of your question has largely been covered.

Q11 **Baroness Neville-Jones:** Not all. Sir John, you described in a pretty recognisable way some of the fragmentation of the government approach. If you had your druthers and you were able to redesign some of the government machinery involved, what would you like to see happen on the co-ordination of risk assessment and risk management and driving implementation?

Sir John Armitt: The puzzle for many of us who have spent a lot of time in the corporate world is what one would see as the relative lack of authority of the Cabinet Office. To me, the Cabinet Office is the equivalent of the executive committee of a large corporation, which then has a series of divisions. The role of the Cabinet Office is to make sure that the divisions fit into the grand plan or strategy of the company, dealing with their respective businesses but at the same time being held to account by the Cabinet Office for their performance, through to the Prime Minister or the chief executive.

What we see in government is far more power sitting in the hands of individuals. The success or not of an individual department is just as likely to be because of the political strength of an individual, who can be there for two or three years and is then followed by somebody with far less, with the consequence that one minute that department is seen as being all guns blazing and the next minute is floundering around in the backwaters.

For many of us, that is one of the challenges here, and it is a political challenge: that if you have this frequent change of Secretaries of State

and Ministers, direction will inevitably change. That causes uncertainty. There will be those who say, "Let's just sit on our hands, because in another 18 months he/she will be gone and the next one will be along. Then we'll start all over again, because they'll need to have a new policy because they're a new Minister and they'll want another set of research".

The continuity that you are looking for in the sorts of challenges that we are describing today, which are very long-term challenges that require long-term thinking, will almost inevitably not take place in a democratic political system such as ours.

Baroness Neville-Jones: You have described something that is familiar to people in this room. The Cabinet Office is much happier co-ordinating than driving. Is there a role for the National Security Council, or should there be a role for the National Security Council? Resilience is part of the remit.

Sir John Armitt: In any situation you have to decide on your governance structure. How much authority will you give the National Security Council, or is it simply a device for providing advice to the Cabinet Office? It does not matter, as long as people are clear about where the authority sits, what the decision-making process is and who is responsible for action and delivery. If you do not have that clear governance structure, chain of command, chain of understanding of where relative authorities and responsibilities sit, frankly a muddle will result.

Baroness Neville-Jones: So you are pleading for clarity.

Sir John Armitt: Yes.

Q12 **The Chair:** Sir John, you have been around and doing these things for a while. It is said that this was done more effectively in the Cameron Government when Oliver Letwin was playing a co-ordinating role.

Baroness Neville-Jones: An implementation role actually, Chair.

The Chair: Do you think that is just, or is it a popular myth and it has never been sorted out?

Sir John Armitt: I would not like to comment. I am sure that those who are much closer to the day-to-day activities could comment on that.

The Chair: I thought that I would try to tempt you.

Sir John Armitt: There is always somebody in every government who lays claim to that power.

Professor Richard Dawson: I cannot comment on that specific point either, but the Climate Change Committee has previously suggested that the Cabinet Office could take a stronger role in cross-government co-ordination of these issues.

I also want to bring in the point that we have a lot of good processes that, if they were strengthened, could embed climate adaptation and risk management more robustly. Think of shoreline management plans, for example. We talked earlier about the Thames and long-term flood management, and the possibility of raising the Thames barrier or constructing a new one in a few decades. That is one example of the many shoreline management plans that are undertaken and implemented around England and Wales. It is a very good process. It is holistic, looking at a wide range of hazards and issues spanning social, economic and environmental objectives and impacts. It is long term, looking ahead 100 years or so. It also brings together a wide range of stakeholders and communities. What is interesting is that it is not statutory. There is no guarantee that all the great planning and thinking will be implemented.

To give the Thames Estuary as an example again, there is no legal requirement for councils or riparian owners to implement and follow that plan in making their planning decisions, for example. That is an example of where we have some of the tools, but they are not implemented rigorously enough, they do not have enough strength or legislative credibility, and they are obliged to be incorporated into planning.

The Chair: Interesting.

Baroness Neville-Jones: Sir John, do you think that more statutory responsibility clearly set out in law would help?

Sir John Armitt: Yes. I think that statutory responsibility is clear in the same way as setting standards is very clear. I think you can drive innovation by setting standards. You do not have to set a standard for next week; you can set a new standard for five or 10 years' time that you expect your infrastructure to achieve. We recommended to Government for example that long-term probability standards were set for flooding, which the Government have declined to accept. We were not saying that you had to raise everything to a particular standard in the next five years. We recognise that that would have been done on a risk-assessed basis over the next 30 years, but in 30 years' time you could have had the whole country set to two specific risk-probability levels—rural and urban—so that there was equality of protection against flooding across the country.

The Government have done a good thing. They have allocated several billions of pounds more over the next five years. That is a good example of government taking a short-term perspective on this. Arguably, instead of saying, "Here's another £5 billion for the next five years", it might have been better to say, "Here's another £15 billion over the next 10 years", or whatever it might be, say £3 billion a year for the next 10 years rather than £5 billion up front. The Environment Agency would have had greater ability, as has just been described, to work on and set out its long-term plans knowing that it had that certainty of finance coming through to make those plans and take them on a long-term journey.

The Chair: That is the purpose of the organisation you head, Sir John.

Sir John Armitt: It is.

Dr Swenja Surminski: We have another example of where an integrated, cross-government approach is needed, and that is the net-zero strategy. This provides a huge opportunity for the Resilience and Adaptation Strategy to be intertwined with that. One of my concerns is that we do not understand that resilience and adaptation will also play a huge role in our ability to achieve net zero. Look at infrastructure. Every extreme event can easily also throw us back in our ambition to reach net zero, because dealing with these disasters is hugely detrimental; it requires a lot of additional power and rebuilding and so on. In a way, there is an acceptance across various government agencies that this requires an integrated approach, and if we add to it and interlink it with adaptation and resilience, that is an opportunity for this topic.

Q13 **Baroness Hodgson of Abinger:** My questions are about the Government's thinking. What is your assessment of the Government's ambitions for the forthcoming Resilience Strategy? Do you think this vision is achievable, or are the Government trying to achieve too much under the umbrella of resilience?

Baroness Neville-Jones: And is it long term enough?

Baroness Hodgson of Abinger: Who would like to start with that?

Baroness Neville-Jones: Nobody.

Baroness Hodgson of Abinger: Nobody?

Sir John Armitt: What is government strategy likely to do, to be realistic? It is likely to bring together its existing thoughts, actions and strategies across the different sectors and combine those into a new, overall publication similar to what the Government did recently in the Net Zero Strategy . The commitment that has to be made is to take a whole-society perspective to this—to take a cross-society, cross-discipline approach. The comment that Dr Surminski just made is important. We cannot take these things as separate strategies. The net-zero strategy will have to sit alongside a Resilience Strategy.

We will become a society that is much more dependent on electricity, there is no doubt about that, and there are risks in how that electricity is generated and how we can reduce demand. We always talk about ensuring that we supply sufficient electricity, but the behavioural changes that we will need to influence demand, which we can do in different ways, have to be seriously considered.

We talk about the resilience of our water supply systems. Our water supply systems are predicated on a certain assumption about how much water we use each day. We need to think carefully about how we can influence ourselves with regard to the demand that we place on water supply systems, and about what we can do to reduce it in the standards

that we put into our new homes. A simple approach needs to be taken to how much water comes out of the tap or the shower.

The Chair: It has long seemed to me, I must admit, Sir John, that our assumptions about water supply are predicated on an assumption that water will continue to fall gently from the sky all year and can be stored safely in large, open reservoirs, which I also have some qualms about.

Baroness Hodgson of Abinger: Have you received any indications about the extent to which the Strategy is likely to address CNI resilience to climate change?

Sir John Armitt: No, I do not think we have.

Q14 **Lord King of Bridgwater:** As I understand it, we are currently going through the National Adaptation Programme from 2018 to 2023. To a layman, that seems a pretty long period, when one senses in the world of climate change that an awful lot more is on the move. Is that too long a period? Should there be more opportunities to upgrade it as the five-year period progresses?

Sir John Armitt: When you say the national adaptation strategy—

Lord King of Bridgwater: The National Adaptation Programme, which I understand runs from 2018 to 2023. Is that right?

Professor Richard Dawson: That is correct, yes. The timings for some of these things are often out of sync. We have just published our third Risk Assessment. That will feed into the third National Adaptation Programme, and of course the second fed into the Programme that you are referring to.

Every two years, the Climate Change Committee provides a progress report where we assess and essentially mark progress on key sectors in delivering the National Adaptation Programme and make recommendations for what we think our priorities should be as we move forward. I think you are absolutely right. It would be useful to look again at the timing of a lot of these different strategies. We talked about the NSRA earlier as being a two-yearly strategy. Some of them need to be a bit more joined up in how they feed information through, and we need to rethink some of that frequency.

It comes back to a point that was made earlier about keeping that information up to date but also giving us time to put some action on the ground. Some of the actions we are talking about take time to feed through. Developing new policies, new standards, or indeed building new infrastructure, does not happen overnight, so we need to find the right balance. I am not sure we are there yet. Maybe it needs to be a bit more frequent, but perhaps not too much more.

Lord King of Bridgwater: There are 13 sectors of critical national infrastructure. Is that right? I think Sir John Armitt just made the point that I was going to ask about, and I am impressed by it. It is that

electricity runs right through the key sectors. In the critical issues that occurred recently over Storm Arwen, electricity was at the heart of a complete breakdown in communications, and it seemed to me that people were desperate. They could not charge their mobile phones and they lost the internet—all the newer ways of communicating. Would you like to comment on that?

Professor Richard Dawson: Do you mind if I pick up a point here? You are absolutely right. Not only did Arwen expose this, although many other events have exposed this before, but with Arwen we see that the issue is getting worse. We are becoming more reliant on electricity, which of course will continue as we embark upon and implement our net-zero strategy. Dr Surminski's point about weaving climate adaptation into delivering net zero is absolutely fundamental.

One of the things that concern me is that whereas we see some sectors with tighter regulations and more reporting requirements are making better progress on adaptation around climate-related risks, some sectors—and I include telecoms—are not reporting their risks through the adaptation reporting power that exists, so we often do not understand the magnitude of those risks. For example, no one has picked up that as we switch off our old copper landlines and move towards a purely digital telecoms system, it compounds some of the interconnectivity risks and, of course, makes resilience and response far more challenging.

This comes back to the point I made about shoreline management plans. We may be underusing the adaptation reporting power at the moment. We need to make better use of it to ensure that all our CNI, and indeed the organisations that deliver and assure our food and the materials supply chains and so on, report through it. I very much encourage the Government to consider making it compulsory again for key infrastructure providers to deliver these reports, because there has been a reduction in the number of sectors and organisations reporting over repeated cycles.

The Chair: That is a very good point. I am very mindful—it struck me when I read about this change—that, in the aftermath of 7/7, mobile phone operators closed down their networks, for the obvious reason that everybody was trying to ring everybody else and cut off swathes of society from communication. That was in one area—all right, it was a large area and it was a big problem—but with a weather event like Arwen, you could have a much greater impact of that kind, with all the attendant consequences.

Professor Richard Dawson: One thing that struck me, and surprised me, about 2015 and the flooding in the centre of York was that it knocked out a telephone exchange that then disrupted blue light services as far away as Tyneside, so about 100 kilometres north. That is one of the interesting things about some of our infrastructure disruptions; they are not localised and can spread far beyond the initial hazard footprint.

The Chair: This is exactly why this committee is looking at this issue.

Sir John Armitt: The 2019 lightning strike was an interesting example of this. Five per cent of the grid was disconnected as a precaution, which took out the operations of Newcastle Airport. Nobody had recognised, nobody at Newcastle Airport itself had recognised, that the airport was not seen as a critical operator, so it was just lumped in with the domestic homeowners who had their electricity cut off.

Q15 **Baroness Hodgson of Abinger:** I want to ask you about where responsibility lies and whether there are clear divisions of responsibility and lines of communication between the different levels of government in the UK—between the local, devolved and national levels.

Sir John Armitt: Most of it will sit at the national level. Quite a lot is devolved to the other nations, but if we stick for a moment to focusing on England—decisions on most of these key infrastructures are held at a national level, and direction is given to the regulators—we have to remember that most of these things are in the private sector. Government only invests in transport and flood defence; everything else is private sector. Everything else goes through the regulated industries, which is why I come back to the point that the NIC has been recommending very strongly that the direction has to come from government as to what it expects from these industries.

Government represents the consumer, at the end of the day, so it has to give clear direction to the regulator as to what it regards as the important issues. With resilience, for example, it sets out standards that it expects from each sector. The operators then need to report to the regulator on how they will meet those standards. A couple of us have said today that that needs to be stress-tested regularly, overseen by the regulators, to make sure that the companies can meet those extreme tests, and that the regulators recognise that that may well require investment and that it is part of the settlements that they reach with the private sector companies.

Professor Richard Dawson: I completely agree. The regulatory landscape is different for each sector, and different degrees of clarity of responsibility and different levels of importance are placed on resilience. The Water Industry Act 1999 explicitly refers to a resilience objective for the water sector. Other sectors do not have that. We need to be mindful of the risks that fall between the sectoral cracks, the interdependency and who owns that. This is where there is often a lack of clarity.

We have talked about the top end of the business, but we still need to look at local government, local resilience fora and communities and their different roles. I am not sure that that is always clear. Indeed, there is variability between local resilience fora, and of course there are huge pressures on local government funding, which makes tackling some of these risks different.

I re-emphasise that long-term systemic risks need high-level overview and co-ordination from the centre.

Dr Swenja Surminski: I think we have come quite some way on the flooding side and that there are some good examples of how things can improve, but it is very siloed and one-dimensional and there are too many cracks. That needs to be a focus, because we live in a multidimensional world. We need to be quite clear about what we mean by resilience. We can set standards, we can talk about adapting to a 2-degree world, but businesses, individuals, customers and so on all experience resilience differently.

That is why it is so important that there is a chain, starting at the community level, that receives the same information and evaluates its own resilience. We work with communities across the country on this.[1] It is very important that local businesses, local councils, local infrastructure providers all come together, but there is a chain that pushes this onward and functions across various hazards, various perils, not just one.

Q16 **Darren Jones:** I want to follow up on a couple of points that have already been raised and just check my understanding. Professor Dawson, you mentioned the interdependencies between CNIs and the gap between regulated sectors. There is probably a Minister who is responsible for this, other than the Prime Minister, ultimately, but who is it?

Professor Richard Dawson: I am not aware that anybody has infrastructure dependencies in their ministerial portfolio, but if it came anywhere I would presume that the Cabinet Office is the department to have that kind of cross-sectoral overview. It might implicitly come under the Cabinet Office remit, but I am not aware that delivering and implementing resilience across infrastructure sectors is explicitly owned by anybody.

Darren Jones: An implicit brief is probably not very deliverable. Sir John, do you know who is responsible ultimately?

Sir John Armitt: No, I confess that I do not. There is a regulators network, but that is more of a voluntary coming together of the regulators whereby they agree to work with one another to try to understand how they best interact and how they can act in a way that recognises some of these interdependencies. Beyond that, I do not know, but rather like Richard Dawson I would assume that this sits within the Cabinet Office. We have our National Security Council sub-committee on threats, hazards, resilience and contingencies, but I do not know how that comes through to the regulators. The regulators work to their individual Ministers, whether in DCMS, DfT or BEIS.

The Chair: As I recall, the Cabinet Office houses the Civil Contingencies Unit, so that suggests that if it is anybody, it is them, but, from your comments earlier about the weakness of this aspect, perhaps not very satisfactorily.

Darren Jones: Dr Lang, the Met Office reports to Ministers. Do you

[1] Note by witness: Dr Surminski later clarified that this work took place as part of the Flood Resilience Alliance.

know?

Dr Will Lang: I do not believe there is a single Minister with the specific responsibility for CNI resilience to climate change. However, I am aware that the Defra Secretary of State has some powers to request resilience plans from CNI managers under the Climate Change Act.

Darren Jones: Dr Surminski, who should it be, if there is no one?

Dr Swenja Surminski: I think there are two options. Either it is someone who is appointed—I guess we have all said that, because it is a central role, maybe it should be someone in the Cabinet Office—or you have a cross-Government approach to this. In the past, there were so-called adaptation and resilience champions in all departments. I do not know what happened to them, but at some point there was this process, and there are probably ways of collaborating and engaging at official level. There probably needs to be central ownership, and I guess that points towards the Cabinet Office.

Q17 **Darren Jones:** Sir John, one final supplementary from me on regulators. I am coming to the conclusion that maybe they have been focusing on efficiency, competition and consumer pricing because they have been asked to do so. We heard, I think from Professor Dawson, that some regulators have been given a mandate to look at resilience and others have not. Would you conclude, from a National Infrastructure Commission perspective, that the regulators are not pushing hard enough on resilience investment and therefore may need to change their mandates if they do not already have it?

Sir John Armitt: In defence of them, I am sure they would say that they do seek to do this and, as has been said, some of them specifically have that obligation. I think we need consistency from government across all the regulators to make sure that there is that statutory obligation on them all to take this into account. The more they take it into account, the more it will inevitably have to be balanced against their other requirement to try to keep costs to the consumer down.

The regulators are in a critical position in all this; they sit in the middle, in a sense. I would argue that they are as much facilitators as they are regulators, facilitating the conflicting objectives of the different parties. They are there to try to balance the long-term requirements with the short-term demand and the short-term costs, and at the same time recognise that there are long-term demands that require long-term investment. Getting that balance right is their big challenge, and the Government need to give them clear directions as to how they see that balance, because the Government speak for the public.

Q18 **Baroness Neville-Jones:** We have largely covered this subject, but in the light of what you have just said, Sir John, do you think that the contribution of placing a resilience duty on the regulators would bring about a greater degree of focus on that issue and standardisation of approach? It seems to me that the regulators have very different remits

stemming from different historic beginnings, and there is very little standard shape to their duties.

Sir John Armitt: Yes.

Baroness Neville-Jones: What do you think about that?

Sir John Armitt: I think it is a good point. One might say that now is the time to have a good look at whether there is consistency across the direction they are given, against the very significant challenge that we have been discussing today. Regulators will say that they are independent, but they have to act within a framework, and that framework needs to be set down by government in a consistent way.

Baroness Neville-Jones: And statutory?

Sir John Armitt: Yes.

Baroness Neville-Jones: Yes, that is what I think, too. Thank you.

Q19 **The Chair:** We have come to an end, but could I venture, with apologies, to ask if somebody would like to give us an indication of what they think stress testing would look like in practice?

Sir John Armitt: I will have a go. In a sense, stress testing is saying, "Here is a series of outcomes that we wish to achieve. Here is a series of standards", and you would then have to sit down and devise how you would do that. Largely, you would have to do it in a theoretical sense. You cannot just whistle up the wind, so you have to test things against how your infrastructure will react to changing environmental circumstances in a modelled way.

I am sure there will be no shortage of people able to pull together the appropriate models, the algorithms and so on to do that. I am not suggesting for a minute that it is easy, but clearly, from the scale of what we have been discussing today, it is necessary as a way to try to make progress. Dr Surminski is probably more of an expert in this area than I am.

Dr Swenja Surminski: We are currently experiencing a wave of stress testing in the financial sector. I do a lot of work with the Bank of England on climate stress testing, and I think there are interesting lessons to be learned. I do not want to go into detail, but the key point is that a stress test is only as good as what you do with the result. That really needs to be part of the process. I have noticed that particularly in the corporate sector there is a tendency to take reporting, stress testing and scenario analysis as part of adaptation in itself. You only adapt or become resilient when you take action, so that needs to be part of the process, but there are some interesting lessons coming out of the financial services sector.

Baroness Neville-Jones: If COBRA can fake a tourist incident, it ought to be able to fake outage of some kind.

The Chair: A good point. Thank you very much. Thank you very much

indeed, all of you. It has been interesting and stimulating, if perhaps rather alarming. I am very grateful to you for coming and giving evidence to us today.