Joint Committee on the National Security Strategy

Oral evidence: Critical national infrastructure and climate adaptation

Monday 21 March 2022

Watch the meeting

4.30 pm

Members present: Margaret Beckett MP (The Chair); Baroness Anelay of St Johns; Lord Butler of Brockwell; Sarah Champion MP; Baroness Crawley; Lord Dannatt; Tobias Ellwood MP; Richard Graham MP; Baroness Hodgson of Abinger; Darren Jones MP; Sir Edward Leigh MP; Baroness Neville-Jones; Lord Reid; Lord Snape; Viscount Stansgate; Bob Stewart MP.

Evidence Session No. 4 Heard in Public Questions 48 - 62

Witnesses

I: Jim Dempsey, Director of Service, Digital and Networks, BT; David Wright, Chief Engineer, National Grid Group; Martin Frobisher, Group Safety & Engineering Director, Network Rail; Nevil Muncaster, Strategic Resources Director, Thames Water.

Examination of witnesses

Jim Dempsey, David Wright, Martin Frobisher and Nevil Muncaster.

Q48 **The Chair:** Welcome, and thank you very much for giving evidence to us today. This is the fourth formal evidence session for our inquiry into critical national infrastructure and climate adaptation. We are grateful that today we have with us some of the key infrastructure operators. I point out that this is a hybrid meeting: some of our committee members are joining us virtually, as is one of our witnesses, Mr Dempsey from BT.

I will ask a general question to start us off. As everyone has noticed, there has been a recent run of extreme weather events. What lessons, broadly, have you learned from that, and what impact do you expect those lessons will have on the longer-term resilience of your

infrastructure?

Nevil Muncaster: I am from Thames Water. I will go back to recent storm events of February 2022—I think that is what the Chair referred to—and give some context to them. They mostly hit our sites in the south of London and up into the Thames Valley. One of the key issues for us was our interdependency with power distributors. I will put that in context. Over the two days when we experienced those storms, we had around 1,250 power cuts, and around 550 operational sites went out as a result. Over the weekend—the storm ran from the Friday through to the Monday—we managed to bring back in the 10,000 customers, total, who were affected by those power outages in the south-east. That was mostly within 24 hours, but a small core of about 5,000 customers were affected over three days. It was really about getting the power networks back on and getting our systems up and running again following that.

I will put that in context. Clearly we knew that the storms were coming, and we planned in advance, so we already had many preparations in place for those storms coming in, which proved very useful. They included things like having our reservoirs full so that we did not have to pump water into them if we had power outages, and we deployed resources, knowing that there would be more events—wind, and sites with assets blown about. We also had people who could recover sites if they went down in the event of an eventual power supply failure. We knew that would happen, and we put measures in place to recover from that.

On the learning from that, preparation is clearly everything. We knew that this would happen—this was an event where you would expect power outages, with many sites affected—and planning was good. We also learned that improving relations with the power distributors is key. We already have good relations, and we found that those relationships enabled us to prioritise how we brought sites back on and how they restored their power supplies to us to enable us to get customers back on to essential water services.

One thing that came out of this is that although Thames Water is seen as one customer, actually that one customer at one site can serve thousands of people. So we need to work on how we can prioritise better, based on the number of customers and citizens to whom we provide water when those power events happen.

That was the main impact. It is about us being prepared and using technology even better in future to understand the impact and deploy resources even faster. But it is also about working across sectors to make sure that we can restore services more quickly.

Martin Frobisher: I am from Network Rail. For the railway, we are certainly seeing more incidents and more severity of weather; there is no question about that. Climate change is here right now; it is not something for the future. We are certainly observing that in the data that we record.

For us, the most significant recent incident was the Stonehaven train crash, which was the first fatal train crash in over a decade. Following that, we did a huge amount of work to follow up and learn from the incidents. We employed two world-renowned experts: Dame Julia Slingo, former chief scientist at the Met office, and Lord Robert Mair, who is a professor at the University of Cambridge, a Member of the Lords and a world-renowned earthworks and geotechnical expert. We got a huge amount of information from working with those two experts. What struck me was a comment from Dame Julia Slingo, who said, "You at Network Rail procure weather-forecasting services and specify the ones that you want. But you don't know what's possible. You're not experts in weather forecasting. Let the experts in weather forecasting tell you what is possible, rather than specifying what you want in a contract".

Since we followed that advice, we have got much better weather-forecasting technology. We have a convective alerting tool, which uses very high-resolution weather data and super-computing power to be able to spot localised convective storms. We are then able to radio train drivers to slow down and control the speed of trains during extreme weather. So we have learned a lot from those experts. There is still more to do, but we have found the whole process of employing some of the best experts in the world and letting them guide our strategy very helpful.

David Wright: I am chief engineer for National Grid and group director for business resilience and safety. Having three storms—Storms Dudley, Eunice and Franklin—within five days caused unprecedented weather conditions. I will put that into context: they were the worst storms ever to hit our electricity distribution network covering the south-west of England. We had just under 2,800 faults due to Storm Eunice, and about 528,000 customers went off supply as a consequence. Our engineers were able to restore all those customers within four days, working in sometimes atrocious weather conditions, as Storm Franklin came in behind.

We are incredibly grateful for the patience of our customers. Four days off supply is a long period of time, but throughout that period our engineers were working night and day to get people back, and we did an immense amount of work to support the vulnerable in society, working with the local resilience forums and voluntary workers and sectors to make sure that everyone who needed warm food and heating had it. We deployed diesel generators to people who needed it.

From Storm Arwen and Ofgem's independent report into the performance during it, we saw that our distribution and transmission network performed incredibly strongly. Some 99% of our customers were back two days after Storm Arwen. To give you a sense of it, our transmission network, which is the motorway network of the electricity industry, had about 45 faults. Virtually every circuit was returned automatically through our automatic reclosure systems, whereby we isolate the fault and put the circuit back into service. So we were incredibly proud of the network

and the response in quite unprecedented weather conditions, which we know we can expect to continue to occur in the future.

We are a big believer in National Grid. We deliver world-class levels of resilience and reliability by being able to systematically think through how we plan for resilience events, build this into our forecasting capability and long-term asset strategy, and then make the necessary reinforcements to the network.

Ofgem's report talks about how the industry has spent £1 billion on vegetation management, cutting back trees close to power lines over the last eight years because they are one of the most significant causes of faults when those storms come through. Our key lesson learned is to do the basics well and plan for that. Our approach is to constantly adapt our resilience approach so that we learn from every storm or significant event and make our networks even more resilient.

Jim Dempsey: I too would go back to Storm Arwen on 26 November. There are rich learnings in every one of these events. Some of the learnings concern the preparation that we do prior to storm season. To set context, we start our preparations going into the storm season, as we call it, around late August and early September, and we do all our work on building firebrick gutters, drainage, pumping equipment, cable ducting, all that stuff, so that we maintain our engines.

That is all done prior to entering into that real high-risk storm season. That stood us in good stead in our response to Arwen, Dudley, Eunice and Franklin. Having said that, the impact and ferocity of Arwen in particular—and Dudley, I think, although they hit different areas of the UK—was quite unprecedented. That tested us and our engineers to the limit in looking after our customers and getting their service back.

During Arwen in particular, which was the probably the highest-impact event for us—Dudley was similar, but because the power came back more quickly, it was better—in our core network estate, which consists of about 5,500 exchanges, we saw something like 1,800 engine runs during Storm Arwen. The average duration of those engine runs was around 7.4 hours, which meant that power was coming back after about seven and a half hours on average, although there were outliers in that data; we had to keep one engine running for 23 days, so we were continually refuelling it to keep service up.

Our core network stood up pretty well. There are 82,000 street cabinets in the access network, which is more in Openreach territory. Those cabinets have a four-hour battery back-up. We have practised getting round to those cabinets and changing batteries as the batteries start to exhaust, and we did it quite well.

There are about 20,000 sites in our EE mobile network and we saw about 1,100 sites impacted, not across all technologies—we were not losing 2G, 3G, 4G or 5G—but at least one technology was impacted across those. The lessons there were our speed of response using all our assets—

whether tow-to-site generators, remote-response vehicles, or emergency response—and working out the best way to deploy those and to the best effect for our customers.

That is where I would probably draw a wider lesson about the ability to co-ordinate across the sectors, and interconnectivity across those sectors—across power, telecoms, rail and water. We have mechanisms in place—we have various local resilience forums, local resilience partnerships, the EC-RRG, all that stuff. All of that was going on, and all of that was working. An improvement would be a less siloed approach. You tend to talk to operators in their silos and less across, so there is not as much sharing of information as there could be.

To give you an example, power engineers were reaching out to us through the civil resilience forums and asking whether we as BT could deploy a remote vehicle that would give them a mobile signal, because they had lost signal in the area where they were working. We could have done that, but it turned out, as we developed that idea a bit further, that they were all connected to the Vodafone network, so there was not a lot of point in us bringing the EE network to them because they could not connect to it. That level of co-ordination, interoperability and sharing of data and resources would be valuable. A wider lesson that we have drawn is that ability to co-ordinate across the sectors.

Q49 **Sir Edward Leigh:** To what extent are you and your regulators currently getting the balance right between keeping consumer prices down and ensuring sufficiently high levels of resilience? I ask that, because—excuse the pun—we are facing a perfect storm in the cost-of-living crisis. These climate issues will be with us for decades, and they might get worse or better, but given the prices that people are paying for utilities, rail and so on, there is an absolute cost-of-living crisis now, particularly in many poorer constituencies in the north and in the midlands, such as the one that I represent.

I ask my question in the hope that you will give a positive answer. Of course resilience is important, but it is a very long-term thing. Really, I am asking you to confirm that you are aware of the cost-of-living crisis. Well, obviously you are aware of it, but I am asking you to confirm that it is a focus of your attention.

Nevil Muncaster: First, we totally agree and understand that there is this crisis. Affordability is a really big issue, and it is something that we are very mindful of when it comes to the protection, and the access to us, that we can give customers where they have an issue with affordability.

You are right: it is a very difficult challenge, because we do not want to push back resilience such that future generations have to pay for it or have to suffer as a result of us not investing now. There is a real challenge and a real dichotomy there. That is where we need to make sure that we understand the current risks and how much we want to bear at this stage against the level of investment that may be required.

We also need to understand how we better protect customers, particularly those who cannot afford to pay, and support them better through some sort of social tariff, making it widely available and more widespread, and allowing those who can afford to pay to carry on, while those who cannot pay do not get hit or disadvantaged by our future investment to protect future generations.

Martin Frobisher: For us, the way I see it is that there is almost a continuous scale from "Do nothing" at one end to "Make it bomb-proof" at the other. For the railway infrastructure, it is not economic or affordable to take an infrastructure that was built over 100 years ago and make it completely bomb-proof. That is just not affordable for the nation. So we are trying to position ourselves somewhere on that scale. Doing nothing would be wrong, but making it bomb-proof is completely unaffordable.

Where we want to be is having a really mature conversation with our regulator and the Government about the right point on that scale to be at. We know that it is neither of the extremes, so it has to be somewhere between the two. We as railway experts can really inform the Government on the choices. We understand our infrastructure and have good modelling of weather patterns for the future, and we can inform that with some sensible choices and then have a sensible conversation with our regulator and the Treasury about the right choice. That is where we want to be.

I reassure you that we are not focusing on rebuilding everything and making it bomb-proof. We are trying to use clever technology where we can. I mentioned earlier the convective weather alerting tool, which allows us to spot intense storms and manage railway safety in real time. We are using lots of clever telemetry instrumentation from our earthworks and other assets, so that we can manage the effects of weather rather than making everything bomb-proof. We are really keen to offer the Government options that offer value for money, recognising that it is impossible to make it completely bomb-proof.

David Wright: We absolutely understand that a key trade-off for a regulator to make is between customer bills on the one side and the level of resilience on the other. It is one of the things that drives us every day: how we deliver the very highest level of resilience and reliability that we can for our customers but at the lowest affordable price.

There is also a reality associated with it. Between 1980 and, I think, 2019, we had already seen a threefold increase in the number of significant events happening here in the UK. We also have to recognise that the world in which we live is fundamentally changing. As we move through the energy transition, we have to find a fair and affordable way of delivering the infrastructure that we will need as part of that energy transition, as well as making sure that we are resilient at the same time.

Similarly to some of the other companies, we are investing quite heavily in automated switching systems. We are investing heavily in using

artificial intelligence and improving the condition and the information of our networks so that we can optimise the engineering solutions. For example, we have thoroughly looked at the flooding risk on our network. We installed permanent flooding defences around a few of our sites, but at a number of our sites we decided that the most cost-effective way was to buy a large amount of mobile flood barrier, which we then deploy where it is needed, because normally we get enough notice of flooding events occurring around some of our less significantly impacted sites.

That is just one example of the types of different engineering solutions that you can have against the risk, but we need to recognise that the risk is growing.

Jim Dempsey: We are very conscious of the challenge here and the positions our customers find themselves in in the current economic climate. We provide social broadband tariffs to all universal credit recipients at cost, and we will continue to do that. The balance of investment and resilience versus costs to the customer of using a service is something that we are very aware of, as are others. Every time we look at what we need to do to make the network even more resilient, whether that be the broadband network or the mobile network, a strong cost-benefit analysis is applied to that. Similarly to what other people have said, we make those decisions on the best cost, given the maximum benefit, and we are very attuned to that.

When you look at resilience and at reducing the cost of providing it, however, I still think that there is a lot we can do as an industry collaboratively. Similar to the digital twin project that is going on right now, we can start to use those AI, API and data-sharing techniques to allow us to understand better how best to provide the resilience at a UK level across critical mass infrastructure.

Q50 **Darren Jones:** I do not think that any witness directly answered the question. I just wonder whether anyone is able to tell us today, in pounds and pence, how much of an average customer's bill in your organisation or sector is being spent on resilience today, and whether that will go up or down, say within the next year.

Nevil Muncaster: No. I can tell you that our total bill is about £400 a year on average. That is regulated, as you know. It is set every five years. I could not give you a number for how much of that is resilience. It will not go up next year because of resilience; it will change only depending on what was determined at the last price review. Every five years, we have to submit a plan to Ofwat, the regulator, which will assess, first, whether that plan is good or not, and, then, whether we have made a sufficient case for the investment that may be required.

Also, in water in particular, Ofwat now has a resilience duty, which is one of the things that you were looking at. It calls us in at each price review to assess resilience, and we explain what we are doing to enhance and improve resilience in the immediate and the long term. Perhaps we can come later to how we are planning for that.

On your question, there is no impact or increase next year specifically in relation to resilience, other than what is already built into the five-year plan. Resilience is part of that five-year plan.

Darren Jones: Okay. Presumably you can write to us with the answer if you check how much of the average bill is spent on resilience.

Nevil Muncaster: Resilience may not be the answer, but we can tell you the components of that plan, which may help you to understand.

Darren Jones: I am conscious of the time, so, in the kindest possible way, I do not need the same answer at length from each sector, but if anyone has the pounds and pence figure, please offer it now. If not, it would be great if you could write to the committee.

David Wright: The only thing I would add is that there is a large amount of asset replacement expenditure, which we consider a separate but key part of resilience expenditure. We have specific resilience investments, such as flooding investment, but we can follow up afterwards and explain how much.

Martin Frobisher: We can give you the investments, but normalising it per ticket on a train. We will have to write.

Darren Jones: Presumably it will be the same for BT, Mr Dempsey. Do you have the pounds and pence figure, or would you like to write to us?

Jim Dempsey: I cannot give you that data right now. We will have to come back on that.

The Chair: Mr Frobisher, you mentioned the need for a conversation between your regulator and the Government about how much should go into resilience. Are those conversations happening as far as you know? If they are, who is leading them?

Martin Frobisher: Yes. We are leading them with our regulator, the Office of Rail and Road. We will soon be entering our next funding control period, from 2024 to 2029, and we are setting that out. Our proposals for the next funding control period involve a significant increase, almost a doubling, in expenditure in earthworks and drainage, which are our most vulnerable assets for weather resilience.

You will also see that we have submitted our climate change adaptation reports to Defra, which set out the methodology. We recently submitted our third adaptation report, and it is published on the website. Our methodology for risk assessing that and the way we have come up with our proposals is very transparent, and we are now in the process of having detailed conversations with our financial regulator.

Q51 **Baroness Neville-Jones:** I would like to continue on the theme of a resilience duty. What would be the impact of a statutory resilience duty on all infrastructure operators that was overseen by regulators?

Nevil Muncaster: —

Sound lost. Committee suspended.

The Chair: Apologies to our members who are watching virtually, and to Mr Dempsey, one of our witnesses. As you may have gathered, our sound went down, which meant that we were not able to communicate. Where were we? Mr Muncaster, had you finished?

Nevil Muncaster: Not quite, but I will wrap up quickly for you just so that we can move on. I was talking about water resource management planning, building resilience into long-term water resources and the fact that it has now moved to a national process that fits into the statutory resource management plan. That is the resilience in water.

There is now an equivalent on the environmental side, which is the drainage and wastewater management planning process. The intention is that that will become statutory, although it is not yet. The first draft will be submitted in June this year. It is the same on the drainage side, so it is very much about looking at catchments and how they drain. What it does well is to start to bring other stakeholders that impact drainage. We may manage combined sewers, but the water that finds its way into that is from local authorities and landowners, and we want to make sure that that process captures all people who contribute to surface water and drainage, such that we get a plan that is integrated in the long term and builds resilience not just for sewers and sewer flooding and dealing with sewage and the environment, but for drainage generally. So that process is ongoing. It will become statutory, and that will be the basis for moving to a more formal resilience process.

Q52 **Baroness Neville-Jones:** I have two further questions, which perhaps the others could also address. First, do you expect, as a result of all this, that your proportion of spend on resilience as part of total spend will increase? Secondly, how much do you see the interstices with other operators being an important part of getting real resilience?

Nevil Muncaster: To reverse it slightly, the importance of working with other operators is key and is part of the process now. That is there, and it is very important because it means that we will get the best-value water at any one time.

From a water resource perspective, it has now been recognised that there will be a deficit in water availability, because increasing demand and less abstraction from the environment, as well as climate change itself, will reduce the water available. Therefore, that will have to be covered. We are doing it on the demand and the supply side, so we are not just building more water resources but looking at how we reduce demand, such as by reducing leakage, which has a cost, and by reducing demand, so working with our consumers to see how we can help them to use less water.

Ultimately, we will also have to build new water resources, which will have a cost. So there will be a cost, although that is looking a long time

ahead, to make sure that we meet that deficit and can supply people with water—to make sure that the taps do not run dry, basically.

The Chair: I am sorry to have to say this, but given that we have lost quite a bit of time due to the sound going down, I ask colleagues to be as brief as they can in their answers.

Martin Frobisher: My suggestion would be not to be overly prescriptive, because it is quite hard to specify what level of resilience is required. Sir Edward was right about the cost of these investments. So we should offer choices. There should then be a detailed conversation with our regulator and the Treasury, and we can provide some expert advice. Rather than being too prescriptive in the regulations, it would make more sense to ensure that those conversations happen and that the right choices are made.

Baroness Neville-Jones: I see. Thank you.

David Wright: I completely agree with Mr Frobisher. I think that resilience is a hard thing to measure. We focus day in, day out on improving reliability for our customers and consumers, and, as I have said before, we embed that into our management approach. However, we need to create more cross-sector resilience standards in trying to get the trade-off right between affordability and customer bills, and the level of resilience that we want UK consumers to be able to experience and enjoy. We need to focus on those UK resilience standards.

This has already been done in the area of cyber. As a consequence of that, all the utility companies now have an obligation to improve their cybersecurity defences, and we are getting a UK-wide standard associated with that. That is one good example to build on.

Jim Dempsey: I agree with the other contributors, to be honest. We are already involved with Ofcom and the consultations on improved resilience. Ofcom has a consultation running right now, which we are contributing to, on improving resilience across the telecoms sector. I do think that we benefit from a sector-wide approach. You can get economy in doing that and in minimising the cost and any pass-on costs to the customers. You are always looking at how much investment is enough and at maximising the benefit of that investment. But that needs to be done at a sector level, which is why Ofcom is the right place to do that.

Q53 **Viscount Stansgate:** This question is addressed, in the first instance, to David Wright. The third climate change risk assessment identified climate-related failure of the power system as one of the highest priorities for further adaptation work over the next two years.

I would be grateful if you could tell the committee more about National Grid's role in this. In answering, perhaps you could bear in mind that the recent storms have shown the vulnerability of overhead power lines. Does any of National Grid's infrastructure face equivalent vulnerabilities, including those of Western Power Distribution?

Secondly, in your view, could we expect to see more short-term regional outages in future as a result of extreme weather and other effects of climate change? That is quite a lot to deal with, but please have a go.

David Wright: As we move through the energy transition, we all know that the number of services going over to electricity will grow significantly. On our own forecast, by 2050 we would expect 30% or more of UK citizens to be getting 100% of their energy needs from electricity. We forecast that on our own network we will need to increase capacity by 60% by 2030, and 80% by 2035, as we move to a fully decarbonised electricity grid.

At the same time, we are dealing with climate and climate adaptation. At National Grid our approach has been to develop a model and forecasting capability that takes the latest climate science from the IPCC or the Met Office. Effectively, against a 2-degree or 4-degree scenario, it knows exactly where all our assets are and starts to forecast what weather conditions we are likely to see on different assets in their different geographies, so that we can then forecast and plan for the right investments at the right time.

It is about taking a systematic approach to integrating your asset management, your funding cases, into the regulatory regime and how you deliver investment as efficiently as possible.

Viscount Stansgate: Are these assets spread throughout the UK?

David Wright: Correct.

Viscount Stansgate: There might be differences.

David Wright: There will be, almost certainly. Our modelling shows, for example, that we are likely to see significantly warmer and wetter days. We are likely to see greater amounts of tree and vegetation growth. In particular, coastal and pluvial flooding around the UK will significantly increase.

The other thing that we are forecasting is that the number of 30-degree centigrade days will significantly increase. So our infrastructure—our gas compressors and our overhead power lines—have to be able to operate at those higher ambient temperatures. There are things that you can do on that. You can replace the conductors but you can also increase the tension or move the tree line back.

It is about being able to forecast, being able to model, these things, and then make the optimum investment decisions in order to deliver that resilient network moving forward.

Viscount Stansgate: Thank you. Do you add into your planning the likely use and take-up of air conditioning?

David Wright: We do indeed. We are constantly looking at the forecasts and how those will change. We add into our planning heat pumps, the

use of electric vehicles, air conditioning. All of that is built into the overall model of what is happening locally, aggregated up to regional level and then looked at nationally.

Viscount Stansgate: Thanks very much.

Q54 **The Chair:** I will ask you something slightly different: to what extent does the heightened cyber threat and the risk of the commercial failure of generators affect the role of systemic outage and make recovery more difficult?

David Wright: Every asset owner on the network has different systems that will be exposed, to a greater or lesser extent, to different levels of vulnerability. Quite often, the malware that you see is aimed at a specific vulnerability in a piece of software. But the defences that people have vary, which is one reason why this new cybersecurity standard has been put in place—to build a systemic capability, if you will, in order to be able to defend and protect against any form of cyberattack.

We at National Grid are monitoring things 24/7, as you would absolutely expect. We are regularly in contact with the National Cyber Security Centre in managing individual threats. I do not have visibility of every generator and asset operator, but the approach of a common UK national standard should provide the committee with some level of assurance that everyone's defences are coming up at a similar time.

Q55 **Baroness Hodgson of Abinger:** This question is really for Mr Dempsey. After Storm Arwen, we had reports that, due to the rollout of Digital Voice, people were unable to use their phones to contact support services. How has this affected your implementation plans going forward?

Jim Dempsey: This is about when we migrate customers on to all-IP or Digital Voice, and if you lose your broadband service you lose your telephony service, essentially. We are aware of customers who went down in that respect. We are doing a number of things about that. There are products that we provide, and a number of mitigations, for that. One is that if you have a mobile phone, you can still use the mobile network—so if the broadband network is down, the mobile network is up. You can still use your mobile phone to communicate, contact the emergency services or do whatever you need to do.

If you do not have a mobile phone, we provide a battery back-up service or product for your home broadband. As stipulated in Ofcom regulations, this currently gives you one hour of use, as a back-up, and 12 hours of standby. We are looking to improve that, and we will have products in the summer that will significantly improve that back-up. Again, if you are on Digital Voice and you only have broadband, with no mobile, we will extend that period of battery back-up. For customers who do not have mobile phones, we are also bringing out another product that, for all intents and purposes, looks like a normal DECT phone, although it can switch to mobile when it loses broadband. We are bringing that product out in the summer as well. We are currently working that through on a

customer-by-customer basis, as part of our all-IP programme, to understand the customer need.

At the moment, we are not migrating vulnerable customers, specifically; we will leave them on the PSTN network until we get our products to a level where we can ensure that they have the resilience that they need in the home to be able to use the services that they need access to. So we employ a number of different products, services and types of customer handling to make sure of that as we move to Digital Voice.

Having said that, we are very aware that some households were without broadband and mobile. Again, we have products that provide battery back-up in the home, and we are very active in maintaining the customer's ability to have their communications, be it through broadband or mobile. As I say, we have those products available now, but the job is now to extend the period for which that battery back-up is active.

Baroness Hodgson of Abinger: You talked about vulnerable customers. Do you particularly identify them, and what would work for them so that they will not be left without?

Jim Dempsey: Yes, we do, and they are not left without. PSTN—the public switched telephone network—will be around for the next three years, so we have a reasonable amount of time to make sure that, through innovation and our product set, we will have innovated and provided products by the time we move everyone to Digital Voice and all-IP, which are the future of the UK telecoms network, so that those customers are not disadvantaged.

Baroness Neville-Jones: In the outage that occurred in Lancaster three years ago, there was no power for telephones and no decent local mobile signal. This affected not just vulnerable customers but a whole community. How will you approach that? Will you improve you signal? Lancaster is not at the end of the earth.

Jim Dempsey: Improving the product set improves the position in the home, but you then have to improve mobile coverage, which we are working on through the shared rural network and extending our mobile coverage, with an additional 2,000 sites by 2024. So we have to work to improve the coverage of 4G and 5G, and we will continue to do that. We have those rollout plans, which are established and understood. There will be another 2,000 mobile sites by 2024. The shared rural network will help a lot; we are probably quite well advanced on that, through our deployment of ESN, and other operators will catch up with that.

So there are a number of different facets to this, but we have to ensure that when we lose power, which was the biggest risk during those storms, we can look after customers in the home and back up their equipment there.

At the moment, there is a view that, if you are on PSTN, you are safe in a power cut—but, actually, given the proliferation of DECT phones, which are powered phones in the home, over 60% of people who use PSTN

have them, so they will lose their phones anyway as they are not powered by PSTN. So there are lots of different aspects, and we are looking at all of that. But we will innovate and drive new products that look after our customers, and we will continue to improve the coverage of our mobile network in parallel with that.

Q56 **Baroness Anelay of St Johns:** Thank you for setting out how you intend to improve issues such as broadband signal. There is also the issue of how one can better identify vulnerable people. You specifically referred to the fact that you consider vulnerable customers and how they can have access. How do you define them? Is it a matter of self-declaration, or do you perhaps also factor in issues such as rural areas having poor signal and causing more difficulty for individuals to gain access to help from other people nearby?

Jim Dempsey: A lot of it is self-declaration—we work very closely with our customers on declaring vulnerable customers. We also know this from the services that they use, because vulnerable customers tend to use a lot of telecare services, such as monitoring services, so we can tell from the services that the customer uses. Families also contact us about vulnerable customers whom they are caring for. So there is a constant dialogue with customers. Customers declare themselves as vulnerable customers, and we have additional ways of telling that they are vulnerable through the services that they use. So that is how we do that.

We have communities where we are really aware of community isolation, where you have small communities that are really dependent on their communication services. Again, that is part of our targets for the shared rural network, mobile coverage and broadband rollout.

Q57 **Lord Snape:** Network Rail's written evidence suggested that we need to tolerate a certain level of risk from extreme weather and climate change. Whose role should it be to identify that level of risk?

Martin Frobisher: It should be our role to provide some advice. We understand our assets and can identify the failures. In our third adaptation report for Defra, we set out quite clearly the methodology for how we risk assess for each individual asset group. We can give government some choices, but, as I said earlier, we cannot make the asset bomb-proof. This is Victorian railway infrastructure that was not built to today's engineering standards, and rebuilding the whole lot is not affordable. So we want to set out a sensible way of describing the risk and the choices that that offers, do it asset by asset, make some recommendations, and buy the best practical solution that we can afford.

Lord Snape: Your survey response suggested that you do not have sufficient resources to ensure satisfactory levels of resilience against extreme weather and climate change. If that is the case, what do you expect to happen in future? Are we going to see more Stonehavens, for example?

Martin Frobisher: We can make the infrastructure more resilient, but we cannot make it bomb-proof. However, we will use the latest

technology to protect safety. Following the Stonehaven accident, we changed our weather forecasting system and technology to spot these convective storms. We have put a new system in place so that we can radio to train drivers to slow down the speed of trains, and in real time in those sorts of extreme weather events we can protect safety. That is a cheap and effective way of protecting safety for the short period of time that we have the storm. That is a better solution than rebuilding the entire Victorian railway infrastructure.

Lord Snape: Staying with the Stonehaven accident, the main cause of it was a French drain faultily installed by an outside contractor working on Network Rail's behalf. How many drains have been installed by outside contractors alongside main lines up and down the UK? Do you know?

Martin Frobisher: We have 20,000 miles of railway.

Lord Snape: I know that.

Martin Frobisher: All the railway that runs in cuttings will have drainage. I can get you the precise number per eighth of a mile, which is how we record and measure it. Following the Stonehaven accident, we have been surveying drains nationwide to identify similar problems. We initially surveyed 500 sites of similar characteristics, and we did that immediately following the accident. Then we have been systematically going through the whole railway infrastructure to identify drainage.

That is quite a big survey, because a lot of it is hidden underground. We have been surveying the whole railway infrastructure to make sure that we update our drainage records and get proper maintenance schedules on what could have been hidden and unknown drains. Following Stonehaven, there has been a huge effort to be more scientific and thorough about the way we manage that.

Lord Snape: I understand that, but, again, the Stonehaven event's main cause was the faulty installation of a lineside facility, was it not? I would like to know, first, how many other such facilities have been installed by outside contractors, and, secondly, how you actually check them. In the old days, each length of track was inspected and maintained by a gang of platelayers. I presume that does not apply these days, but how are these lineside facilities checked in the normal run of day-to-day or month-to-month maintenance?

Martin Frobisher: First, I should be absolutely clear that the drain that was installed in 2012 by Carillion was not installed to the right standard. We did not check it properly. That was the primary cause of the accident, and I apologise for that. There is no question about that. We did not check the installation of that drain properly, and that was the primary cause of the accident.

Lord Snape: Forgive me for interrupting you, but nor, presumably, was it checked in the eight years between installation and the accident.

Martin Frobisher: The RAIB report says that a drainage inspection in the subsequent years would not have identified the issue, because this was about whether or not it was built to the design. What we call a bund, an earth mound, channelled the water into the drain. Someone looking at it without checking it against the original construction design would not have spotted that. I went to the site immediately after the Stonehaven accident and I did not see that. It was only the forensic check by the Rail Accident Investigation Branch, checking what was there against the original design, that exposed that. So the project construction checks were not right.

We have strengthened our processes for doing that checking. The vast majority of our large principal contractors do an absolutely fantastic job. They come to work and do a really good job, and the work they do is excellent. We have strengthened our processes following Stonehaven. Following the survey of the whole network, we put it into a maintenance scheduling tool that makes sure we maintain and check the assets on a schedule.

Lord Snape: Would you agree that if the drain had been checked, as it used to be by the old-fashioned method of someone walking along the track, just maybe in that eight years someone would have noticed that the drain was faulty and was not draining water away from the trackside in the way it should?

My additional point that I would like to put to you, and I would like an answer from you, is: how are these things checked these days? Is it by a passing Network Rail train? Is there a physical method? Does someone actually check lineside installations like this on a regular basis?

Martin Frobisher: First of all, the Rail Accident Investigation Branch report asked that specific question, "Would someone walking by have identified the problem?", and concluded that they would not.

How do we normally check our assets? Different assets have different checks. A lot of it is done by train-borne instrumentation. We have a measurement fleet that records the whole network and identifies faults and work, and we put them into our work scheduling system. We also do manual inspection of assets, depending on the asset. Bridges are inspected by survey, for example. Track geometry is inspected by an instrumented train. All these things feed into a work planning system, and then we deliver the work and the maintenance.

Q58 **Lord Dannatt:** My first question is for Mr Muncaster. I think we are all aware that a prolonged power cut would disrupt wastewater and sewage treatment operations. That is probably a given, but tell me if I am wrong. Could you talk a bit about the dialogue and the interactions you have with the energy sector to try to mitigate that, and indeed what the mitigation processes are to prevent that kind of disastrous and unpleasant overflowing?

Nevil Muncaster: We have good ongoing dialogue with the distributors about how we need to respond. It starts with our own assessment, so obviously we have our own process of risk-assessing what the impact will be of power failure, depending on the number of customers served by the asset and the impact that a failure would have. First, a lot of sites, the high priority sites, will have standby generation in place so that if there is a failure we can maintain power supplies and service. That is our first port of call.

Then we will go through a process of working with the power companies on where we see subsequent risks, and between us we will prioritise bringing power back online if it is needed. We have mobile generator sets that we can move to a number of sites, although not to all, but we also have other mitigations that we plan in advance. If we cannot get a site moving, for example, we can tanker water and supply customers elsewhere. So there is quite a rigorous set behind that.

As I referenced earlier, we need to understand, with the power companies, that one site is not just one customer but a number of customers. We need to make sure that we have got the priority right in bringing them back online, against all the other issues that the power company will be dealing with if there is a major outage.

Lord Dannatt: You mentioned tankering. Is the overall national capability to tanker sufficient? I am conscious that 15 months ago in the east of England there was a huge water event. I think Anglian Water's tankering capacity was almost overwhelmed and it had to do a lot of borrowing. If that had been a more widespread national issue, would there have been enough capacity or would we have been in trouble?

Nevil Muncaster: The way the industry works is that companies will have their own plans to mitigate, but we also have a national response, which is manifested through Water UK, which will pull together our platinum incident team. That is where all the operations directors get together on a regular basis and look at the potential for an event and how we as an industry will work together, not only to respond but to plan better. Subsequent to the "Beast from the East", which you will remember from recent years and which had an impact on the industry as a whole, there was huge learning and it was shared through that group.

The other piece that we have in the industry is called mutual aid. That is where the companies get together and will supply and support services to others immediately on request. There has been good support to other companies, such as Thames supplying bottled water to neighbouring companies when they have incidents and have a need for it, or, most recently during Storm Eunice, Northumbrian Water providing tankers to us when we needed them where we did not have sufficient. So the interconnectivity between the companies—support, procedures and the ability to learn and support each other more nationally, whether it be on planning for Brexit or planning for power incidents—is quite strong.

Lord Dannatt: I am glad to hear that.

Q59 **Lord Butler of Brockwell:** I am conscious that as an old Treasury hand I am leading with my chin in asking this question, but in view of the public interest in national resilience and, at the moment, the pressures of the cost of living—I noticed that Mr Frobisher talked about a conversation with the Treasury—are the Government doing enough to help you with investing for resilience? Would you each like to answer that? I can guess what the answers might be.

David Wright: I have been really encouraged by the approach that the Government are taking to defining the UK national resilience strategy, which came off the back of the integrated review. That is absolutely the right approach to take: thinking strategically about how Britain becomes one of the most resilient nations at home and abroad.

We have been able to get access to funding through our regulatory regime for all the things that we believe we need to do on the network in order to deliver a resilient network today. However, let us be honest in the room and recognise that the threats—the strategic and geopolitical threats, the cybersecurity threats and the climate adaptation weather threats—and the level of investment needed as we go through the energy transition are significantly increasing. From an electricity perspective, we are incredibly conscious of the increased importance to UK consumers of the criticality that electricity networks will have in future compared with the already high level of criticality that they have today.

More needs to be done, as I have said before, to create these broader cross-sector resilience standards in order to make sure that there is a completely joined-up picture across all aspects of UK critical national infrastructure. That standard is set because there is an incredibly complex series of networks with a lot of dependencies and interdependencies, as you have already heard from other witnesses on the panel. That is the next area, and we as industry leads also need to do better on collaboration and looking at the weaknesses between some of our networks and systems, making sure that we are proposing cost-effective engineering solutions.

Martin Frobisher: For the railway, the short answer is yes. Steve Fletcher was one of your previous witnesses to the committee. He is our regulator at the Office of Rail and Road, and we have very detailed conversations with him, asset by asset. As I said earlier, we are prioritising earthworks and drainage at the expense of other assets. So in the short to medium term we are in a strong position, with detailed conversations happening with our regulator.

I suspect that in the longer term there will be some issues. For example, when we model coastal erosion in the period 2050-80, there is a step change; if you plot it on a graph, there is almost a point of inflexion. So in the short to medium term we are having the right conversations, but things like coastal erosion need to be considered more in our long-term planning than we are doing at the moment.

Nevil Muncaster: From the water perspective, on the whole it is right. I talked earlier about the statutory processes of water resource management planning and drainage and wastewater management planning. There is a piece about interdependencies, which we have talked about quite a bit today—in our case with regard to power supply, and, when it comes to flooding, how we manage and take ownership of water across a catchment, the impact that has on people and how we plan and invest for that jointly for multiple agencies. That is one thing that I would look at.

We are recognising that a lot of the costs are set looking backwards—"What have we achieved in the past?", "What is the right level of maintenance?" and so on—but we recognise that it is a changing environment, so our maintenance costs will probably have to go up because our assets will have to work harder and maybe to more extreme limits, so we have to maintain them differently. That again is something that we need to pick up with our regulators to make sure that we demonstrate the need for that and pull it forward.

On what we would like to see from the Government, there are two issues for me. One is the developer's right to connect to a combined sewer. That is still there and it should be stopped, because it is adding load to a system that is just not designed for it. There has to be a debate about that.

The other issue is smart metering, mandating it and making sure that we understand demand properly so that we can help people to manage water supply effectively, again, looking long term, to make sure that we secure supply to the taps.

Jim Dempsey: For me, there are a number of points to make. As I mentioned earlier, we are working with Ofcom on a consultation about resilience, but we have not quite got to the cost implications of that. We also continue to work with DCMS on the severe weather adaptation group. You can see, based on all forecasts, that resilience in our sectors will become increasingly necessary as the climate changes.

As for what I would like to see from the Government, putting the funding issue to one side, it is really about—as I think I said in my opening—bringing sectors together, using technology, AI and National Digital Twin. We are involved in the National Digital Twin project, along with Anglian Water and UK Power Networks. That proof of concept is due to deliver at the end of this month, I think, and it looks really promising. Being able to do that will reduce costs for everyone if we can pull together across the sectors and are able to analyse, using digital twin technology, where our resilience needs to be, right across our critical national infrastructure. The Government doing that would be very beneficial.

Q60 **Baroness Crawley:** I would like to ask about the role of the Government. In his answer to your first question, Chair, our colleague from Thames Water said that one of the lessons learned was how significant the interdependencies of his sector—water—will be with power

operators. I think Mr Dempsey also said that we need fewer silos, and that interdependency and working together will become more important with climate change and the need for resilience to it.

Do each of you have a clear sense of which part of government, and which Minister, leads on this area of interdependency? Is enough being done at local level to bring sectors together? How frequently do you meet? What fora do you use to engage with each other to discuss the implications of these interdependencies?

David Wright: To pick up on your last point first, I am a member of the National Preparedness Commission—I am a commissioner under Lord Harris's excellent chairmanship—which brings public and private sector experts together to discuss the subject of resilience. We recently discussed a report by the British Red Cross that looks specifically at the importance of local. It says that when resilience actually happens, it always comes down to the local circumstances on the ground.

As part of developing a more resilient Britain, we need to be able to work effectively at the local, regional and national levels. In particular, the UK's strength is the voluntary sector, and it is important to make sure that that sector is properly recognised in creating the right resilience solutions. We also have the Energy Networks Association and the Energy Emergencies Executive Committee—E3C—which go cross-industry in order to look at a number of these issues.

More work needs to be done, as I said in my previous answer, but exactly where this comes together at a ministerial level in government is not clear to me at the moment; I hope it will become clearer with the UK resilience strategy. That is why the cross-sector resilience standards coming from government need to be put in place to properly address the situation. I and my colleagues are doing more, both bilaterally and cross-industry, to identify the right solutions. As always with complex problems, a number of different aspects need to be addressed in order to properly solve this.

Nevil Muncaster: More needs to be done. There is good, strong working at a local level. We are members of the local resilience forums, and we work closely with a dedicated team that works across the Thames region with those forums, not just on responding but on planning and starting to carry out exercises. We have carried out adverse weather events exercises with Swindon and three of the London boroughs, for instance, and those planning exercises draw in not just Thames Water but the power companies, so through those we build relationships and plan our response together.

We also have local relationships with UK Power Networks and SSE, for instance, where they provide 95%-plus of the power supplies to our works. Those relationships are growing all the time and strengthening our planning and ability to respond and building the connections between us, so that in an event we can talk to each other about the priorities and making sure that we can work together to bring power back.

Martin Frobisher: For us, the greatest dependence is, first, the power to drive the railway and, secondly, the Environment Agency. Power is the simpler of the two, because we need to procure a reliable electricity supply for the railway. But our relationship with the Environment Agency is really important, because if a river floods there is a limit to what we can do as a railway. We can raise our vulnerable electrical equipment on stilts or platforms to keep it out of the water, but that money is far better spent in a joint scheme with the Environment Agency to prevent the river from flooding in the first instance.

So we are working closely with the Environment Agency on a lot of bilateral schemes, and that is far better value for the taxpayer than individual organisations working in isolation. The detail of that is probably best managed at a local level, rather than trying to push it up to government, but we are working very hard on our local relationships with the Environment Agency.

Jim Dempsey: At a local level, we work with local resilience groups and local resilience partnerships. We also work with the EC-RRG, which we have chaired for the past couple of years. Like others, I could not point to a Minister who is specifically responsible for critical national infrastructure and its resilience.

At a local level, the local resilience forums are really good for understanding their area, but when you start to have situations like those in Storm Arwen and Storm Dudley, where you are going across lots and lots of local resilience forum areas, co-ordinating across that at a national level is quite difficult. We get together and discuss where we are, but that co-ordination in bringing sectors together at a national level is quite difficult.

Q61 **Baroness Crawley:** In response to a Lords committee report on risk assessment and planning, the Government have accepted in principle that there should be an office for preparedness and resilience, as a non-departmental public body, headed by the newly created post of government chief risk officer. Would that post be helpful, with national oversight of interdependency between the sectors, or would it be a case of needless bureaucracy getting in your way?

David Wright: I personally contributed to that report and attended a meeting with a number of Lords who prepared it. I was really encouraged to see that the Government took on the vast majority of its recommendations in relation to how we put together the national risk register for the UK. I am sure that, in our businesses, a number of us have chief risk officers, as part of the way that we do business and work, and having that approach across government can only help.

However, it needs the risks, particularly the high-impact but low-probability risks, to be properly and transparently reviewed and updated. When you are doing risk management, you are quite often looking at likelihood on one axis versus consequence on the other, but for high-impact but low-probability events that is not necessarily the right

approach. What you really need to look at is preparedness on one axis versus consequence on the other. I was really encouraged to see a number of the recommendations—the vast majority, as I say—getting accepted by government.

Jim Dempsey: I echo that and agree that single accountability and responsibility would be very helpful

Q62 **Baroness Hodgson of Abinger:** If you could make one request to the Government to enhance the resilience of your assets, what would it be?

Jim Dempsey: I will go back to what I said at the start. My ask of government is that co-ordination across the sectors. The interdependence across them is very evident. Being that co-ordination point and driving the technological approach to that—AI and digital twin, for example—would be really helpful. Basically, I would ask for a system-based approach.

Martin Frobisher: For the railway, the answer is quite specific and simple: drainage. The flooding and rainfall risk is the biggest issue for us. We are making proposals for our next funding cycle to increase the amount of drainage work that we do. My request is simply for the Government to endorse that proposal.

Nevil Muncaster: We are building on a theme here. There are certainly some interdependencies for water as well. It is about power, but it is not just about power. Flooding is also a key issue for me, in terms of how we manage water across sectors, including local authorities and landowners. It is one of our biggest risks, and we cannot manage it on our own, so we need to be able to find ways to work, co-fund, co-invest and co-manage those risks for best effect.

David Wright: I have said this before, but creating UK resilience standards that go cross-sector is really important to make that the UK has the right level of resilience—this comes back to the affordability question that we started with—in order that UK citizens are able to get transport, heating, electricity, data and communication services, and the food and drink that they will need, in tomorrow's world rather than today's.

The Chair: We have one further question about technological innovation, but we will write to you. That would be much simpler than trying to get you to think of something now. Thank you for giving evidence to us today.