HOUSE OF COMMONS

Defence Sub-Committee

Oral evidence: The Security of 5G, HC 201

Tuesday 28 July 2020

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Watch the meeting

Members present: Mr Tobias Ellwood (Chair); Stuart Anderson; Richard Drax; Mr Mark Francois; Mr Kevan Jones; John Spellar.

Questions 261 - 306

Witnesses

I: Howard Watson, Chief Technology and Information Officer, BT Group; Scott Petty, Chief Technology Officer, Vodafone UK.

Written evidence from witnesses:

- BT Group

Examination of witnesses

Witnesses: Howard Watson and Scott Petty.

Chair: Welcome to this Defence Sub-Committee hearing. When Parliament is not sitting and has gone into recess, the Defence Committee keeps going. I am delighted to continue our study into the security implications of the 5G rollout. Today we will be looking at BT and Vodafone's 5G operations here in the UK and their relationship with vendors and indeed Government. We will also examine the input of the Government's restrictions on the use of high-risk vendors in the 5G world, particularly looking at the announcements in January, but also more recently in July. We will be considering whether these decisions will cause delays and have economic costs, as well as whether the Government should be providing any compensation to the operators.

I am very pleased to welcome two witnesses this afternoon. Mr Howard Watson is chief technology and information officer at the BT Group. Thank you for joining us this afternoon. Scott Petty is the chief technology officer at Vodafone UK. We were also expecting Huawei to join us. Unfortunately, they have declined to be here. This might be connected to the recent announcement in July. I am sure they are here in spirit. If not, I am certain that they are going to be listening this afternoon. Thank you very much indeed, gentlemen, for coming here.

Q261 **Stuart Anderson:** Thank you both for coming on the panel today. We want to look at the 5G network operations first. Scott, could you give the Committee an overview of your current operations in relation to 5G in the UK and what you have been doing to roll that out?

Scott Petty: Thank you for the invitation to the Committee. We began our 5G deployment just over a year ago. We commercially launched in early July last year. We have been deploying a 5G radio access network on top of our 4G network. 5G today works on what is called non-standalone mode and depends on the underlying 4G network to be deployed. We operate the network using Vodafone engineers, resources and people, including our own field engineers and capabilities in the UK.

Q262 **Stuart Anderson:** Has this experience differed to yours, Howard?

Howard Watson: Ours is very similar to Scott's. Again, thank you for inviting us here today. We also launched just over a year ago, last June, and, likewise, we have been rolling out using, as Scott mentioned, the non-standalone solution, which means that the 5G equipment is inextricably linked to the underlying 4G network. We have continued that rollout and we are now present in 80 towns and cities throughout the UK. Again, that network is run by our own BT engineers in our own network operation centres, so very similar.

Q263 **Stuart Anderson:** You said about the linkage with 4G. How has this rollout of 5G differed from 3G and 4G?

Howard Watson: The key difference there is that, when we stepped from 3G to 4G, you could deploy extra technology standalone. The way to think about that is that, when your phone is connected to 4G, if you move out of range, it switches to use 3G; you use them alternatively. The non-standalone technology is such that you are simultaneously using both the 4G signal you can receive and the 5G signal at the same time. We are what is called aggregating or dual connectivity is the official term, where we take the amount of capacity of both of those and pull them together. For that reason, we need the same vendor for the two technologies.

Q264 **Chair:** Could I give you an opportunity just to sell yourselves, BT and Vodafone? On the global circuit you are FTSE 100 companies. There are ever fewer companies in the market in this space. Can you just give us an indication as to your reach internationally, but also your size compared with some of your competitors?

Howard Watson: BT is primarily a UK-based operator. We do have a global business, but that is delivering fixed services to multinational corporations. Where those customers need mobile, we use the local mobile network operators. In the UK we have about a 30% share overall. Clearly, we are a large fixed operator as well as a large mobile operator. We are very proud of the fact that the UK was the second country in Europe, after Switzerland, to launch 5G and that is really critical for our global presence as a nation on the world stage from an economic perspective.

Q265 **Chair:** Do you operate in China?

Howard Watson: I have some people in China in BT. We also have a telecommunications licence, which we recently were awarded in China, fundamentally because we have some multinational corporations that have offices in China, and we connect to them today through the local operators there.

Scott Petty: Vodafone operates in 27 countries around the world as a mobile operator. We have joint ventures and partnerships in a number of other markets around the world, primarily in Europe, parts of Africa and parts of Asia. We do not operate in China.

Q266 **Chair:** Where can I get 5G right now in the UK from either of you two?

Howard Watson: In my case that, as I say, is in 80 towns and cities now. We are continuing that rollout. That is all of the big urban centres—London, Birmingham, Edinburgh, Glasgow, Manchester and Liverpool—plus many other towns as well.

Scott Petty: In Vodafone's case, it is in more than 50 towns and cities around the country, as well as a number of rural locations throughout the UK.

Q267 **John Spellar:** Moving on to your suppliers, which vendors do you have

contracted to supply core and edge components of your 5G networks currently and which parts of your network do they currently provide? Could you also give us approximate percentages?

Howard Watson: Let me start with 4G. Today about two-thirds of BT's 4G network is provided by Huawei. That is the radio access network. Today the core for the 4G network is also provided by Huawei. We are in the process of removing that technology from the core, as we are upgrading base stations from 4G to 5G. Because it is the non-standalone I described earlier, it runs off that existing 4G core. Likewise, because of the existing underlying supply of the 4G equipment most of our 5G deployment so far is with Huawei, although we also have Nokia, which supplies about a third of my 4G base and now is rolling out 5G too.

Scott Petty: In the case of Vodafone, we use in our radio access network a technology called single RAN, which means we use the same product vendor on each base station for 2G, 3G and 4G. Huawei represents roughly one-third of our radio access network, the remainder being Ericsson. In line with NCSC guidance, we do not use Huawei technology in the core. Our core technologies are a mixture of vendors, including Ericsson, Nokia, Cisco and a range of other vendors for different functionality. Likewise, in our fixed network we do not use Huawei technology.

Q268 **Chair:** I am slightly confused. Forgive me, but I thought there was guidance by Government to say that only 35% Huawei technology, but you said two-thirds Huawei. Is that not connected with 5G then?

Howard Watson: No. Right now two-thirds of the underlying 4G network is Huawei, but we are working to ensure that by 28 January 2023, which is the date for the 35%, we will have reduced use of Huawei for 5G down to that level.

Q269 **Mr Jones:** I have a question now about the previous policy the Government pursued and the new one. Mr Watson, in terms of the original policy of a 35% cap in the system, how did that change your business plan for the introduction of 5G in the UK?

Howard Watson: That policy was introduced in January on the back of the supply chain review, which DCMS had been running for some 18 months prior to that. That limited the extent to which I could use my deployed base of Huawei equipment to add and supplement 5G on top of it, as we have just described.

Because I initially launched in the more urban areas of the UK, which is coincidently where I have most of my Huawei 4G kit, we do have quite a bit of work to do now to start swapping out 5G and 4G kit from Huawei to alternative vendors. The implication of that, as we announced in our results in January, is a £500 million price tag in order to meet that requirement by January 2023.

Q270 **Mr Jones:** In terms of existing suppliers, have they got the capability to

meet that timescale?

Howard Watson: Clearly, there are three scale suppliers that are actively used in Europe right now: Huawei, which I already have in the network, Nokia, which I already have in the network, and we are trialling and are in commercial discussions with Ericsson. We believe that will certainly enable us, for the medium term, to be able to initially restrict Huawei to 35% of sites and traffic and then, as we know, in the longer term, to have removal by 2027.

Scott Petty: We were supportive of the Government's January decision for a 35% cap to balance the security needs and the deployment strategies for our 5G networks. We did not feel that, given our current RAN penetration, it would have any material impacts to our network, either financial or from a deployment point of view. Likewise, we would like to see further diversification of the supply chain and we have begun trialling OpenRAN technology in the UK in a number of rural sites. We are working with the Government and the other operators to drive scale in the OpenRAN environment to try to create an opportunity to create further diversification.

Q271 **Mr Jones:** The Government's policy has changed now and the purchase of new Huawei equipment for 5G will end this year. The target date is 2027 to remove it from the 5G network. Mr Petty, what effect will that have on your plans for the rollout of 5G?

Scott Petty: We acknowledge the complexity of the decision and recognise the change in NCSC's guidance based on changing the supply chain in telecommunications. As we intimated earlier in the discussion, 5G today is inextricably linked to 4G, i.e. when you deploy 5G technology it has to be from the same vendor that is running your 4G and, in fact, 3G and 2G technology. As we deploy our 5G base stations, we will need to swap our Huawei 4G base stations to an alternate vendor. That creates both disruption in our network and an incremental cost for us in our 5G deployment plans.

The Government themselves have said this will slow down the deployment of 5G in the UK by a couple of years. We are happy with the decision on 2027, because it gives us time to do that swap without major disruption to our networks and enables us to have time to develop the OpenRAN ecosystem as an alternative supply. For any timeline shorter than that, it would be difficult to complete the engineering task without disruption to the network.

Howard Watson: Very similar to Mr Petty's response, we welcome the clarity and we welcome the fact that 2027 was being discussed. We had a lot of conversations with Government about the possibility of doing that more quickly and in all cases concluded that would cause significant network outage implications for customers—essentially blackouts across 2G and 4G, as well as the 5G network—whereas the measured approach for seven years means that we can do that, first, in a controlled way

without causing excessive amounts of network outages and, secondly, in my case, we can also do that within the guidance of the £500 million that we laid out in January.

Q272 **Mr Jones:** In terms of the delay in the rollout of 5G, what is it in terms of BT's timelines?

Howard Watson: That is quite hard. Scott has mentioned 50 towns and cities. I have mentioned 80. We continue to roll out 5G. However, in order to meet the 35% restriction, I need to visit 4,000 sites between now and then that I would not otherwise be going to, so that has an implication. I could have been adding extra 5G capacity to the network with that workforce. We are continuing to work out how we double up and how we do the two things in parallel, but we see some risk. I would say the risk is more at the back end of the programme. It took about seven or eight years to get 4G out to the geographic extent that it is now. These interventions, which are understandable and are the right decisions from a security perspective, will probably mean that that will be a year to a year and a half longer than it otherwise might have been.

Q273 **Mr Jones:** It also creates problems for you, because if you start doing this and, for example, the US policy changes, that is not a good way to run a business, is it, in terms of having certainty?

Howard Watson: Do you mean the US policy relaxes or becomes more stringent?

Q274 **Mr Jones:** It may possibly relax, because already the US policy has changed a few times in terms of its attitude towards Huawei. If it does change, that creates problems for you, does it not?

Howard Watson: We have worked very closely with the National Cyber Security Centre. We absolutely understood the fact that the Government requested them to undertake a further review, given the changing supply chain climate. We have to work with the facts and decisions that we are presented with right now and that is where we are focusing.

Q275 **Mr Jones:** We were told that Huawei, for example, have something like a five-year stockpile of chips anyway, so is the argument that what you are being provided with would be somehow a threat to security not a little bit of a red herring and really it is more to do with geopolitics than security?

Howard Watson: I have heard mentions of whether we are stockpiling equipment to roll it out, even though we can no longer buy after the end of this year. That would not make any sense whatsoever for me, because I have to get to a 35% threshold.

Mr Jones: I am talking about Huawei stockpiling chips.

Scott Petty: If I could help a little bit, while it would potentially be possible to use already manufactured equipment, five years is a very long time in our industry and technology evolves very quickly in terms of the performance of the units and antennas that we deploy, as well as the

power consumption and elements. We would essentially be locking ourselves into a five-year deadlock on the equipment that we could use and would not be able to take advantage of evolving equipment, faster chipsets and lower energy consumption. That, in a balanced risk discussion, would be difficult to accept.

Chair: There are two follow-up questions from Richard Drax and Mark Francois. Do you both want to ask your questions? That way we can continue to make progress, and there may even be some similarities in the questions.

Q276 **Mr Francois:** On this point about stockpiling, some in Parliament think that the Government have deliberately allowed your companies leeway, knowing that you might want to take advantage of this. I have heard what you have already said, but what is your response to that?

Q277 **Richard Drax:** Good afternoon, gentlemen, and thank you for coming. I am just interested in your perception of the threat from China, bearing in mind this whole thing has bubbled up really quite recently and you are heavily reliant on the company, Huawei, which, as we know, is linked to China. Had we not intervened, as we have now done, I am assuming you would have got into bed completely with this company. Was there any stage in the past where security questions or concerns about this Chinese company were asked by your two very big companies at board level?

Chair: We may come back to that latter question in more detail, so if you just want to give us a teaser now, then that would be very welcome indeed.

Howard Watson: On the first point, as I just said, because we have to meet the 35% deadline by 28 January 2023 it would make no sense for me to take advantage of the fact that I have until the end of this year, but seven years or six years left for deployment to start stockpiling large quantities and deploying it. We will not be doing that.

On the second question, we have worked at BT for the last 15 or 16 years closely with Government, the NCSC and its forerunners to make sure that we jointly understand the risks posed by Huawei and also more recently, in the last 10 years or so, through the joint work with the Huawei Cyber Security Evaluation Centre. Throughout that period, we have been very rigorous, collectively, in inspecting the equipment and the software that comes into the UK market through the lens of ensuring there is no security risk presented to our network. That has been a successful process and we feel it has given us the security requirements that we have required.

To the point of whether it is something that we discuss at board level, yes, we do. It is something that I have discussed a number of times and, again, we have discussed it with colleagues in Government and in the NCSC. The key things that have been changing most recently, hence why

we welcome the further look by the NCSC, are the sanctions from the US and the impact on the supply chain.

Scott Petty: For Vodafone, for the reasons I just outlined we see no benefit in stockpiling Huawei equipment in the short window that would be available to us. We need to ensure we have spares for equipment already deployed, but other than that we see no benefit.

In terms of Huawei itself, like BT we participate very closely with the NCSC in a security oversight board. We have always applied NCSC's guidance in terms of the deployment of Huawei equipment. As I said, we use them in the radio access network, protected from our core network with a multilayer of security. We do not rely on Huawei-managed services for the operations of our networks. That has been the position, with constant guidance from NCSC, for a number of years.

It should be said that the mobile industry is a global standards industry. With 4G, for the first time the entire world ran the same mobile technology. That created scale in our industry. It made vendors' equipment cheaper, it enabled handset manufacturers to create a single product anywhere in the world and it drove down the cost of supplying mobile networks, which resulted in lower consumer prices.

That standardisation is important. Huawei has been an important contributor to that standardisation and has added much of the IP and IPR that is required to deploy 5G in the way that it is today. As that starts to separate, then it is likely our industry will bifurcate again, as it did before 3G, where different parts of the world ran different mobile technology. That will have potential cost implications for the manufacturers of equipment and the device handset manufacturers in our industry.

Chair: I would like to move more on to the Government's recent announcement, which is directly affecting you.

Q278 **Stuart Anderson:** You have said about how supportive you are of the announcement. Bringing forward the option to remove Huawei out of the 5G network before 2027 will have huge cost implications. How realistic is it that we can get everything out by 2027? Is there a margin of error, or is it straightforward that we can do it by that time?

Howard Watson: We are confident that, by 2027, we will be able to have reduced Huawei presence in the 5G market to zero. Whether there will be some underlying 4G equipment still from Huawei we are working through right now. That depends upon the pace of rollout of 5G to some extent.

Q279 **Stuart Anderson:** How confident are you? That is quite a wide variety that that will cover, considering so much is weighted on this.

Howard Watson: I am confident that we will meet the Government requirement of zero Huawei in 5G by 2027.

Q280 **Stuart Anderson:** Would your view be the same, Mr Petty?

Scott Petty: Yes, it is. We believe that is an achievable swap plan for the number of sites where we need to remove equipment and replace with new equipment. It is fair to say this deals with just the mobile element of Huawei use in the UK. There will still be Huawei equipment in the fixed environments in the UK, for which mobile networks have a data dependency.

Q281 **Stuart Anderson:** Were either of you consulted about the 2027 deadline and the feasibility of taking that out prior to the decision being made?

Scott Petty: Yes, we had a number of discussions with NCSC, as well as with other Government Departments, to work through the logistical challenges and the impacts of swap timelines, in terms of what that would mean for us and the impacts of that. We were asked for our input. I would not say we had any role in the decision, other than to give engineering and technical guidance on the feasibility of faster swaps.

Howard Watson: It is exactly the same for BT.

Q282 **Stuart Anderson:** Was your advice 2027?

Howard Watson: Yes.

Scott Petty: Yes, it was. We were concerned that a more aggressive swap time was simply unachievable without significant network outages. Deploying 5G equipment to an existing base station requires planning and the addition of some new antennas, but is a reasonably medium-effort task. Swapping an entire site is much more complex than that. It requires totally new planning, all of the site to be turned off, all of the old equipment to be taken away and removed and new equipment to be deployed, tested and integrated into the network. Instead of a site being down for one or two days, it will be down for two to three weeks while we go through that particular process, with all of the logistics and elements related to that.

In our case, we have 18,000 base stations around the country, and a third of those would need to be swapped for Huawei technology. The logistical element of that means that a time window to 2027 is the most feasible for the lowest level of disruption of our networks.

Q283 **Stuart Anderson:** It would be fair to say both BT and Vodafone got the announcement they wanted.

Scott Petty: To be honest, we liked the 35% cap model. We thought that was a fair way to manage high-risk vendors in the UK. As I said earlier, Huawei is an important contributor to mobile standards around the world and has driven much of the standardisation. As a business, we felt confident in the way that we could manage the security infrastructure and the security layer in the radio access network to ensure that we had the highest level of security, but we understand elements have changed, particularly related to the supply chain, because of US Government

decisions. In that situation where we need to swap sites, we felt that the Government listened to our advice to minimise the disruption to our networks.

Chair: It is good to hear that there is such synergy around the 2027 date, but there are other implications to financing as well.

Q284 **John Spellar:** Have you made some sort of estimate as to how much this exercise is going to cost you? Furthermore, have you been in discussions with the Government regarding any recompense on that?

Howard Watson: As we said back in January, when the 35% cap came in, that requires an investment of £500 million and we were very clear with that. The advantage of the seven-year period for complete removal, while absolutely it means that we can avoid significant service outages, is it also means that in many cases it now falls within the cycle of replacing the underlying 4G equipment anyway. Typically, our mobile networks have a seven or eight-year life before we roll out new technology. That has meant, in our case, that we will be able to get the 0% within the same £500 million guidance that we issued back in January.

Scott Petty: We have done calculations on the cost impacts, although those are commercially sensitive data, which I would be happy to share with you in writing but not in a public forum, as we are in negotiations in mapping out those elements. As the Committee probably know, the mobile industry in the UK is one of the least profitable mobile industries across the developed world. Our return on capital employed is reasonably poor. There are many things the Government can do to help us mitigate those costs, including spectrum costs and regulation fees we pay for the cost of running our network. We are actively engaged in discussions with the Government to balance those costs to ensure that we can stay on-track with our 5G deployment.

Q285 **John Spellar:** Would you also be, frankly, turning over your equipment fairly quickly anyway?

Scott Petty: In Vodafone's case, no.

Q286 **John Spellar:** You were saying you would not be stockpiling because of the speed at which the industry changes. Presumably, as the industry is changing, you would be taking bits of kit out and putting new ones in.

Scott Petty: In Vodafone's case, we have just completed a modernisation programme of our 4G estate and, as Howard alluded to, that has a seven-year capex depreciation window that we will manage through this particular programme. My point around not stockpiling equipment is that every year vendors release new pieces of equipment for the same function that get faster and cheaper and, therefore, there is no real benefit in stockpiling.

Chair: We have talked about the technical aspect of this in the light of the Government's announcement. Can we now move to the security implications and risks of the wider telecoms rollout?

Q287 **Mr Francois:** Gentlemen, you are commercial enterprises. Your role in life is to provide a service to your customers and make a fair return for your shareholders. We understand that, but what role, if any, as major companies, do you perceive you also have in terms of maintaining Britain's national security?

Scott Petty: Our national security is critical, as is the security of our customers, be they consumers, enterprises and businesses or the critical national infrastructure that leverages our infrastructure. We take that seriously in all of the decisions that we make around procurement of technology. That is why we have invested time and effort in building a strong relationship with NCSC and the Government to ensure that the decisions we are making are always done in conjunction with their advice and guidance and their risk mitigation strategies. You are right: we are a commercial company and we need to make a return. That needs to be put in balance with the requirements for the security of not just the nation, but our customers, be they enterprises or consumers.

Q288 **Mr Francois:** Just to follow up on that, do you put that above your profit?

Scott Petty: They go in balance. We have shareholders, as you said, that we need to respond to. It is all about risk and risk balance. All of our decisions in this area have been done using NCSC's risk matrix to ensure that we find the right balance between meeting our security requirements and having the best technology and best products deployed in our networks.

Q289 **Mr Francois:** With respect, that sounds to me like you are hiding behind the Government.

Scott Petty: We have worked hard as an industry to build capabilities with the Government. We are very fortunate in the UK that we have the NCSC. Not all countries around the world have an outreach body to work with industry to ensure we are applying security in the right way and managing our vendors. HCSEC in the UK is quite unique and we are fortunate to have those capabilities. I would say we are partnering with the Government and working closely with our experts and theirs to make the right decisions based on risk for the technology we deploy.

Howard Watson: BT has always taken the role that we play in providing critical national infrastructure for the UK really seriously and, absolutely, as part of that the top priority is ensuring that the networks that we deploy meet the highest possible security standards. Once we are confident that we have met that, then we look for a really diverse supply chain that brings innovation in technology and capability into our networks. It is that innovation and the timing of deploying that

innovation that allows us to create a commercial return for our shareholders.

Q290 **Mr Francois:** As parliamentarians, some of our constituents may well be your shareholders, so on one level we do not want to do down our constituents' ability to fund their pensions or whatever, but we also have a responsibility for the security of the nation, particularly those of us who serve on the Defence Committee. We are going to have some kind of telecoms security Bill in order to facilitate 5G, because the scale of the project will require legislation, similar in principle to the way you needed a Bill for HS2. From your point of view, what would you like to see in such a Bill?

Howard Watson: What we have seen in draft form so far around the Telecommunications Security Requirements—TSRs—is a really good set of consistent standards that we will apply in the UK. That is putting ourselves really high up in terms of capability in this space compared to many other countries, so I really welcome that as that arrives through the telecommunications security Bill in the autumn.

Scott Petty: Likewise for Vodafone, we have been actively involved in reviewing the drafts and providing input into TSRs and we welcome that legislation. It puts the UK in a very strong position relative to the rest of the world, particularly in combination with the TBEST testing mechanism. We have been through the pilot of that TBEST mechanism and are leveraging all of the skills of the Government to validate that we are implementing the TSRs and the policies and the standards that it asks us to. Effectively it is world-leading in terms of capability and will create an additional level of security in our networks, not just for ourselves but for the industry as a whole.

Q291 **Mr Francois:** You both said something interesting there. You have been consulted by the Government about what is going to be in the Bill. Have you actually seen a draft Bill?

Howard Watson: No.

Scott Petty: No.

Howard Watson: Do not misunderstand us. Remember that DCMS held the supply chain review for some period, and it is out of that that the Telecommunications Security Requirements were published, which we have seen and been part to reviewing alongside NCSC. We are not party to a draft Bill.

Q292 **Mr Francois:** When the Bill comes before the House, one of the critical elements of the Bill is going to be this date of 2027. I would not be surprised if that date gets amended, whether the Government like it or not. Let us say, purely for the sake of argument, that backbenchers amend that date to 2023 and that then becomes the law. How will your companies then react to that?

Howard Watson: We will comply with the law, but we have been very clear that a 2023 date for complete removal would cause significant mobile network outages of 2G, 3G, 4G and 5G. That is the wrong thing to do for the nation, given the dependence that we have all found on our telecommunications networks through the period that we have been through in the last four or five months. To rush this carries significant risk of blackouts across the country.

Q293 **Mr Francois:** What do you say to people who would argue that, "You would say that, wouldn't you?" and that you are crying wolf?

Howard Watson: I would say to that that we have provided the empirical evidence for numbers of sites, amount of time and amount of effort to close streets, bring in cranes and lift equipment to the top of rooftops. Scott described some of it earlier. We have provided all of that in our evidence to the supply chain review, on which that decision was based.

Q294 **Mr Francois:** To come back to your earlier reply, just to be clear, if that become the law, you would have to do your best to comply with it.

Howard Watson: Clearly, we have to comply with the law.

Q295 **Chair:** Just to add on to Mark, Mark is talking about a change in legislation. We are dealing now with a China that is all the more erratic, and there could be a scenario that actually sees Huawei being told to pull out itself, so there have to be contingency plans, do there not, to be prepared for this to happen when it is not the law that is changing but simply Huawei's instructions to be able to operate here in the UK?

Howard Watson: Our contingency plans are the ability to run the equipment that we have now completely independently of Huawei. We have the software specifically in escrow, which has always been part of the process for having Huawei in the network. If, as you describe, Mr Chairman, Huawei was instructed to pull out of the UK, we would run the network ourselves while we undertook the swap.

Q296 **Mr Jones:** Can I just say, on what Mark Francois just said, that some of us would support the 2027 deadline? Actually, I would still support the 35% cap, because this decision is not anything to do with security? It is to do with geopolitics, but that is another issue. Can I just ask you about the replacement of Huawei equipment in the 5G network by the 2027 deadline? What are the main vendors that will be brought in to replace Huawei?

Scott Petty: The two primary scale vendors today are Ericsson and Nokia. If accelerated swaps are required, realistically, they are the only two available vendors that an operator could choose to deploy at scale in our market. One of the reasons we are supportive of the 2027 timeframe is it enables us time to develop the OpenRAN ecosystem. As I said earlier, we are trialling that in the UK. We believe by 2023 we may be able to deploy at some scale in the rural parts of our network, but it will

take until 2025 to be able to deploy at real scale in our dense urban and suburban areas. If the 2027 timeline is the timeline, as the Government have suggested, then we will be swapping to a mixture of existing vendors and OpenRAN vendors across our estate.

Howard Watson: We are very similar. As we have discussed previously, I have more Huawei equipment than Scott to swap out over that timeframe. That probably means that I am more likely to be leaning on the existing two vendors of Nokia and Ericsson throughout that process. We are also, though, very active, through the Telecom Infra Project, in the OpenRAN initiative and looking at that as an opportunity to diversify our supply chain.

Q297 **Mr Jones:** What about Samsung and NEC? Are they vendors you will be looking at as well?

Scott Petty: Samsung has a role to play, particularly in the OpenRAN ecosystem. The UK still runs a range of mobile technologies in 2G, 3G, 4G and now 5G and certainly for the foreseeable future that will be the case. Samsung lacks the capabilities, particularly in 2G and 3G, to be deployed at scale, but it has a significant role to play in OpenRAN, as will likely NEC.

Q298 **Mr Jones:** You have already said, Mr Petty, about 2025 being important for OpenRAN. What is needed to speed that development up? Is it technological or is it the number of different companies that need to come into this market?

Scott Petty: It is a combination. OpenRAN by its definition means a group of companies need to come together to build all of the requirements for a base station, so the antennas, the baseband units and the software elements. You do not buy those from one company.

The technology itself is very new and has not really been trialled at scale for everything across 2G, 3G, 4G and 5G. The places in the world where it has been deployed has just been for a single mobile technology, perhaps 4G or 5G only. We need to learn how to operate those tools and technologies and make sure they are secure and fully validated and tested for all of the different vendors that we are using in that ecosystem.

It is why we began trials in the UK to start to develop those skills and, more importantly, encourage the UK as an investment opportunity for that ecosystem of vendors. There are very few parts of the world that are deploying OpenRAN at any scale. We in Vodafone believe, if we can create that scale opportunity, those software developers will develop the specific features we need in the UK to allow us to deploy at scale to win that commercial opportunity.

Q299 **Mr Jones:** In terms of timescale for OpenRAN to be widely used, what are you realistically looking at?

Scott Petty: As I said, we will complete trials over the next 18 months and we will be able to do scale deployments in rural areas, so small villages and edges of the network in 2023, but capability for our bigger cities where the most advanced features, speed and capacity are required will not be at scale until 2024 or 2025, being most realistic.

Howard Watson: I would agree with Scott's timeframes there. The challenge by that date for me is I will already have swapped a significant amount of equipment out for new equipment, which, from an economic perspective, I need a seven-year life for, and that will, in the main, be equipment that exists today. In the BT mobile network, I am probably looking at very much towards the back end of the 2026 or 2027 time period before I could usefully deploy OpenRAN.

Q300 **Chair:** Mark Francois touched on the commercial relationship that you have with Government themselves, but we are where we are perhaps because we have not done what the Chinese have done, which is to invest heavily into the growing tech area, given our ever greater reliance on the online world. Is there a little bit of you that finds it frustrating that you are having to compete with Chinese companies—Tencent, Baidu, Alibaba and Huawei—that get such huge subsidies from the Chinese state?

Howard Watson: Let me try to answer that in two parts. I started my career out at GEC Telecommunications in 1984, which was one of three healthy vendors in the UK, along with Plessey and STC. In fact, it was Charlie Kao at STC who invented fibre optic cables. We have a long history of significant interventions for the good in the telecommunications market in the UK, and I still am one of the largest R&D investors in the UK because of the telecommunications research that we do here. We have a real active role to play here.

We have allowed ourselves in the UK, along with many other countries, the US being another example, to have lost the manufacturing part of the supply chain, and I do look back with regret on that. Anything that we can do to stimulate that for the next generation of telecommunications technology would be really welcome. It is probably a decade-long endeavour, but needs R&D investment right now.

Q301 **Chair:** Perhaps this is the concern. We can look back and say that mistakes were made in the past, and we need to learn from that. My question is whether there needs to be state funding for us to catch up or indeed overtake the competition we now face, in the same way that the space race took massive state intervention by the United States, in, for example, its Apollo programme, to advance and overtake what the Russians were doing. China is moving ahead at a colossal rate of knots and we are continually having to play catch-up.

Scott Petty: Mr Chairman, as an industry we were very keen for the UK to be a leader in the deployment of 5G. We are one of the few countries where all four operators have deployed commercial 5G services early in

the lifecycle and we are seeing tremendous benefit in the work that all of us have done in building incubation centres and development centres. Early uptake of applications of 5G in the UK, in my view, outstrips what we are seeing in other parts of the world.

Certainly, any Government incentives or help from an R&D point of view to facilitate that growth would be very welcome, but having a competitive 5G ecosystem in the UK, where application developers and our fantastic university talent can develop applications that can get to market at scale in the UK, is the most effective way for us to keep pace with the rest of the world and develop the leading-edge telecommunications applications that will be available through 5G opportunities.

Mr Jones: Mr Watson has been in BT a long time, but I do not know if he also remembers one of the fatal decisions that Margaret Thatcher took was the opening up of competition in this area, which threw away the competitive advantage that the old Post Office and other companies Mr Watson referred to had. That, unfortunately, was a political decision then, which we are suffering from still today.

Chair: If you want to respond to that, you can do.

Howard Watson: I am not sure, Mr Chairman, there was a question.

John Spellar: We had manufacturing capability. We were world leaders in fibre. Those plants were sold off and then they were shut down by the companies that bought them.

Q302 **Chair:** We are not going to get into an interesting discussion about the benefits of privatisation. Focusing back on where we are today and looking forward, if I may, I am concerned as to the trajectory of where China is going. Many would argue that the Government's decision has been mitigated by China's response—the fact that they are threatening to pull the broadcast of Premier League football and the fact that they may be pulling investments in our universities. There are repercussions that we are seeing because of what Huawei is doing. Do you have a concern with where you see China going itself, not least with events in Hong Kong, that makes you appreciate why politically there are some difficult questions now being asked by parliamentarians, including this Committee?

Howard Watson: I am here as the chief technologist of BT and we need to operate within the policies set by a political framework that, clearly, the politicians are part of. It is not appropriate for me to comment on the politics of this.

Q303 **Chair:** Mr Petty, are you going to take a similar line?

Scott Petty: I will. My only add to that is our industry is a global standards, scale-based industry, where use of the same technology across the world has driven enormous benefits for the mobile industry in terms of what our consumers and our businesses can see. If the

geopolitics of the world splits that and we go back to the 2G and 3G world where every part of the world runs its own mobile technology and has to develop its own mobile technology, that will have cost, service quality and performance implications for the entire industry, not just operators but everybody who uses mobile services.

Q304 **Chair:** This is moving to the political arena and I perfectly understand if you are not in a position to answer. HSBC and Standard Chartered signed a petition to support the draconian laws introduced in Hong Kong. That is something that concerns us: that they were leant upon to do that. Does BT or Vodafone have official positions about what has happened in Hong Kong?

Howard Watson: As I say, I am not really in a position to comment on that. We are assessing the implications, not least because we have employees based in Hong Kong as well.

Scott Petty: Likewise, we take those issues incredibly seriously and we have global procurement procedures, including ethical procurement, which I would be happy to share with you in writing, as I do not have them to hand with me at the moment.

Q305 **Chair:** It would be very helpful if you could do that. We touched on OpenRAN as being a potential. Can you just explain how far along in this discussion we are, because we have looked at this quite carefully and it seems it is still a little bit far off as a potential solution to deal with mitigating the high-risk-vendor issues and making sure that our critical national infrastructure is secure itself?

Scott Petty: As I intimated, it is in the promising technology category. It is now ready for production trials and we are turning on our first sites. In fact, we have turned on our first site and we will start to deploy those more broadly across our trial areas. The industry left to its own devices will continue to invest in that technology and will get it to scale in the middle of this decade. With focus, a scale opportunity and potential investment, we may be able to accelerate that by 12 to 18 months.

Howard Watson: We also, as I said earlier, welcome the OpenRAN initiatives. One of the key innovation areas that Huawei actually brought and created an early-adopter opportunity in is the ability to be really effective at taking an electrical signal and modulating the radio waves. I am really focused on that area and how we ensure that we get more innovation in that space. I am slightly concerned that a lot of OpenRAN at the moment is more in the virtualisation of the network and the components there, but I am very actively involved in steering it in the right direction. As I said, I believe it will be deployable by the middle of the decade. It then depends upon phasing it into the lifecycle of equipment replacement.

Q306 **Chair:** In this discussion of 5G, this is a step change, is it not, from 4G, allowing automation of cars, industries, smart cities and so forth? When

we speak of 6G, is there a distinction between that, or is that simply just faster 5G?

Scott Petty: 5G actually is the evolution of 4G. The technology standards are called LTE—Long-Term Evolution—and 5G was an advancement of what we had in 4G. Some of the things you talked about in the internet of things exist in 4G, but 5G makes them much faster, much more secure and creates much greater capacity in our network with new radio antennas and elements. There will be a release of 5G features over the coming years that add additional capabilities in terms of performance, speed and new applications.

The decisions or the discussions around 6G are only just beginning in the standards bodies. Companies and businesses are being asked for contributions on what 6G will need to deliver, but what I hope is that will be an evolution of the standards and technology in 5G with a broader set of capabilities. That is important, because it enables us to deploy technology effectively and at scale with minimal disruption to our environments. The change from 3G to 4G was a significant change. None of the 3G technology was reusable in 4G, whereas in 4G we can reuse some of that technology in 5G, which drives down the cost.

Chair: That is very helpful. Thank you very much indeed. That brings us to a close in this session on the security implications of 5G rollout. I am very grateful for your time, Mr Watson from BT and Mr Petty from Vodafone, in helping us explore these fast-changing issues and ensuring that Britain is at the forefront of the 5G rollout for the very reasons that we have been discussing here today. Clearly, the security aspects of this are what are keeping us busy in this Committee, but we are very grateful for your contributions this afternoon. Thank you very much indeed.