

PARLIAMENTARY DEBATES

HOUSE OF COMMONS
OFFICIAL REPORT
GENERAL COMMITTEES

Public Bill Committee

TELECOMMUNICATIONS (SECURITY) BILL

Fourth Sitting

Tuesday 19 January 2021

(Afternoon)

CONTENTS

Examination of witnesses.

Adjourned till Thursday 21 January at half-past Eleven o'clock.

Written evidence reported to the House.

No proofs can be supplied. Corrections that Members suggest for the final version of the report should be clearly marked in a copy of the report—not telephoned—and must be received in the Editor’s Room, House of Commons,

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Saturday 23 January 2021

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The Committee consisted of the following Members:

Chairs: MR PHILIP HOLLOBONE, † STEVE McCABE

† Britcliffe, Sara (<i>Hyndburn</i>) (Con)	† Russell, Dean (<i>Watford</i>) (Con)
Cates, Miriam (<i>Penistone and Stocksbridge</i>) (Con)	† Sunderland, James (<i>Bracknell</i>) (Con)
† Caulfield, Maria (<i>Lewes</i>) (Con)	Thomson, Richard (<i>Gordon</i>) (SNP)
Clark, Feryal (<i>Enfield North</i>) (Lab)	† Warman, Matt (<i>Parliamentary Under-Secretary of State for Digital, Culture, Media and Sport</i>)
Crawley, Angela (<i>Lanark and Hamilton East</i>) (SNP)	† West, Catherine (<i>Hornsey and Wood Green</i>) (Lab)
† Johnston, David (<i>Wantage</i>) (Con)	† Wild, James (<i>North West Norfolk</i>) (Con)
† Jones, Mr Kevan (<i>North Durham</i>) (Lab)	
† Lamont, John (<i>Berwickshire, Roxburgh and Selkirk</i>) (Con)	Sarah Thatcher, Huw Yardley, Yohanna Sallberg, <i>Committee Clerks</i>
† Matheson, Christian (<i>City of Chester</i>) (Lab)	
† Onwurah, Chi (<i>Newcastle upon Tyne Central</i>) (Lab)	
† Richardson, Angela (<i>Guildford</i>) (Con)	† attended the Committee

Witnesses

Dr Andy G Sellars, Strategic Development Director, Catapult Compound Semiconductor Applications

Dr Nick Johnson, Independent consultant

Heba Bevan OBE, CEO, Utterberry

Helen Duncan, Managing Director, MWE Media

Mike Fake, Director and Co-founder, Lumenisity

Dr David Cleevly CBE, Independent investor in many telecoms companies

Doug Brake, Director of Broadband and Spectrum Policy, Information Technology and Innovation Foundation

Public Bill Committee

Tuesday 19 January 2021

(Afternoon)

[STEVE McCABE *in the Chair*]

Telecommunications (Security) Bill

2 pm

The Committee deliberated in private.

Examination of Witnesses

Heba Bevan OBE, Dr Nick Johnson and Dr Andy G. Sellars gave evidence.

2.1 pm

The Chair: Good afternoon. We come to our fourth panel of witnesses today, consisting of Dr Andy G. Sellars, Dr Nick Johnson and Heba Bevan OBE. We have until 2.45 pm for this session. I will ask the witnesses to introduce themselves for the record, starting with Dr Sellars.

Dr Sellars: Good afternoon, Committee. I am Dr Andy Sellars and I am the strategic development director with the Compound Semiconductor Applications Catapult. We are a non-profit research and technology organisation that helps UK companies to exploit new technologies, predominantly for electric vehicles, quantum technologies and advanced telecom products. I look forward to answering and helping the Committee with their inquiry.

Heba Bevan: Good afternoon, and thank you very much for having me. My name is Heba Bevan, and I am the CEO and founder of Utterberry Ltd. We are a company that deals with artificial intelligence and very heavily with wireless sensor networks or internet of things solutions. We provide our solutions to major infrastructure such as Crossrail, London Underground, Network Rail and Tideway, and we are also involved in healthcare. We design systems that are part of the IoT system, dealing with communications. My background is that I am an electronics and computer engineer and I used to design central processing units for Arm Ltd.

Dr Johnson: Good afternoon. My name is Nick Johnson, and until a month ago I was chief technical officer of ip.access, a UK-based small cell vendor that was bought in September last year by Mavenir—I think you guys interviewed Mavenir on Thursday—but I left at the beginning of this month, so I am now independent. I just want to stress that, on the connection with Mavenir, I am truly independent; I am not speaking for Mavenir in any sense at the moment.

I think ip.access came up a couple of times in the conversations with Mavenir last week, but we are a small cell radio access network vendor, a RAN specialist for cellular technology, global system for mobile communications, 3G and long-term evolution, and to some extent 5G. We are deployed in many networks. Historically, over the 20-year life of the company, we have been deployed in more than 100 networks worldwide, and are probably active in a little more than 50 of them. Those networks include T-Mobile in the US, AT&T in the US, Airtel in India, BT One Phone in the UK and others of that sort. Those are my credentials.

Q137 Dean Russell (Watford) (Con): As you know, there are very many benefits to a 5G network in terms of the speed, application development and the new era that it can bring, but would you mind focusing for a moment on the new security risks that 5G will also bring, please?

Dr Sellars: You are quite right that 5G opens up a whole load of new benefits, predominantly high-speed access/lower latency. I think some of the security risks are around who is providing the infrastructure to support 5G. The concern that we have at the moment is that we need to have security of supply—both resilience of the supply chain for that infrastructure, and the cyber-security and encryption element of that infrastructure.

I think it is fair to say that 5G is likely to support a much broader selection of services. It is likely to have an impact on commercial, governmental and security transmission, just because of the widespread access and its very high-speed capability. It is also likely to support a very large number of internet of things devices—the sort of devices that UtterBerry develops. Some of those devices are another potential attack vector, if you like; they are another potential vulnerability. It is broadening the access into the network, which is potentially opening up new sorts of vulnerabilities that we need to take into consideration.

Dr Johnson: Let me start by saying that some aspects of security in 5G networks are actually much more secure than in previous generations. Looking over the lifetime of cellular, you will know that you could just listen into first generation analogue networks with a very high frequency radio. GSM—the global system for mobile communications—was secure, partly at least. The network and the phones would authenticate to each other, but only asymmetrically, so the phone could be captured by a surreptitious network. That sort of attack is still used.

3G is much more secure, with symmetric authentication. It is harder for devices to be captured by the wrong network, but it is still possible. It is also possible for the IMSI—that is to say, the international mobile subscriber identity—of an individual or group to be found from that network. The same is true of 4G. In 5G, that is much more difficult. In terms of the security of the user of the network, 5G has tightened up a lot of the loopholes in previous generations in a way that is very hard to unpick. That creates tactical problems for some law enforcement agencies, which rely on some of the insecurities of earlier generations to do their job.

From the network side of things, there are some issues. There is a new network model in terms of the way nodes are connected in the core network. No longer are there physical interfaces as in previous generations of network, where there would be an S1 connection from the base station to the core. There are still connections, but they are much more in a publish-subscribe-type model. I think those, conceivably at least, bring a little more opportunity for attackers to probe nodes within the core network to find weaknesses and vulnerabilities. That is my take on 5G.

Heba Bevan: We have three elements that the telecoms community could work on: the communication aspect, which is provided by companies such as BT; the hardware aspect, which is probably provided by companies such as Utterberry; and the software element within the system. So there are three types of vulnerability that

could be introduced in the path of these three elements. The only problem with these paths is this: who is responsible if there is an attack? Usually, the communication aspect is the most important part to get protected.

Currently with 5G, there is a huge opportunity for opening up a huge economic impact from the sector in terms of healthcare, education and tech industries. These industries will need to move on and having 5G is definitely an important element, but how can we make sure it is secure in providing an effective communications network that provides an end-to-end solution and security? That is where I think we need to concentrate on the telecommunications and how can we make sure that what we are getting from that communication is totally secure, and that the encryption within it passes certain thresholds.

We can follow a certain standard within the hardware and software, but if the network is weak and has not provided us with good reliability, that is where things could be broken.

Q138 Christian Matheson (City of Chester) (Lab): Thank you for those answers. I have just a couple of questions. First of all, following on from Mr Russell's question, the impression I get—I am not an expert—is of a network that is a bit like a bowl of spaghetti. There are bits here, there and everywhere. And there are bits of different generations that are all added on. How easy would it be from your point of view, with your different areas of expertise, to audit and identify within any part of that chain in the network exactly where there is equipment—hardware, software, chips or whatever—that perhaps needs to be removed or checked?

Is there a shelf-life of the older versions? I am surprised that we are still talking about 2G—that it has not been removed. Is there a shelf-life for those elements and will they be removed from what I term “the network”, which is of course the whole global telecommunications infrastructure of the UK? Nick, do you want to start on this question?

Dr Johnson: Yes. Let me start on that shelf-life question. GSM is a little bit like Radio Four longwave, right? I do not think that it is ever really going to die; there are just too many people who depend on it for one reason or another, whether that is for emergency calls, or just for coverage in remote locations or wherever. I think GSM will stay there forever, despite its security issues. They are well known and understood, and managed in due course.

The shelf-life of network components is an interesting aspect. Our experience of deploying into cellular networks is that there is always a security audit involved. When we take a piece of equipment into a new operator, there is always a hurdle to be overcome. They have their own audit procedures and those include a sort of paper audit, where they look at the particular software components that the software is built from, some of which we build ourselves, some of which is open source and some of which is commercial off-the-shelf software libraries and so on. They want to make sure that those are all up to date and properly patched, with all the latest security patches and so on. I think that will just continue on. To some extent, that is just the baseline hurdle.

I am not sure this is exactly what you are asking, but what has changed in my mind as we go forward is this idea that there can be software in the network that is not so much interested in security—as in, somebody hacking

into it—but is more of a Trojan horse type of software, completely undetectable until some signal or some date comes by and it springs to life and does bad things. The example I have in mind is the SolarWinds example from December last year, where software had been inserted in the supply chain and had been sitting there quite happily for a while. That, to my mind, is very difficult to detect. Until it goes off, you do not know there is a bomb inside it, and that is an issue.

Coming back to the shelf-life question, keeping the software up to date is a major issue. It sounds easy, but practically speaking, I know it is an operational dialogue all the time within vendor businesses: they are striving for revenue from new customers, for new features to be added, and that is acting against updating the software libraries and so on to bring them up to date. There is a continual dialogue in every vendor company to ask, “Do we need these features to get more revenue, or do we need to update these libraries because we need to maintain secure software?” I guess to some extent, the whole reason for this Bill is to try and force that to the front of the conversation; to say, “Look, you can't go on. That dialogue has to stop now. The software needs to be secure.” That has to be the baseline; it has to be a basic hygiene factor in selling software that it must be secure to a certain level, and the features need to come as value added. If you have some questions coming up on the code of practice, designated vendors and so on, we might talk about that, but those are my comments on shelf-life.

I think I missed your first question. I apologise.

Q139 Christian Matheson: No, that is grand. Heba or Andy, do you want to add anything to that?

Dr Sellars: I can add a little bit. Your question about auditing systems is very pertinent to the experience we went through at the end of the 1990s with the Y2K bug. Lots of companies were required to do an audit: financial institutions, companies using software-driven automation, were required to do an audit of their systems in response to that threat. It would probably be a fairly similar exercise for telecoms. I am sure they must have a register of the equipment they use.

Nick has made all the points about software shelf-life, but from a hardware point of view, there is a capacity that the hardware can deliver. My understanding is that as they put in a new service such as 5G, it is quite often built on existing infrastructure such as 4G and 3G. Clearly, each piece of hardware has a bandwidth and can support a certain amount of data throughput, so in terms of shelf-life, I would argue that it is mostly capacity-related. I do not think there are any major concerns about things wearing out as such from a hardware perspective.

Q140 Christian Matheson: Heba, did you want to add anything?

Heba Bevan: If we are auditing basically hardware, it becomes very difficult. You can audit maybe 10 main base stations, 20 or even 100, but every single one of them is quite hard and intensive, and it might also be locking to a certain competition in who the supplier is. If you are getting it from one supplier, you are able to audit that supplier, but if you are getting it from multiple suppliers, how would you audit every single supplier? Would you go 10%, or 20%?

The other thing I would like to highlight is that back in early 2018, Intel had a problem with the security of one of its chips. I can provide written evidence later on to give you the full details on that. One of their chips, as well as AMD and Arm, had a problem, and they knew about it, but it has not been fixed. The problem is that if you put it out there into the community, it becomes a major threat, and a bigger threat.

In terms of hardware, as long as it is supported, maintained and updated on a regular basis, its shelf life will be built to a certain recognised standard. However, if it has not been built to a certain recognised standard and it has not been tested and maintained yearly, it will come to an end very quickly and will need to be replaced. We have a huge problem with a lot of networking in smaller areas and bigger areas in the UK. Some of the areas have an amazing network and speed, and some of them are very bad and are actually degrading. We can see that even in education. Schools currently rely on these networks to have Zooms and Teams meetings, as well as normal meetings. Some areas have not been maintained as other areas in the UK have. Maintaining and auditing them is bound up with the maintenance and making sure that, whoever the supplier is, they maintain the system on a regular basis, update the software and keep a track on that.

The Chair: I am sure Members would appreciate further details on the Intel example, if you can provide that.

Q141 David Johnston (Wantage) (Con): Can I ask about the diversification strategy, which is a question I asked some of the other witnesses? The Government are rightly investing a significant amount in this. We all agree that it is needed. What do you think success looks like? Our problem at the moment is that if we take out Huawei, we have only two vendors we can use. What range would you like to see, and in what sort of timeframe?

Heba Bevan: The problem with Huawei is a bigger problem. The technology was freely created by BT and got sold to Huawei. I think that such an important technology should not have been allowed to be sold in the first place. I am sorry; this is my personal view, not a company view. I think certain technology should be kept within the country because it has a certain importance and all of us use it, so it should be kept in a certain way.

On replacing Huawei with something else, currently we do not have many options, to be honest, in terms of 5G. We have Ericsson, which is a provider of a chip. There are other providers, but they have not come out. Even looking into modules currently, UtterBerry is working on a 5G project with DCMS and the Welsh Government, and we are basically creating the first IoT solution that is completely compatible with 5G.

In terms of supplier for the chip, we have one option, which is Qualcomm. We have Ericsson as well, but they are not at the same speed as Qualcomm, so in terms of options to go with 5G, I do not think there are many suppliers in that market. The capabilities within the—

Q142 David Johnston: May I briefly interrupt? I accept that there are not many suppliers now. Given the money that the Government are going to invest in trying to support having more suppliers, how many would you like to see and by what timeframe?

Heba Bevan: That depends on competition law. The more the merrier probably, at least to give each of us a choice. It would be great to have a choice and to pick the best for the situation. The problem is, given the speed at which we want to roll out 5G, I do not think we will have enough time to create many companies that can provide 5G. We have the capabilities to do it in the country, but we do not have the capability to manufacture that number and roll it out to the entire country. Perhaps Dr Andy Sellars or Nick can comment on that.

Dr Johnson: Let me chip in for a bit. In terms of diversification, there is an issue with scale. Derek McManus made this point—I listened to his contributions from Thursday—about scale. In order to serve the global telecoms operator network, you need scale. You need enough financial and technical muscle to withstand the procurement practices. There is an issue around how much you can afford to deliver, at certain profit margins, in order to make a business. It is very difficult for small companies to achieve that scale.

Speaking for myself, we are a case in point. We achieved a certain degree of scale but did not get to the point where we could compete effectively with Ericsson, Nokia or anybody else in that space. There are quite a few second-tier players around, Mavenir and Airspan, which have 5G technology that could be deployed. Is that scalable to the degree that Vodafone Group would require? Do they have the financial backing to withstand Vodafone procurement organisation? I think that is a major issue.

If you look for the sentiment of the investment community around telecoms, I do not think you will get very positive feedback. Investors are, with one or two exceptions, looking elsewhere to make money. It is a very mature market. Finding new growth in that market is very challenging. I do not have an obvious answer to how, globally, you would achieve diversification. Doing from the UK is a big challenge.

The only crumb of comfort I can offer is that we should, I think, focus on core intellectual property, as a country, strategically. If you just focus on the software, and the implementation of the technology, we will get outrun by people with much bigger and much cheaper workforces, which are as highly skilled. The only way to cement the position in the global economy is by intellectual property and ensuring that you own it, it is well protected, and you can leverage it and exploit it appropriately in that space. Some of the work that Andy is doing at the Catapult is looking at not necessarily software, but technology that could be used in 5G to improve the efficiency of radios and so on. Paradoxically, hardware-centric IP may well be very important to the effective operation of a network.

I am not giving you a very good answer here. It is a very challenging political goal, to say that we want to diversify. What is in it for us as an investment community and a technology community? I think everyone is looking elsewhere at the moment.

The Chair: I am conscious of the time. Dr Sellars, do you have anything to add to that?

Dr Sellars: Absolutely. We are in a situation where we have three monolithic suppliers—we are actually down to two monolithic suppliers. With telecom diversification, we have an opportunity to look at disaggregating parts of the network, especially for newer 5G and other services.

My background is similar to Heba's. I am an electronic engineer by trade. I have designed electronic systems that have been manufactured in the UK and I have written software to drive those systems. In the UK we have something like 5,000 companies that design and manufacture electronic systems. Something like 600 of them are involved in telecoms. I am not suggesting that all of those 600 become equal players. That would be a crazy scenario. But there are certainly some parts of the telecom network where the UK is pre-eminent. There are some backhaul and fibre technologies that we are very good at. As we deploy 5G into rural communities, that is likely to require low Earth orbit satellites; we are very good at satellite communications.

We have clusters of activity with these things around the UK. There is a cluster of radio frequency, backhaul and satellite communications in the north-east, and of satellite manufacturing in the central belt of Scotland. We have clusters of activity in the Western Gateway and around small-cell base stations. In south Wales, we have clusters of activity in compound semiconductors, which are the next generation of chips required for 5G and other high-data rates communications. So, I think the diversification strategy goals of opening up and disaggregating the markets are certainly going in the right direction.

Ultimately, it comes to the telecom operators and how many suppliers they would like in their vendor supply chain. If we can disaggregate the network and come up with open standards for various parts of the network, such as open RAN and backhaul network gateways, that opens the playing fields and enables companies to compete equally. As I say, there are a number of UK companies that could compete. They are globally competitive and could compete on equal grounds with other companies to get access to those markets.

In terms of the timescale to do this, at the moment we have three monolithic suppliers and we are going down to two. Patching that scenario feels like a very short-term timescale, but I would indicate that a broader diversification would probably be in the order of three to five years.

The Chair: Thank you. I want to try to squeeze in both Sara Britcliffe and Chris Matheson before we go to the Minister and the shadow Minister, so we need short questions and succinct answers.

Q143 Sara Britcliffe (Hyndburn) (Con): Mine is quite a simple question: what do you support in the Bill? Can I come to you first, Nick?

Dr Johnson: I think broadly the Bill is okay. I have a couple of questions about the wording. The definition of a security compromise is too narrow. At the same time, the first clause would cover every single bug in every single system, regardless of whether they were to do with security or not. Does it affect availability, performance or functionality? Every bug on the planet would qualify for that. The Bill does not cover the issue of prepositioned viruses that are implanted in software, which are crucial to the next phase of network security, but it broadly makes sense.

I have one other comment around the designated vendors. What do the friends of the Bill think about a designated technology register? Designated vendors are all very well, but the technology that is being incorporated

into telecoms networks is itself subject to security concerns. Should such a register of the specific technology generations or of particular operating systems and libraries, which are known to be buggy or compromised from a security point of view, be included in the Bill? It might be too late in the day for that, but I guess some of this will be picked up by the NCSC.

The Chair: I am sorry to interrupt, but I want to move on to Heba Bevan. The question was, what is there in the Bill that you really approve of?

Heba Bevan: One of the things in the Bill that, to me, is essential is that whoever is providing the telecommunications system has to be liable for providing the security on it. I totally agree on that. They have to make sure it is secure. There are a few bits and pieces on how that is being achieved but, because of time, I can send you a few points around that.

The Chair: That would be helpful, thank you.

Dr Sellars: I agree with the points made by the other two witnesses.

Q144 Christian Matheson: Thank you for squeezing me in, Mr McCabe. I will direct this question to Ms Bevan; it should really be directed to the Minister, but unfortunately procedure does not allow that. There is a quote on the UtterBerry website:

"I am delighted UtterBerry has been selected as a champion of British technology excellence through the TechHub programme—just one of the new initiatives we have launched in partnership with industry and the Chinese government."

That is from Sherry Madera, the deputy director general of the Department of International Trade at the British Embassy in China. Are our firms still being pushed to share communications technology with China as this Bill is going through?

Heba Bevan: No, we worked with the Department of International Trade in 2016. The Chongqing Government were interested in having UtterBerry there. We spoke with our lawyers about the amount of IP we have and decided that we would not pursue this. We do not manufacture anything in China. Everything in UtterBerry is manufactured in the UK—software, hardware and everything we do. We mainly have graduates from the UK. We have European engineers, but recruitment is mainly kept closer, because of the IP sensitivity.

The Chair: Thank you for clearing that up. Chi Onwurah.

Q145 Chi Onwurah (Newcastle upon Tyne Central) (Lab): It is a pleasure to serve under your chairmanship, Mr McCabe.

I will be brief, as we are running out of time, but thank you for your expertise. My question to Andy Sellars and Heba Bevan is about the diversification strategy. In what areas do you think the UK has the capability to exploit the opportunities of this diversification strategy, particularly in hardware versus software? We have been told that hardware is beyond our manufacturing capabilities, yet you seem to be making a success out of it, Heba. What barriers are new entrants and smaller companies likely to experience and what kind of interventions should the Government make that are not fully addressed by the diversification strategy in order to ensure a UK capability in this area?

[Chi Onwurah]

My question to Dr Johnson: we heard from Mavenir earlier, which said that open RAN could provide 2G, 3G, 4G and 5G networks now. We have also heard of the operational challenges associated with that. What is your view on the maturity of open RAN technology? We will start with Andy.

Dr Sellars: The first question was about UK capabilities to exploit the opportunity. Specifically, the UK has a cluster of small-cell base station manufacturers around the Bath and Bristol area. We have satellite communications clusters around the north-east, central Scotland and Surrey. We have a compound semiconductor cluster around south Wales, employing 1,600 highly skilled engineers generating something like £180 million per annum to the Welsh and UK economy. We have quantum encryption expertise funded through Innovate UK's programmes, we have world-leading providers of optical transceivers for fibre communications, and we have backhaul capability.

Q146 Chi Onwurah: What interventions would support them?

Dr Sellars: For interventions, I would suggest that the Advanced Propulsion Centre is a really good model to look at. It is in a different sector. It is funded through the Department for Business, Energy and Industrial Strategy, and its remit is to help to transition the automotive industry from petrol and diesel engines to electric drivetrains using batteries. Have a look at that as a model. It is an incredibly good model for transitioning an entire industry from one technology to another. It brings together supply chains and is very effective. That is one of the interventions I would suggest. Other interventions could be cyber-certification and just helping UK companies to access some of the standards bodies. That would be very effective. We have a lot of SMEs.

Heba Bevan: Thank you for your question. On hardware, as a company—and to be honest in the UK as a nation—we do not have the essential foundries. We can design and prototype the silicon, and we can work on, from the beginning, how actually it would work, but the actual manufacturing of the chip—not the hardware: that one chip which is like the CPU or a piece of DSP—those actually require very high-intensity foundries. If we want to build them in the UK it will cost around £10 billion today—probably over that number. Andy can correct me on that.

In the far east, they have unlimited resources with the state aid rule; and Europe, in the last few years, passed something, for the state aid rule, called IPCEI, which is important projects of common European interest. Germany was able to fund €1.2 billion from its money to support these foundries. France put in €0.8 billion, and Holland put in €0.4 billion. In the UK in the last few years, in terms of building these foundries, the UK has not supported that type of manufacturing. In chip manufacturing, we do not. However, on the hardware scale we are able. The way we see it, we build the hardware; we build the software—but the actual components and the chips, today we do not have the capabilities in the UK to manufacture that.

The Chair: I am really sorry to do this to you, but I think I had better interrupt and go to the Minister or we will run out of time completely.

Q147 The Parliamentary Under-Secretary of State for Digital, Culture, Media and Sport (Matt Warman): Thank you, Mr McCabe, and thank you to all the witnesses, and particularly Dr Sellars for the map of UK brilliance, which is really appreciated. In short—given that we have four minutes—we have £250 million of this diversification funding to spend over the next three years or so. My question to you three is simply how you would spend it. Thirty seconds each: 250 million quid.

Dr Sellars: I would prioritise the funding in terms of where the vulnerabilities are in the network, in terms of the ability of the UK to fulfil those vulnerabilities and in terms of what markets it would open up. There are specific parts in the telecoms stack that are likely to be more vulnerable than others, where the UK has prime capability and where we could then develop an export opportunity. I can provide some more detailed answers in writing if that is helpful.

Dr Johnson: For my 30 seconds I would spend it on basic research, cementing the intellectual property position of the UK.

Heba Bevan: I would agree with Dr Sellars—Andy: we need to increase the amount of spending around vulnerability and strengthening the network. One other point is about spending it on areas outside the UK so it would generate more jobs around the north.

The Chair: Chi, I think you had something outstanding, and you have got just about a minute and a bit to do it.

Q148 Chi Onwurah: It was a question to Dr Johnson with regard to open RAN maturity as an IP.

Dr Johnson: So, the 45-second answer: Mavenir is using IP access GSM 3G technology in its open RAN development. Pardeep, I think, said that it would be ready within 12 months, and I agree that that is a true statement.

The Chair: Did you have anything else, Minister?

Matt Warman: Not that we can do in 90 seconds.

The Chair: I am sorry we had to hurry you a bit, there, but we are trying to get through quite a lot this afternoon. Can I just thank all our witnesses for your evidence and the extra bits that you said you would possibly forward to us. That would be much appreciated. Thank you, on behalf of the Committee. That brings this session to a close.

Examination of Witnesses

Dr David Cleevley, Helen Duncan and Mike Fake gave evidence.

2.44 pm

Q149 The Chair: We move on immediately to the fifth panel. We are going to hear now from Helen Duncan, who is the managing director of MWE Media, and Mike Fake—have I pronounced your name correctly?

Mike Fake: It is Mike Fake, as in genuine.

Q150 The Chair: I apologise. I have got it now; that is very clear. It was kind of you to clear it up for me. Mike Fake, director and co-founder of Lumenisity, and Dr David Cleevley CBE, who is an independent investor in several telecommunications companies. We have until 3.30 pm for this session. Could we start with Helen Duncan? I ask you to introduce yourself for the record.

Helen Duncan: I am a consultant and freelance journalist, specialising in RF technology and the wireless sector. I have been writing about this industry for the past 30 years. Prior to that, I was a practising engineer in the high-frequency electronics industry.

The Chair: Thank you. Mr Fake.

Mike Fake: Thank you, Mr Chairman. Hello, everybody, and thank you for giving me the opportunity to give evidence at the Committee today. I am director and co-founder of Lumenisity, and I have spent the past 30 years in telecoms fibre optic components.

Lumenisity is a spin-out from the University of Southampton, and we have developed a new fibre optic cable technology, in which data travels 50% faster than in a conventional cable, which would digitally shrink the UK; provide a more responsive internet; increase the physical separation of data centres, moving them out of big conurbations; and potentially reduce the cost of deploying 5G. We are building a company to engineer telecoms solutions and innovatively scale up the manufacturing base in the UK.

Our opening statement is that we support the principles of the telecoms security Bill. We see the diversification strategy as critical for successful execution. It is a real opportunity to build a secure, UK-leading network, fostering new entrants and technologies in the UK telecoms supply chain, and to leverage innovative solutions in manufacturing scale in the UK.

A challenge for SMEs, which I would like to highlight, is ensuring sufficient scale-up investment. This is an expensive step and it is difficult to raise this level of capital independently, so we need a combination of public and private funding. Lumenisity is part of an overall eco-system to improve the UK competitive position in a growing next-generation economy. In summary, we would like to see this as an opportunity for a positive change, rather than a retrospective solution to a singular problem.

Dr Clevely: My name is David Clevely. As you have pointed out, I have invested in a number of telecoms companies and sold a few of them successfully. I have been an adviser to the Government and Ofcom. I was one of the experts who helped with the Communications Act 2003. To ensure I have full disclosure, I was on one of the boards of the MOD for eight years, looking after our ICT for all of defence, in theatre and the back office.

If I may, I would like to make three points very briefly. First, I would like to explore perhaps outside of this Committee a little bit more the edge cases for what constitutes a telecommunications network. Although provisions in the 2003 Act, sections 125 to 128 or so, cover quite a lot of things that are extended in this Bill, I think we need to think rather more carefully about what a telecommunications network actually is, in a world where many of these things are distributed, both in hardware and software.

The second point I would like to make is about the spending on R&D and procurement. I am sure we will get on to that. We need to solve a problem that is deep-seated in the UK economy about the difficulty of translating R&D and deployment into real practice. I have some further comments I could make on that.

Finally, I note that in the previous session last week, Miriam Cates picked up on one of the contributors, saying we could not forecast 20 years into the future,

and Alex Towers asked about a contested story to do with Huawei back in 2005. I would like to point out that I had a small part in all of that and can verify that that was discussed. I will not go into details, as you would probably imagine I would not.

One of the things I participated in then was the Foresight cyber trust and crime prevention project. A lot of the things that we are talking about today were indeed forecast 20 years ago. There are some lessons that we can explore later in the Committee from that experience, if you wish to do so.

The Chair: Thank you. The first question is from James Sunderland.

Q151 James Sunderland (Bracknell) (Con): Thank you for the opportunity to ask the first question. Welcome and thank you for giving us your time. I note from the biographical notes that all three of you have clear commercial backgrounds with what appear to be British-owned firms. I am very pro-British myself, as you would expect as a British MP, so may I ask your opinion on the extent to which the telecoms Bill will offer opportunities to British firms?

Mike Fake: I think the diversification strategy is important. It is great to see the national telecoms centre proposal and the £250 million for research and development. One concern is whether that will be enough. Listening to earlier parts of the hearing last week, BT said that they invest £500 million per annum and Huawei has a revenue of probably \$120 billion per year. Sorry, did I say, “million”? I meant billion. What do they invest in research and development? Probably \$2 billion a year. The opportunity I see is that we have a short-term focus for network equipment manufacturers to replace high-risk vendor equipment, but it will be difficult in that period for other new entrants to get their share.

The opportunity is to foster new entrants in technologies in the UK telecoms supply chain, and to leverage innovative solutions for manufacturing scale in the UK. Another issue is that there is a lot of focus on the radio access part of 5G, but that is only one small part of the network. There is optical fibre connectivity from the masts, and transport to the network’s core: that is critical to the network’s security and performance.

Helen Duncan: When I started my career, the industry was dominated by big names such as STC, Plessey, GEC and Racal. They all received funding from defence organisations such as the Royal Signals and Radar Establishment at Malvern. They used a lot of the spin-offs from that technology to develop their telecoms capability. That all ceased in the 1990s after the Berlin wall came down and cost-plus was abolished and so on. It is significant that independent industry research shrank in those times. We are now, at last, seeing a bit of stimulation going back into British industry thanks to the catapults, like Andy Sellars’, and this could be an opportunity, if not to return to those days, to put some investment in and to develop the talents we have in this country.

Dr Clevely: The Bill is a great opportunity, as the other speakers have said. In technical jargon, it is a necessary but not sufficient condition. It does provide some great opportunities. I am an investor and have created a number of British companies of which, like you, I am very proud. We do, however, need to think carefully about how the market actually works. A number of speakers before us talked about the way in which the

number of suppliers has come down in this business. We need to be careful in thinking about how we intervene to set the rules of the game and to encourage certain kinds of behaviour. I am very familiar with one example that relates not only to Government but also to large corporates: the notion that you go through a procurement department that is forcing you down on price, and it does not have the notion of innovation as one of its key performance indicators. The notion of innovation, on the other hand, is built into a lot of the systems that are employed in other countries, primarily the United States, as a way of evaluating whether a technology should be procured or not. We need to think rather more carefully about how we foster that development and growth of smaller companies into larger companies, particularly with this view about innovation.

For example, Ofcom is an economic regulator—one of 11 or so economic regulators in the UK. It has always, below the radar, treated innovation as one of the things it ought to be fostering. I would suggest, for example, that alongside the consideration of this Bill, we think about how we push innovation rather more firmly and put some money behind it in terms of procurement.

Q152 Dean Russell: I would like to understand what the impact would be of bringing forward the 2027 deadline with regard to many of these measures. If I could ask Mike in the first instance, please?

Mike Fake: Obviously, we have got two things to do here. We need to replace the existing vendors' equipment, but in parallel, if we can invest in the UK supply chain—we have a very healthy supply chain in the sense that there are a lot of companies which provide optical components and subsystems into the equipment manufacturers. We need to do both things at once. We need to swap out the equipment, and also invest in the new companies coming up, so that in the future we can have a much more future-proof, innovative, secure and leading network.

Pushing the timescales forward, we have to recognise that in the short term we are going to be stuck with two alternative vendors that we need to swap out, but if we can invest in the up-and-coming, innovative, small SMEs and really foster those, as the previous speakers have said, I think we have got a real opportunity to change things and to have a world-leading, British, high-UK content network moving forward.

Dean Russell: Thank you. Could I ask Helen the same question?

Helen Duncan: I think there are some real practical difficulties in swapping out the equipment. It sounds simple; you just take one radio out and put another one in, but I think you would find that cell sites would be down and consumers would be complaining.

There has been some research recently by a company—albeit funded by Huawei—called Assembly Research, which estimates that it would put the UK three years behind in its programme of 5G deployment. At a time when communications are key to our surviving the unusual circumstances of the pandemic, it seems counter-intuitive to think about putting even more strain on that by moving the deadline closer. I think perhaps it should be the installation engineers who work for the networks we should be putting this question to: how much disruption is it going to cause?

Dean Russell: Thank you. David too?

Dr Clevely: I would like to echo what Helen said, but in a rather different way. There is an engineering problem, which is what we have been dealing with, but there is also a human behavioural problem. Anybody who has worked in a large corporation or worked on these large projects will know that the way in which people approach the problem, and the way they think about it, the way they want to programme it and the urgency they feel, is driven as much by the psychological issues as it is by the technical. I would urge you to think through how you would encourage the behaviour that you want to see. Now, obviously Government can do that by simply issuing an edict and forcing a deadline, but there may be other ways that you can get more innovation and a more rapid shift than the 2027 deadline, simply by thinking through with the industry—going back to Helen's point about the engineers on the ground—about what is required. A little bit more detailed thinking on that could yield some very positive result.

Q153 Mr Kevan Jones (North Durham) (Lab): Could I just follow up on Dean's point about the actual date? The date that has been set is 2027, and the equivalent that is going to go in is basically going to be two vendors, Ericsson and Nokia. I think it was you, Mike, who said earlier that there are opportunities for UK diversification. What will drive that? If you have operators who have put brand-new equipment in in the lead-up to 2027, what will be the incentive for those companies to look at alternatives to that?

Mike Fake: That is a difficult problem to solve, but I think it is important that innovation is a powerful force, and you can turn around things in this new world very quickly. Although you have old legacy systems, and you replace everything from overseas vendors with old legacy systems, you need to keep moving forward. In terms of optics, we probably have one of the world's leading telecom fibre optics innovation capabilities in the world, through the universities. We have a whole bunch of small and medium-sized enterprises out there, and they are struggling to make that step to some scale and to get that innovation deployed in the network. But I think innovation—

Q154 Mr Jones: Not to cut across you, but, while I accept all that, if from the operator's point of view they have just invested a lot of capital in ripping out equipment and putting new equipment in up until 2027, what will the incentive then be for those operators necessarily to look at new technologies?

Helen Duncan: I do not think it is necessarily the case that they will just use Ericsson and Nokia equipment. Vodafone, for instance, has committed to equipping something like 2,500 cell sites with open RAN equipment, so they are taking a forward-looking view and trying to stimulate that themselves.

Dr Clevely: If I may intervene here as well, it is curious, is it not? The economists will tell you that sunk costs are sunk costs and you should always move forward, and that is something to hold on to. Human nature says, "Well, we've invested in this—let's see if we can sweat that asset to make the most of it." A constructive dialogue with your finance director or chief financial officer is always an essential part of all this, and, for example, it is important to understand what is driving the risk that a company is running, its weighted average cost of capital and its cost of borrowing on the market.

Essentially the point is this: if you can get more business and improve your service, and get more customers and make more money, as a result of doing investment, then that is what you will do. The key point here is whether we can find a way of making it clear and straightforward to the most truculent of finance directors or chief financial officers that this is a good investment for the future. In there lies the key, because you need to get the incentives right.

Q155 Chi Onwurah: Welcome to all of you, and thank you so much for joining us. May I say, particularly to Helen Duncan—I should also have mentioned this earlier when we had Heba Bevan—that it is great to have two other female electrical engineers giving evidence to the Committee. I hope we have many more such qualified representatives of the technology sector in Committees in the future.

We have talked a little about how we got here; Helen, you worked for Marconi, and I worked for Northern Telecom, which bought STC, one of our last UK companies providing telecoms equipment. Without putting words into your mouth, I think the situation could be characterised by a lack of investment in innovation and in British sovereign capability. Now that we are seeking to reverse that, or to jump ahead of that, what interventions could best guarantee the long-term security and resilience of the UK telecoms network, with UK sovereign capability supporting it? Is the £250 million diversification strategy set to achieve that? Can you give examples—I am looking for quite concrete examples—of what you might add or change? David, you talked about needing to give the right incentives to the mobile operators. The telecoms supply chain review was quite clear that there is not an incentive right now in the supply chain to deliver security in mobile networks. What interventions and what incentives should there be?

Helen Duncan: Starting from how we got into this situation, in the 1990s we had three incumbent base station manufacturing companies in the UK, which were Orbitel in Nottinghamshire, and Motorola and Lucent Technologies, both in Swindon. They survived for different lengths of time: Orbitel closed down in 1996 when Ericsson took over, Motorola ceased base station manufacturing in 2002, but stayed open and was then sold to Nokia, and Lucent became Alcatel-Lucent and was closed down. Mergers and acquisitions have clearly played a huge part, as did the dotcom bubble and, as I mentioned, the removal of funding from the defence sector.

Heba made the point that to support semiconductor manufacture in the UK, the £250 million would not even start to scratch the surface. We need to concentrate a little bit further up the food chain. We have some very good capability in this country in component and subsystem manufacture based around the chips. We have some good design capability for chips that are then manufactured in the larger foundries elsewhere in the world. Supporting those activities, the design and the manufacture of components and subsystems, would give us a good basis and improve resilience.

I also want to mention that we have some capability in this country in the test and measurement sector with Spirent and VIAVI Solutions—although VIAVI is an American-owned company, it manufactures RF and wireless test equipment in the UK. By definition, test is

ahead of the curve on development. If you can make equipment to test something, you can actually make that equipment, because it is much more complicated to make the test equipment than it is to make the base station or the handset itself. Those companies deserve our support as well. That was a very long question, Chi; I am not sure I covered every aspect you were asking about.

Q156 Chi Onwurah: That's great. David?

Dr Clevely: Thanks, Chi—nice to see you. One of the things that was mentioned in the session a little bit earlier was standards, and I think one of the things that changed telecommunications between the 1970s and the dotcom revolution was the emergence of some of these more open standards, such as TCP/IP for running the internet and so on, and HTML for doing the web browsers. I think we could be putting a lot more money and effort into defining some of those standards, because if you define the interfaces for pieces of equipment correctly, you can allow people to come in and provide bits of equipment that can conform to those interfaces. That is one very concrete thing.

You are right to say that, until relatively recently, the penalties on security and so on—the consequences—have been very small, but in terms of behaviour, you need both carrot and stick on things like this. You need to have something that will give the telecom operators a real reason to do something, which might be as simple as a kitemark that says, “The telecoms network you are using has been certified as secure.” That may or may not be the kind of thing that would engender the behaviour change, but it is noticeable that with a number of things like Telegram and WhatsApp, that is seen to be quite an important thing.

Finally, the networks of people are important in all of this. I noticed that the Government have spent some money on the 5G networking across the UK, which is being run by Cambridge Wireless, which I am very proud to have helped set up. We talked in the previous session about the cluster of people down in Bristol working on semiconductors and so on, and I think the Government should be putting some money into networking people together across the UK, and between regions in particular, to have ways in which we can be exchanging ideas and getting to understand what each other is doing. We complain about silos in Government and siloes in corporate, but we have siloes across every single component of this industry, and it is no good to sit in a part of the west midlands, Cambridge or Belfast and not talk to other people about the issues, the standards and the technology. While we seem to think that that gets delivered by the free market, in reality that is not happening, and I think the Government in particular need to intervene to connect up all these people.

Today, I launched the Northern Ireland Engineering Hub for the Royal Academy of Engineering—I am chair of the enterprise committee—and that was specifically picking Northern Ireland because of its deep engineering history in order to start to connect it with a lot of the other things that are happening in the rest of the United Kingdom. I think we need more of that, and I think that out of it will come the same blossoming of innovation and engineering that we have seen previously when people have been connected up together. I am a great optimist on that.

Chi Onwurah: Great. Thank you very much.

The Chair: Mike, did you want to say anything else?

Mike Fake: I would just add that the radio part of this network is very important, but there is also a fibre optic network that connects it back to the core, and if we can invest in innovation—which means investing in the people who are coming up with the ideas, at the universities and so on—and in the SMEs, there may be clever ways in which we can get to scale manufacturing. That is not just for radios, but potentially hardware boxes, looking at gateways and so on, and also optical fibre, for instance. I support wholeheartedly what the other two witnesses have said, especially the point on open standards that David made.

The Chair: I am just going to go to the Minister, and then I will come back.

Q157 Matt Warman: Thank you for the evidence you have given so far. It seems to me, over the course of a lot of the evidence that we have heard over the last several sessions, that there is a lot of consensus on standards being hugely important and on building on clusters, in both existing businesses and the networks that David was just talking about. If you look into the short and medium term, what are the immediate interventions that you would make, rather than the longer term things to build up in the next few years?

Dr Clevely: Thank you, Minister. On the short-term stuff, I am very reluctant to dash in on some of these things. I have started a few businesses. It is always a mistake to try to spend money too quickly, because you do not quite know how it is working, but if you are asking me where I would specifically spend some money, I would start to spend it on groups of people and existing researchers, connecting them up, having seminars and workshops, starting to fund little bits of research, opening up some competitions, and getting some ideas for where the standards might be—putting oil in a mechanism that has seized up and become somewhat rusty.

With relatively little money—we are talking about nothing like Heba's amounts that you need to spend on a fab plant—I think you could free up a lot of stuff, but you need to put in, at the same time, quite a lot of investment in monitoring all of that, so that you are learning from the process. There are a lot of brilliant engineers and brilliant people in the United Kingdom. My impression is that we do not do enough to connect them up, so my first action would be to use the catapults, the academies, our brilliant universities and fabulous corporations.

Honestly, as we have already heard, we have some marvellous stuff going on in telecoms manufacture. Start to bring those people together. That costs money to service and to actually make it work. That is where I would start, and I would have a framework for what kind of information we were going to get out of that, so that it was not just a nice party, as good as that is, or a talking shop. A distributed catapult would be one way of thinking about it.

Helen Duncan: I absolutely agree with what David has just said. I would also suggest one specific area where some intervention could be very timely, given that a lot of antenna engineers were made redundant just before Christmas when a company called Axell Wireless went into administration. Antennas have not been mentioned, but Huawei holds an awful lot of intellectual

property in antennas. That will be a weakness going forward. In the past, we had some significant antenna capability in this country, most of which was bought up by Cobham, which has now said it has no interest in telecoms at all. It was because they sold Axell Wireless that it has now gone into administration. That is a specific case, but it is just one example of an area where it is not too late to reverse a particular trend.

Mike Fake: I completely support David and Helen's comments.

The Chair: We have about 11 minutes left. I will go to Kevan Jones, who I think had a question that was prompted by a reply to the Minister. Then I will try to go back to Chi and to the Minister before we finish.

Q158 Mr Jones: It is just a quick one. We are talking a lot about Government, and what Government can do, which is fine. But when it comes to attracting sufficient private sector investment in some of these emerging technologies, how will you kick-start that? I ask because that will be the acid test for growing some of these companies.

Helen Duncan: I think hardware technology has a very poor image with investors and we could probably take an initiative to try to improve that, including trying to attract the right people to take up careers in hardware rather than software, as it is seemingly becoming not so glamorous but it underpins the whole thing.

Dr Clevely: Helen, I think you are right. It is very interesting that these days, if you want to get investment in a company—I have personal experience of this—you present it as a software company that needs a little bit of hardware to make the software work; you do not say at all that it is a hardware company. That is one thing to note.

More seriously, on the general point about private investment and interest in these things, this is a matter of setting up the rules of the game so that it makes sense for the private investors and the private people to get involved. None of this is achieved by Government; none of it is entirely achieved, indeed, by the private sector. This is one of these areas, these issues, where you need to think about how Government set the rules up and set the incentive structure so that the private sector explores the environment—because Government cannot work out exactly how this is going to turn out. The private sector can then explore it. That is why, for example, procurement is so important. If you can procure from a number of different sources and encourage people to move forward, you will explore the possibilities of innovation much more rapidly than any single company or any single Government can. We need to construct the rules of the game so that the private sector can start to deliver what the private sector is really good at. I talked about oiling the wheels; I am talking about unblocking drains at this point. We really need to make sure that the mechanism is working properly.

Mike Fake: I would support that. I will just add that some of the mechanisms that we could explore are things like the competitions where Government put in a certain amount and private industry puts in a matching amount, but it has to be significant; it has to be a large investment—something that will make a difference, something that will take the thing from the early innovation stage through to full-scale manufacture, in the UK.

Q159 The Chair: When you say that that has to be significant and large, do you want to put a figure on it? [*Laughter.*]

Mike Fake: I walked into that one, didn't I? I just come back to my earlier point, which was that it is really great that the Bill is proposing £250 million of money for research and development over five years, but if that turns out to be £50 million a year and then you think just about BT, which is spending £500 million a year just on its network, the £50 million really is not very much, is it? It is appreciated—it is really appreciated—but it is not a significant amount in the context of that.

The Chair: Thank you for that. Chi Onwurah.

Q160 Chi Onwurah: Helen, you were absolutely right to emphasise, in terms of how we got here, with no UK telecommunications network capability, that as well as being about under-investment, which I mentioned, it was about acquisitions—many acquisitions of UK capability and capacity. We have the National Security and Investment Bill going through the House; in fact, that is coming back for Report tomorrow. It will make national security—although not economic security—a ground for intervening in acquisitions and investments, but it will not make investment in companies any easier. We are talking about concrete measures—what measures could Government take, or could be taken, to make significant additional investment available or easier?

Helen Duncan: That is an interesting question.

Chi Onwurah: We could perhaps have a telecoms business bank?

Helen Duncan: You cannot stop mergers and acquisitions happening, but if you can put in some sort of criteria that companies that buy British companies need to give a commitment to continue to invest in this country for a set period of time—whether or not that is practicable—that would help.

The most important thing is to make the companies themselves strong enough so they are not targets for asset stripping, as has happened in the past. All the measures that we are talking about to oil the wheels, as David says, will make our companies stronger and able to compete in what is still a global market. I think making our companies competitive is the key to this.

Dr Clevely: There was a thing called the Macmillan gap, which led to the emergence of the Industrial and Commercial Finance Corporation in the late 1940s. Translated into modern terms, that gap is investments required of around about half a million to £5 million or £10 million. We are still living with that, and that gap was identified in the 1920s. We have a structural problem in the United Kingdom about the way in which we invest in some of what would in Germany be called *Mittelstand*—those smaller companies. I think you are quite right, Chi, to draw attention to that as a particular risk profile. People do not want to put money necessarily past the seed stage into what I would call late series A and into series B.

The other point is procurement. As I have mentioned before, if you have a client or two who is prepared to buy kit from you, you not only get money but you get experience and expertise and you develop your company. We need more incentives for procuring from those kind of middle-sized companies, because out of those will come the giants of tomorrow.

My experience in Cambridge and elsewhere is that quite often, many of those companies say they are entirely private sector driven, but actually they have been the subject of lots of Government procurement and interventions along the way. That is particularly true in the United States where the SBIR scheme is very important.

The Chair: Do you have anything you want to add to that?

Mike Fake: I do not have anything to add to that. I support what has been said.

The Chair: I am going back to the Minister, Chi, because I am conscious of time.

Q161 Matt Warman: Thank you. It is a very simply question in some ways in that it follows up on a lot of what David has been saying. Obviously, when we have talked about £250 million, that is to work with the private sector, and where we have run test beds and trialled programmes, we have talked about match funding. Presumably, you would think that is a sensible approach, but I wonder what you think the limits, or what a reasonable proportion of Government investment in a company might look like, rather than simply the traditional match-funding model. I know this is sort of “how long is a piece of string”, but in terms of stakes and all that sort of thing, there is obviously a spectrum, isn't there?

Dr Clevely: Well, Minister, my instinct is not for the Government to not take stakes in companies, so I think that that is beginning a distortion of—

Matt Warman: That is perhaps not the phrase, but you get the gist.

Dr Clevely: The primary way to do it is: first, let's set the rules and regulations. Secondly, let's put some pump priming into the networks to allow people to talk. Thirdly, let's see if we can get the procurement sorted out so that these companies can actually get the lifeblood pumping through them. Fourthly, if you really need to, because of security or other strategic interests, are there things such as the British Business Bank or other mechanisms that can act as intermediaries? You do not want the Government directly intervening in this stuff. That is the hierarchy in which you deal with this. On exactly how that works in a particular case, I have not spent enough time thinking of a detailed response.

The Chair: I am afraid we have run out of time. I know we could have gone on a bit longer, but thanks very much to our witnesses. That concludes this session.

Examination of Witness

Doug Brake gave evidence.

3.30 pm

The Chair: We will now hear from Doug Brake, director of broadband and spectrum policy at the Information Technology and Innovation Foundation. We have until 4 o'clock for this session.

Good afternoon, Mr Brake. Will you introduce yourself for the record, please?

Doug Brake: As you mentioned, my name is Doug Brake. I am the director of broadband and spectrum policy for the Information Technology and Innovation

Foundation. We are a think-tank based in Washington DC, focused on policies that we believe advance innovation, with the basic belief that innovation is the key to economic growth and human flourishing over the long term.

The Chair: Thank you. I call Sara Britcliffe.

Q162 Sara Britcliffe: I have a quick question that I asked the previous witnesses. What is it that you support in this Bill?

Doug Brake: At a very high level, I would say cyber-security generally. The goal of Government intervention should be to make it easy, cheap and desirable for the private sector to do cyber-security well. I have some vague concerns that some increased costs might come from the Bill—the compliance costs—but identifying this as a serious issue that needs to be looked at and giving Ofcom the tools that it needs to investigate security challenges, especially with regard to the equipment and working with the private sector to mitigate those risks, is a big step forward.

On the diversification strategy, I think it is a very wise document. That to my mind is one of the best opportunities that we have to mitigate long-term risks, particularly where there are high-risk vendors in the area. So I think the diversification strategy is quite wise and would make the UK a real leader in this space in terms of policy.

Q163 James Wild (North West Norfolk) (Con): What is your view on the implications of the Biden Administration for potential American involvement in the diversification strategy in telecoms more broadly?

Doug Brake: That is a good question. A lot of people are asking that question and trying to figure out exactly where this will go. I think that at a high level we have passed through the confrontation with Huawei and China over some of these innovational mercantilist policies that we have seen, which have undermined the global innovation of wireless equipment. I don't think that will change at a high level. No politician in Washington in the US wants to be seen as soft on China. I think there will continue to be policies that attempt to roll back some of the innovation mercantilism that we have seen in the wireless equipment space. I expect and hope that it will be done with a more measured and co-ordinated effort with like-minded allies such as the UK and with less scattershot policies across the US Government.

What we have seen over the last several years in the United States is a variety of different agencies doing what they can to mitigate the risks. It is less a co-ordinated whole of Government approach in the US and more a disjointed and fragmented policy response across different agencies, so I am hopeful that under a Biden Administration we will see a much more co-ordinated effort and one that is more co-operative with allies.

Q164 Mr Jones: Regarding that co-operation between nations, clearly it has not just been the UK that has responded to the threat from Huawei; we were forced to go down our present track by the American sanctions against China over semiconductors. Going forward, how do you see that co-operation developing and how do we prevent a situation whereby, with its scale and obviously its resources, the United States dominates any future standards and also technology areas? They

might talk about co-operation, which they do in a lot of areas, but when it comes down to brass tacks, it is America first in terms of business. And that is not a Trump comment.

Doug Brake: It is a good question. To start with, I will take the first part of your question, with regard to the export controls that the Administration put in place with the aim of trying to kneecap Huawei; I think it is fair to say that.

First, from our perspective, ours was not a very well-thought-through strategy—right? Without co-ordination and without a broad coalition to address those sorts of trade practices, in effect in the US we really only shot ourselves in the foot. It undermined any of the technology companies or equipment providers that were attempting to sell components and chips to Huawei. So to my mind, if you are not going to succeed in killing Huawei, or if there are ineffective strategies that undermine your own industry, I am hopeful and expectant that we will see a change in the policy going forward.

That said, if there was a desire from a broader coalition internationally to make some more extensive efforts—something like a NATO for trade, to address these unfair practices—that could be a very effective strategy, if it was done with a broader coalition.

In answer to your second question, the long-term goal of diversification of the radio access network supply chain is to allow for a much more diverse and modular system, in which any number of companies can compete within different niche areas of the market. Admittedly, there are some areas of that—high-performance, generic server infrastructure, as well as software—that the US does quite well. However, I think that opening up the supply chain would allow for a number of companies internationally to compete quite strongly.

Also I think there is a question about the extent to which different countries are willing to aggressively pursue an industrial strategy to support the sort of change that could give them a potential comparative advantage in pursuing this sort of transformational change to the telecommunications supply chain.

Q165 Mr Jones: Regarding the ban on semiconductors, obviously that is worth a lot to the US in terms of exports, mainly to China. Do you see that changing? Also, do you think there is a danger—not in the short term, obviously, but in the longer term—that China will then create a separate semiconductor market, which could be a threat not only to the US but to others, in that they will buy into markets and try to get standards that are different from those of the US?

Doug Brake: I think it is absolutely right that there is a real risk if we cut off supply to China, particularly in semiconductors. We have already seen an aggressive action on their part to stand up an indigenous semiconductor industry. This is getting a little outside of my area of expertise; semiconductors is not some place that I know super well. However, I think that it is absolutely correct that there is a real risk that the extent to which we try to cut off Chinese companies will see them double down efforts to create their own indigenous supply chain. So—absolutely.

I am hopeful that we see either a change to that or a much broader international coalition to double down on those efforts. I think that it is more likely that we will

see a Biden Administration ease some of those restrictions, or work through the current legal means to allow for licences for companies to sell semiconductors to Huawei and others.

Q166 Dean Russell: During my previous career as a physics researcher many years ago, I was fortunate to work at places such as the Advanced Photon Source synchrotron facility in Argonne, Illinois. I worked extensively in the semiconductor space, looking at materials such as gallium nitride and other group III nitrides. What I learned back then, working very extensively with American scientists and scientists from around the world, was the importance of that root-and-branch look at semiconductors, innovation and having a decades-long view. From your perspective, how much does that fit in with a joined-up international approach to create diversity, both at the end stage and at the really early research stage?

Doug Brake: That is absolutely right. This is a long-term effort. I worry about some who tout ORAN as something of a silver bullet that we can make a quick transition to, that it is a flash cut for existing equipment providers to an open RAN sort of system—a more modular and diverse ecosystem. It is something that is going to take a number of years. I honestly worry that it is late for ORAN to be incorporated into 5G, at least on a broad scale. For greenfield networks, it is a different story and it might make sense to go with these open and modular systems from the get-go.

I worry that this is much more a conversation about putting in the tools, resources, testing facilities, the labs, R&D, et cetera, to put us on a path for years down the road so that this becomes the industry standard. I do think, absolutely, that this is the time to be looking at those early stage investments to be driving further and, frankly, looking down the road to 6G, to be able to put in place the policies and efforts to transition the industry to this more diverse future, and put those in place now for years to come.

Q167 James Sunderland: Thank you for coming in. A quick question: can you put in layman's terms what the roll-out of 5G anywhere means in broadband terms? Can you also place that in terms of rural areas?

Doug Brake: I worry that sometimes 5G is conceptualised as a singular technology or a singular thing. It is not a monolith; there are a number of different component technologies and a number of different flavours. Depending on whether you are doing a fully 5G network, a stand-alone network or a non-stand-alone network, it is a very different sort of system. There are also a lot of differences between what spectrum is used to deploy the network—if you are using low-band, mid-band or high-band spectrum or a combination of all three. It is hard to answer that question in generalities.

A number of different component technologies and architectures will be rolled out over time. At a high level, the real advantage of 5G compared with 4G is in its flexibility. It is able to tailor its connectivity to a number of different applications' needs. It can offer extremely high throughput and much faster speeds. It is very reliable, with very low latency. For example, if you want to stream a football match while travelling on a train, it can do that quite well, or quite a bit better than LTE and 4G today. At the same time, you can also change very obscure technical parameters to make for

simple communications that require very little battery on the device side to be able to communicate. If you want to have massive deployments of sensors for smart agriculture, or something like that, that have battery life in the order of decades, it can do that. The hallmark is its flexibility.

Given that flexibility, it is anticipated that 5G is going to be much more deeply integrated within the economy and trade sectors, and will be a key tool to boost productivity. There is an important hope that we see a broad deployment, not just in urban areas but in rural areas. Again, I go back to that note on differences depending on the spectrum that is used to deploy—unless it is of interest, I do not want to get too bogged down in the details, but there are real differences in what we would expect to see deployed in urban versus rural areas. But, again, we would also expect to see very different use cases in those areas. Admittedly, there will likely be a performance difference between urban areas and more rural areas. But at the same time, like I said, the use cases look very different—you are not likely to have massive crowds of people all looking to share video from a stadium or something like that in rural areas. There will be a real difference in the roll-out, but I worry that sometimes the challenges with that have been overstated.

Q168 Chi Onwurah: Thank you very much for joining us, Doug. It is particularly interesting to have your American perspective. As you may have heard, my first job as a hardware engineer was with Nortel, a Canadian-American company that had just bought one of the last UK companies in this area. Nortel ended up seeking chapter 11 and having most of its IP bought by Huawei. What are your views on how we got ourselves into this position of not having a single UK or US supplier that can supply to our UK networks? How do you think we can work together to rebuild our telecoms sectors? You talked about pursuing transformational change and an industrial strategy to do that. What might you say to the Minister about how the UK Government should be working with the US, and about what sorts of vehicles there might be to work together and with other allies to achieve that?

Doug Brake: That is a great question. We talk now about needing diversification and seeking entry of a US-UK equipment supplier, but the question and lessons from history are about why we need this in the first place. In the past, we had quite successful telecommunications supply companies, especially in the US. The president of our organisation, Rob Atkinson, set out to answer that question. You may have seen an article in the *American Affairs* journal, titled, "Who Lost Lucent?" It is a long and interesting article—I will not go into all the details of history. I would say that it is fair to characterise the failures and decline of Lucent as a complicated story, but it stems from a combination of unique challenges imposed by the Anglo-American economic system, systemic failures of US Government policy—particularly with regards to anti-trust and some of the regulatory policy throughout the 1990s—and very strong and aggressive foreign industrial policies, particularly with regards to China, to acquire market share.

I am happy to go through that in some detail, but feel free to cut me off if I go on too long. You are absolutely right to say that we had Lucent and Nortel. Lucent was

absolutely massive—it was three times larger than Nortel—and originally spun off from AT&T's equipment arm, Western Electric. It had the famous Bell Labs. Throughout the '90s, it was the largest telecoms equipment company and was still growing dramatically overseas, but due to a number of strategic decisions within the company and decisions within the US Government, it ended up really suffering as a result of the dot.com bubble.

Setting aside all the competitiveness questions, particularly with regards to Chinese companies, a hands-off, free market globalised system reigned in the US and UK throughout the '90s. It was finance-focused capitalism that saw Lucent and Nortel cut their R&D budgets and staff dramatically, particularly as a result of the 2001 crash—much more so than some of their international competitors. With that financial system, it was harder for those companies, which were designed to be growth companies—much more so than a valued company. They were focused on growing quarter after quarter and meeting their financial targets, which made it very difficult to focus on long-term growth. You can contrast that with Ericsson in Sweden, where the Wallenberg family control a lot of the voting shares. Ericsson was able to focus on much longer-term value creation, and they did not cut staff or R&D by nearly as much as Lucent did.

Before that, I think there are a lot of lessons to be learned from the aggressive anti-trust action that broke up Bell Labs and restructured the entire industry. Up until the restructuring of the US telecom market in 1984, Bell Labs had a fantastic situation in order to generate innovation. It had the commercial drive, focus and flexibility that is often lacking in a Government research lab. It also had a long-term focus and an interest in broad technological change, which many R&D efforts in industry do not see. It had steady revenue from telecom rates. There is a complicated story there. It is hard to tell what concentration is good for innovation and where competition is really the order of the day, but it seems clear that the decline of Bell Labs was a real loss.

Q169 Chi Onwurah: Perhaps you could contribute the article you mentioned and the key points made as written evidence.

Doug Brake: Absolutely. We would be happy to do that.

Q170 Chi Onwurah: The second part of my question was about how we can work together.

Doug Brake: Absolutely. I think the diversification strategy is a very strong document. I would say, when it comes to open RAN generally, there are clear benefits that you have heard a lot about, I am sure, including diversification and faster innovation when software is decoupled from hardware. Generally, lower margins on generic components eliminate the risk of the entire sector tipping to a single vendor or a gradual narrowing of trusted suppliers, but there are real challenges with this process. Again, this is going to be a gradual effort. There is not a need to transition immediately.

First, there is a real risk of bandwagoning, where this is seen as a silver bullet and even companies that might not be interested in pursuing this area, such as Nokia and Ericsson, are willing to join in these efforts, even if it is just for the sake of defence. So, there is a real risk of

bandwagoning. There is real complexity with transitioning to this sort of system. It is not immediately clear how well open RAN will scale. Actual implementation at scale in urban areas is adding a tremendous amount of complexity. There is a much larger attack surface. It is worth keeping in mind SolarWinds, a US company trusted by many within the Government, which saw this massive damaging breach.

I think there is a real challenge that remains to be addressed in the manufacturing of stand-alone radios. I think that is a potential opportunity for real co-operation: identifying companies that are interested in focusing purely on radio. There is still hardware that needs to be provided that historically was integrated with the broader system, when you only have relatively small providers that are interested in scaling up manufacturing.

The Chair: I am just going to interrupt you there. I am sorry, but I am conscious of time and I want to give the Minister a fair opportunity.

Q171 Matt Warman: Thank you for that interesting evidence. This follows on from Chi's question, in a sense. I think it goes without saying that we will be very keen to work with America in the future, and the opportunity to do so is significant. I have held conversations with my Swedish and Finnish counterparts, but when it comes to further international co-operation, if you were in my position, where would you look to first? Do you think the Bill is forward leaning enough to bring that collaboration up a gear, if that makes sense?

Doug Brake: I think there are two different opportunities. First, in the efforts of diversification, this is necessarily a globalised sector. The incumbents are massive companies with huge global economies of scale, so in order to transform the industry structure, it is going to have to be a global effort. We need all the countries aiming in this general strategic direction.

I think the document is sufficiently forward leaning. At a high level, one of the most important first steps is identifying this as a strategic imperative—that this is a goal that is shared by Governments across the world—and taking a genuine interest and focus, especially on the level of venture capital investment. Just the creation of the document is a hugely important first step. As for continued research, the real focus is on research and development and test beds. They are the key tools that we need to test and scale up, to identify real challenges and complexity.

I am not sure if this quite fits the answer, but there is a challenge around systems integration. We need to identify real leaders in systems integration. When you have real risk in pulling together different components from different suppliers, into what is essentially critical infrastructure, the risk of failure—at least, the downsides of failure—is extreme, so operators are often eager to have a single company that they can go to if something goes wrong, which can integrate all the different components. There is an important opportunity, to the extent that policy can help support those efforts.

There is all sorts of opportunity for global collaboration and for rowing towards the direction of this diverse supply chain. I think you have put together a very thoughtful piece in moving that forward. Then again, I go back to saying that this is not a silver bullet in addressing the long-term challenges around innovation mercantilism from China and Chinese companies. I think there should

be more co-ordination and collaboration, especially when it comes to trade policy. Again, this is outside my area of expertise—I am 5G, specifically—but the more we can co-ordinate to be honest and up front about the real challenges and work to scale back the problem, the better.

Q172 Matt Warman: On that long-term point, do you think that both the Bill and the strategy allow Government to retain the kind of flexibility we will need for them to persist for the long term? We do not want to be revisiting primary legislation too often on this, even though we obviously need to keep aspects of it under review?

Doug Brake: I think that this is absolutely the right direction to be moving in. Clearly, you need the tools to be able to analyse the risk, identify high-risk vendors and work away from potential security risks associated with that. So, absolutely, you need the tools, but there is always a broad challenge when it comes to cyber-security of the negative extra challenges, where private-sector providers might not always face all the downside of cyber-security breaches.

You can solve that by increasing the cost and increasing the downside to cyber-security risk. I think it is much wiser to help work with Government to lower the cost

of doing cyber-security well. The UK, from what I can tell, is a real leader in this regard, setting up NCSC. To be able to work closely the private sector, to identify those risks and eliminate them, is much better than just turning up the dial on the downside to cyber-security breaches, or things of that nature.

I would tweak the Bill in that direction. I guess much of this can be done through implementing regulations, but, to my mind, focus more on collaboration and co-ordination with the private sector, rather than simply increasing the downside as well as the compliance costs with the legislation.

The Chair: I think that brings us virtually to time. Thank you, Mr Brake, for your evidence. That was the final evidence session for the Bill, so I thank all the witnesses. The Committee meets again on Thursday morning for line-by-line consideration. I believe that will be at 11.30 am in Committee Room 14.

Ordered, That further consideration be now adjourned.
—(*Maria Caulfield.*)

4.1 pm

Adjourned till Thursday 20 January at half-past Eleven o'clock.

Written evidence reported to the House

TSB 07 Simwood eSMS Ltd

TSB 08 Dr Louise Bennett, Director, Digital Policy Alliance