

Science and Technology Committee

Oral evidence: UK telecommunications infrastructure and the UK's domestic capability, HC 450

Wednesday 28 October 2020

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Members present: Greg Clark (Chair); Aaron Bell; Graham Stringer.

Questions 388-480

Witnesses

I: Lord Ian Livingston of Parkhead, Chair, Telecoms Diversification Taskforce, and Scott Bailey, Deputy Director, Diversification Unit, Department for Digital, Culture, Media and Sport.

II: Tareq Amin, Chief Technology Officer, Rakuten Mobile, and Dr Tobias Feakin, Ambassador for Cyber Affairs and Critical Technology, Australian Government.

III: Dr Yih-Choung Teh, Group Director for Strategy and Research, Ofcom, and Dr Ian Levy, Technical Director, National Cyber Security Centre.

Written evidence from witnesses:

– [Add names of witnesses and hyperlink to submissions]



Examination of witnesses

Witnesses: Lord Ian Livingston and Scott Bailey.

Q388 **Chair:** Welcome to this meeting of the Science and Technology Committee. This morning's session continues our inquiry into the UK's telecommunications infrastructure and domestic capability, with particular regard to 5G.

I am very pleased to introduce our first panel of witnesses. First, there is Lord Livingston of Parkhead – Ian Livingston, who is chair of the telecoms diversification taskforce, which was established last month by the Government. Lord Livingston is a former Minister of State for Trade and Investment and was chief executive of BT between 2008 and 2013.

Joining him is an official at the Department for Digital, Culture, Media and Sport, Scott Bailey, who is deputy director of the diversification unit at DCMS.

Welcome to you both. We are delighted to have you here.

Perhaps I can start, Lord Livingston, with some questions about the new taskforce that you have been asked to chair and run. Can you explain what the role is and what it is intended to be?

Lord Livingston: Thank you, Chair. It is probably best to start with what it is not, and what it is not is trying to relook at and ask questions about high-risk vendors. It is really focused on saying, "Here's the policy. How do we actually enact it in a way that gives the UK the best chance of having a choice and diversity of supply of different vendors for its communication networks?", starting with 5G and later on we will probably look at the fixed network as well.

Q389 **Chair:** When you say it started with the policy, perhaps you can say what you regard as the policy settlement that you work from.

Lord Livingston: The policy is that high-risk vendors are basically excluded from our network over time, and that leaves us in a situation of choosing between a limited set of non-high-risk vendors. That is taken as a given. What we have looked at is a strategy that the Government has put forward as to how it should try to create diversity in that context. We have looked at that, but really it is focusing on how do we do it and what are the key things as a Government, and from a policy point of view and other areas, that we must concentrate on as a country.

Q390 **Chair:** I see. It is taken as a given that there will be the progressive exclusion of high-risk vendors. Also taken as a given—correct me if I am wrong—is the three-pillar diversification strategy that the Government adopted earlier in the year.

Lord Livingston: Yes. The question of how many pillars there are is a little flexible, because we feel that one of the other pillars is the role of UK industry—I am sure we will talk about that—both in terms of gaps there may be but also in terms of the opportunities there are for UK industry in all of this. I think that is probably an extra pillar, but basically it is taking



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that strategy as outlined when the Secretary of State came to talk to you a couple of months ago, I think.

Q391 Chair: I see. Just to understand a bit more about that, this strategy was announced and it has these three pillars: pillar 1 is to look at the position of incumbent vendors; pillar 2 is to look at attracting new vendors; and pillar 3 is to look at changes to network protocols that might allow a different type of network. You have started with that—you have inherited that; it was there before the taskforce was created. Do you expect to revise that framework substantially, or is it principally a question of implementing it?

Lord Livingston: It is principally a question of implementing it. As I said, I think there is another important strand to this, which is UK capability. You could say that it underlies all of them, or you could call it a separate pillar. We will probably focus less on protecting the incumbents and more on areas such as bringing new vendors into the market, what you need to do to create a more open choice of network, and issues around Open RAN, but also other options. Then we will look at UK capability and R&D, and how to direct it in the correct way. We are trying to create a road map of how you do this, the areas the Government should focus on and where it should spend its money—and, hopefully, avoid spending too much of it unnecessarily.

Chair: Thank you.

Q392 Graham Stringer: You chair a very distinguished panel. Can you tell the Committee how it was put together?

Lord Livingston: I agreed with the Department and the Minister that we wanted representatives from different parts of the sector: academics, people representing wider groupings, and also practitioners. With all of this, the Government can decide to do anything, but, practically, what are the issues that are preventing us from doing some of the things we want to do? Having the CTO of Vodafone brings a lot of international knowledge as well. Also, Openreach connects to a lot of mobile networks; Clive Selley is the CEO there. In an advisory capacity but taking an active role is Ian Levy, who you will speak to later, and there is also a representative from Ofcom. The idea was to have a wide range of people. We were delighted that everyone we approached said yes, they would do this and commit to it. It was to have a diversity of thought and representatives.

I would add that they are not the only people we will speak to. One thing that we will seek to do is to go out and hear from, for instance, small vendors and the vendor community more generally because we do not have an individual vendor representative, which I think is right. This is a core group of industry experts, and we will supplement that, with the help of DCMS, to speak to a number of other people who have knowledge and input into this.

Q393 Graham Stringer: That leads me straight into my next question. Are there any obvious gaps where it would be beneficial to increase the taskforce? Can you think of any particular area or people who would



enhance the work of the taskforce?

Lord Livingston: There are a number of people. We have an issue—we have about a dozen; we have diminishing returns. We need to hear from small vendors, particularly in the early stage. That is important, particularly when we think about UK capability and the art of the possible. There are people who should not be members of the taskforce per se, but who we really need to hear from—the vendor community. What sort of road maps do they want? What do they want to do? How do they consider the UK? Some of them might not be that interested. We will talk to network operators in other countries and also other Governments. We will do a lot of that. Although they should not be members of the taskforce per se, getting their input will be hugely important in all of this.

Q394 **Graham Stringer:** And it was an invitation process, not a competitive process, to get on to the panel.

Lord Livingston: The pay is not great. Everyone is doing this for nothing. They have all got busy diaries, so it was an invitation. It was mainly suggested by DCMS. It was people they had worked with and who they knew, to try and get a mix. I would be delighted for anyone to write a note to me or DCMS if they have particular points to make, or I would be happy for one of us to talk to them and get their input. I see it as slightly more fluid than just this grouping. We asked people, and, slightly to our surprise, we got 100% acceptance.

Q395 **Graham Stringer:** Good. A final point. This is perhaps a slightly unfair question. Are you a stable door that is banging loudly after Huawei was let all the way into the system some years ago? Are you really an answer to a problem that happened when Huawei got into the system?

Lord Livingston: I think we are trying to answer a problem that probably only happened as a result of American sanctions. While this is not the taskforce's remit to look at, I do have some history in this sector, and the UK has had a very eyes-open approach to all of this, whether it be about keeping Huawei out of the core or the way the software was looked at.

However, the facts changed. We are seeing a bifurcation of technology between the west and China, and that has changed the situation and now we have to deal with it, but this is not just a Huawei question, of course, or a question about any high-risk vendor. We have seen a massive shrinking of the base of telecoms operators at the same time as most telecoms networks are still being defined by proprietary equipment. The decision on Huawei has meant we have gone from a choice of three to a choice of two as we stand today. Obviously, we are looking at other options.

It has to be said that we are trying to deal with the problem going forward. Today, when it comes to Huawei, I think the security advice is fine; it is a question of uncertainty about the future. We do have Nokia and Ericsson today, and Samsung has been a bit involved, but as we look forward, you can see a situation where the UK would not have sufficient



choice. We are trying to shut the stable door before the horse bolts in that respect.

Q396 **Chair:** Before I turn to Aaron Bell, I just want to ask something on that. As you described, in this sector, we are now in a world where we have fewer suppliers than we are comfortable with, which is why your taskforce has been established. We do have a long-standing telecoms regulator, Ofcom, with a duty to promote competition. Is that a matter of concern? Do you think there are things Ofcom could have been doing in anticipation to stop us getting into this position?

Lord Livingston: I think it is very difficult. You can debate to what extent Ofcom's remit is to promote competition at the supplier end rather than at the telecoms operator end, but also when coming up with a UK answer to this, I think one of the clear things the taskforce is going to say is that this cannot be a UK-only answer. One of the questions we are raising and looking at is whether there are regulatory barriers that make it more difficult for new providers to come into the UK, and other incentives that could be provided to encourage more suppliers.

It would be unfair to blame Ofcom, but Ofcom could be part of a big solution to how we encourage a more dynamic vision of the future. Of course, Ofcom will be looking at some of the new technologies. Switching off old technologies is also going to be an important part of that, and the flexibility operators have in that context, because you do tend to end up picking up a UK-only stack of technologies. That is part of the problem we are looking at today, compared with greenfield operators, for instance.

Q397 **Chair:** The witnesses to this inquiry have, I think, given a sense that this has been quite a long time in coming. This concentration has not just happened overnight: it has been a tendency in the industry for some time. Again, without necessarily wishing to blame Ofcom, you perhaps implied that its remit is more to look at the consumer end. Is there some reflection to be made on whether it ought to have the capability and the remit to look at developments in the industry, and be able to act on them before they become a consumer problem?

Lord Livingston: While, as I said, there may be certain things that can take away some barriers in the UK, I think the notion that the UK could have prevented a situation where the whole world had gone to proprietary equipment from a small number of manufacturers is asking a bit much of UK markets. It is, what, 2% of the global market: I think it is asking a bit much. The UK cannot change anything on its own. There is a whole list of things about the UK's involvement in standards, for example, where we have frankly lost the position we had many years ago, but I do not think that is an Ofcom issue. I think Ofcom can help take away some of the barriers, but it could not have stopped this movement towards a small number of proprietary vendors. That is a bigger technological issue and also, frankly, it has been an economic issue, where you have seen mergers and re-mergers because, whether it ranges from Marconi in the UK to Nortel in Canada, Alcatel-Lucent, and so on, people just have not made the money and you have seen a concentration. I think it is a far



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bigger question of what has happened, but certainly I think Ofcom and the UK can be part of a solution that makes a much more open structure for the future, that hopefully will ameliorate the possibility of this situation occurring in the future.

Q398 Chair: Just on some timing points, when do you expect to report? Have you been given a deadline by the Secretary of State?

Lord Livingston: You should not think of it as there is going to be a report date when we hand over and say, "Here's the answer to everything." We have talked about this committee going for about six months, and I think we need to be transitioning at that time to some sort of full-time executive, because this issue is going to go on for a long time. It is going to need a lot of communication with other countries, with security services, with the regulator, with operators, with suppliers, and you are going to need a full-time executive—I know DCMS are setting that up, but with I think a senior leader to do this full time. The idea is we are going to start producing the work plan, effectively, and over the next six months we have got a number of work streams. We will basically provide advice to the Department as to how we think the Department should proceed on this journey—but it certainly will not be finished in six months—and have the work plan and the areas to focus on, and take it from there. We certainly have asked all the members to sign up to a six-month sentence. Hopefully we will not be too far out on that one.

Q399 Chair: So six months for your immediate work, but you think there should be a standing capacity to keep promoting and developing the means for diversity in the sector.

Lord Livingston: Absolutely, and I think it has been one of the flaws—maybe it goes to your Ofcom questions. I do not particularly think it is an Ofcom flaw, but I think it has been a UK flaw that there has not been a strategic look at the UK's position, whether that be standards or capability, or R&D. Bits have happened in different places but they have not been brought together, so I think, particularly with the diversity lens but also with the UK capability lens, there should be a standing executive going forward with somebody leading it with enough heft who can deal with countries and operators at a senior level—so, yes, I think it is a permanent position. Whether it is full time, or near full time for whoever heads it, certainly I know DCMS are putting together a big team to support it going forward, and I think that is right.

Q400 Chair: If there is to be a permanent or standing team capacity, where in your view is that best located? Is it within DCMS, is it within Ofcom or is it a new independent agency?

Lord Livingston: There are arguments in each of these things on whether it is some sort of separate body, like UKTI used to be. I do not have a strong view. I think there needs to be clarity about its role. It should clearly have a reporting line into the Government, because it has got to be in line with Government policy and effectively its job is to execute Government policy rather than create it. Whether that is in DCMS or separately I will leave up to the Secretary of State and the Minister for



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Digital Infrastructure to decide, but it is needed, and with clarity over objectives and reporting lines.

Q401 **Aaron Bell:** You have covered quite a lot of where we are and how we got to where we are, so talking about the strategy going forward—I will come to Mr Bailey, but I will start with you, Lord Livingston—what are the most important factors for success in diversifying the telecommunications vendor market in general and specifically in the UK? How are we going to succeed in this, given the challenges you have already identified?

Lord Livingston: I think the place you start is this point that the UK on its own is not going to be able to do this. There are notions, and I have heard some people comment, but a UK-only solution does not work. The place to start is to understand that. We can act as a catalyst to a number of countries. Take standards, for example. It is going to be really important to work with Five Eyes, Japan, India—countries that have a similar outlook, that want openness of standards and capabilities and do not want them defined by either the supplier community or countries with other aims. The same is true for technology. We have some great technological base in the UK and great academics, but we most certainly do not have all of it. Again, working with other countries on R&D will be important. Finally, no supplier, small or big, is going to create a world-beating product just for the UK, so it will be important to have a consistency of approach across a number of countries where they know that they can scale up. I am of an age that means I remember System X. It may have been a great piece of technology, but a UK-only solution was not going to be the answer. That is a core part of it.

Getting the network operators in line will be important as well. They have to see the advantages of it, so you have to come up with solutions that are advantageous for them and also do not expose them to a lot of risks. One of the things we have to remember when we talk about all this—I see that it is forgotten about in some of the stuff—is that nobody will remember that you were trying to be innovative if you take the mobile network down for a couple of days. There is a reason why people use tried and tested technologies. Understanding the commercial, technological, security and resilience parts of it is going to be really important. But I keep coming back to the point that if we have an answer that looks very different from a whole load of other countries that have a similar challenge to us in terms of not using high-risk vendors, I think we have to be asking ourselves, first, whether we are right, and secondly, whether we can possibly be successful on that basis. It is consistency.

Q402 **Aaron Bell:** On the economic point, a lot of the consolidation, as you and previous witnesses to this inquiry have said, has been driven by the raw economics of it: the economies of scale, the costs of the R&D, the purchasing chains and all the rest of it. Are there going to need to be incentives, subsidies, infant industry arguments, about trying to support something else, or can it be done through standards? Obviously, Open RAN is the ultimate approach on the standards front.



Lord Livingston: That is one of the things we have to look at. You can throw enough money at anything, but I am not sure that is going to be the right way. Certainly, we will be looking at all options as to how one can encourage it. The biggest way one can encourage it is if you have multiple countries demanding it, with operators around the world saying, "This is the way forward." I have to say that the operators have been very keen on open standards, because they do not like the fact that they have little choice. They are worried about it. While having proprietary equipment does have some advantages, it has a lot of disadvantages, and they would like to see more flexible standards.

Can I just add one other thing that I have not seen in some of the other evidence? One of the challenges with a lot of this is the issue of provision of service from the supplier. This does not get mentioned a lot. In order to, let's say, provide to an EE, a Vodafone or whatever you need a big service operation, both in the initial installation and ongoing. That is one of the challenges of scale. If an operator, no matter how big they are in the world, does not have an on-the-ground service operation in the country that it is operating in that is a challenge. People do not talk about that challenge—why scale is important—but you have to create a service organisation for an unknown set of demands in the future. That is another challenge when we look to scale.

You talked about Open RAN. Today, one of the advantages of proprietary equipment is that the people who provide it are effectively doing the systems integration. As you move away to a diversity of supplier linking in, you do not have that single entity doing the systems integration job, which also becomes more difficult. There are some challenges beyond the obvious ones in terms of going forward. The best way to be successful in all of this is to recognise the challenges upfront, which is effectively what our job is, and try to raise them and therefore help to deal with them in advance.

Q403 **Aaron Bell:** Thank you. Can I bring in Mr Bailey for his view on the same questions from the point of view of the diversification unit at the DCMS? What are the important factors for success, do you agree with the overall analysis about why we have the problem that we have now, and what is the future balance in your opinion between regulation and facilitation as we try to diversify?

Scott Bailey: Ian has set out a lot of the things that we are thinking about. For me, ultimately where we are trying to get to is we need things like disaggregated supply chains. Ian has talked about the importance of open interfaces and interoperability. I think we want to move towards a situation where we have those as default. We have touched a bit on standards. Again, I think we are focused on looking at how we can work with others to set standards transparently and independently. Then of course we need to move to a situation where all parts of the supply chain view security and resilience as a priority.

Q404 **Aaron Bell:** Thank you. One final question for both of you. Open RAN is obviously a fairly key part of the third pillar, or it is seen to be at the



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moment. What is the risk that Open RAN basically does not work, is unsuccessful, never gets economies of scale and never gets adopted, and how can our strategy account for that risk?

Lord Livingston: To take your second question first, it cannot be the only part of that third pillar, or it cannot be the only part of the strategy that is the third pillar. We have to look at widening the supplier base because we are in a situation today where effectively our main mobile providers are, in some combination, Ericsson and Nokia. Looking at other providers entering the UK market is part of it. In terms of Open RAN, you are going to hear from Rakuten later, who will talk well about it. Certainly there are other entities that are doing things with it—Jio and I think Dish as well.

First of all, it is about learning from them, but I think the idea that the UK network put on top of creating a national network with Open RAN is not going to be a short-term answer, so what we have to work on is helping to create global standards that help Open RAN to develop and give it testbeds in the UK, because I think we have to make sure that it works with the UK network as is, as well as encouraging people to try things, and some R&D.

It is about trying to do things to limit the possibility. Will we move away from a proprietary set of network solutions? I think across fixed and mobile networks that is the direction. How long it takes and whether it is done quickly enough in order to roll out initial 5G is the question, rather than: "You will never have an open solution." I think that is probably unlikely.

Q405 **Aaron Bell:** Quickly, in 10 years' time what would be a good outcome for the proportion of the network that is covered by Open RAN or some other open network?

Lord Livingston: I don't know. If I can give an answer to a marginally different question—

Aaron Bell: You're a politician.

Lord Livingston: Please no! What would be a good answer to diversification is that network vendors have a choice of multiple suppliers, some of whom are proprietary stacks and some of whom are open stacks. That is what good looks like. Let the best man win, as long as there are a lot of them.

Aaron Bell: Thank you. I had better hand back to the Chair, because we are at 10 o'clock already.

Q406 **Chair:** Thank you, Aaron. In terms of thinking about the future, are we in danger of extrapolating from the recent past and the present and assuming that things look more or less the same? Specifically, do you expect to see a greater prominence of private networks rather than the regulated, publicly available networks that we have been talking about?

Lord Livingston: I think that instead of "rather than", it is going to be in addition. Indeed, it may be earlier. On the public network side, of course



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5G brings greater capacity and speed. On the private network side—campus solutions and the like—you will see many of the differences between 5G and 4G in terms of what you can do with low latency, unencumbered by having existing networks to worry about.

I saw the report just yesterday about a private 5G network in Belfast docks, which will allow repair work to be done with virtual reality headsets and the like. That is something that would not have been available before—machine-to-machine in factories. There is a danger that we just think of 5G as the major network providers—although it may be in conjunction with network providers. We forget that a lot of the benefit and a lot of the places where we should be investing—I know already that there is R&D—should be factories, campuses, docks, football stadiums and the like, where a lot of the 5G use cases will come. It will probably be easier than re-engineering the whole of our network. Some of the technological advances, in terms of open networks that stand alone, may well come in some of those areas.

Q407 Chair: Is that something that will just happen? Should they be left, in effect, for the creators and the users of those networks to specify their needs and how things should be? Or should there be a public policy interest in the specification of those private networks?

Lord Livingston: I think it is less about policy specification, but what the UK Government can do, through both its R&D and its testbeds, is help create some environments and some money to help test and to introduce some of the particular aspects. The security of critical national infrastructure would be very important, and the Government has a view on that. To the extent that docks are treated, that might be different, but on an individual campus you might not have the same issue. What the UK can absolutely do is create the environment to allow enough things to be tested and enough different use cases, and to provide some of the seed capital. It will also bring in UK suppliers. Although the chances of creating another Nokia in the UK are close to zero—I am not sure that is the right answer anyway—the chance of the UK's R&D capability being able to provide a number of these use cases, and the value added for UK industry, is absolutely something that we should be focused on.

Q408 Chair: Finally, on the question of regulation, the UK has always had a strong reputation for innovation in regulation, and specifically in telecommunications, going back to Sir Bryan Carsberg and the creation of sector bodies. I get the impression that we are not in the lead in this area around the world. We are thinking, and you are helping to think, about what the regulatory regime should be. Is there a question for regulators in the sector and perhaps beyond as to whether, in a world of intense change, we have enough reflexivity in regulation? That is to say that they can ask themselves whether we have the right models and the right set-up for the future, rather than simply implementing an established pattern of regulation.

Lord Livingston: The goal for the regulator was competition. The UK has one of the most competitive telecoms markets in the world. The UK has



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one of the most competitive telecoms markets in the world. We tend to be with Sweden and South Korea in our adoption of internet technologies. I think we are the No. 1 nation for internet shopping, for example. With the pandemic, I can't imagine that has changed—if anything, it is higher. I think we have created a pretty reasonable background, and that was what the regulation was meant to do.

Has it created enough risk taking in investment? If the prices keep on being lower and the competition keeps on, that is a challenge. One of the questions that we need to look at is that balance. I don't blame Ofcom at all. I think it has to be against a background of a Government policy situation, and certainly Ofcom, in its role of looking after citizens and consumers, should have flexibility. Maybe in a world in which it is answering less to the EU regulatory body, it will have more flexibility. Ofcom has the most capability of all the regulators that I have come across. It is more down to policy and funding on a wider basis.

Chair: Thank you very much. I said that was the last question, but my colleague Graham Stringer has a supplementary question.

Q409 **Graham Stringer:** Lord Livingston, you mentioned at least once that we are moving towards global standards, which would be what the vendors and the industry want. Do you think, following the Huawei decision, and given the tension between China and the west at the moment, that there is a real possibility that we will end up with two global standards—one in Europe and North America and one based in China? What are the implications of that, in terms of commercial and security threats?

Lord Livingston: I think it is quite feasible in a number of areas. I don't think it will stop interconnect and things like that, but you should remember that for mobile networks there have long been different standards. One of the challenges given to the Committee by Samsung is the support for earlier UK and European standards, because Korea had different standards. For a long time, your mobile phone didn't work in different countries. I don't think we are going there, but the biggest influence on the standards bodies today probably is China and certain suppliers.

As a group of countries that have different policy aims, we have to reassert our influence either in these bodies or potentially new bodies. If it became a Chinese-defined standard, that would have definite economic consequences. You are speaking to Ian Levy later, and he will probably answer on security. That is why, as a country and as the west, we need to get our act together again on standards. The west has dropped the ball on standards.

The work on standards doesn't give you an answer in one or two years; it is a five, 10, 15-year exercise. We definitely need a more influential approach from the west, who want more open standards and security, and don't want to be beholden to a particular supplier. We have to work hard to stop what is happening just now, which is probably a more Chinese-



oriented capture—not a complete capture, but certainly a strong influence on a number of standard-setting bodies.

Chair: Thank you very much indeed. I thank our two witnesses, Lord Livingston and Mr Bailey. We are very grateful for your assistance with our inquiry while you are still working on your recommendations to the Government. We will reflect on all the sessions that we have had and share with the Department, and therefore with you, our thoughts and reflections on what we have heard, in the hope that it will be useful to you and the Government. Thank you very much indeed, and thanks for joining us.

Lord Livingston: Thank you. I look forward to seeing it.

Examination of witnesses

Witnesses: Tareq Amin and Dr Tobias Feakin.

Q410 **Chair:** I will move straight on to our second set of witnesses. Welcome to Tareq Amin, who is the chief technology officer of Rakuten Mobile, which is a Japanese mobile network operator that was referred to in the previous session and which deploys an Open RAN network.

We have Dr Tobias Feakin, who is the ambassador for cyber and critical technology for the Australian Government. Between 2006 and 2012, he was the director of national security and resilience at the Royal United Services Institute here in London. Thank you very much for joining us at night where you are. It is morning in London, but you have stayed up for us, so we are very grateful for your attendance.

I will start with a question to Dr Feakin. What are the Australian Government's priorities with regard to 5G security?

Dr Feakin: I should probably say good evening from Parliament House here in Canberra. I have come out of my Senate estimates hearings this evening to take part, so it is an absolute delight to be here.

We had a whole range of priorities, many of which have been documented publicly, but which it is always worthy of note to go back through. On 23 August 2018, which, in relative history, was quite a long time ago, the Government made a decision that it would ban high-risk vendors from the construction of 5G networks. That had its basis in something we refer to as the TSSR—telecommunication sector security reforms—which, at their simplest, put an onus of security considerations on to any telco that was going to be building a 5G network.

Paramount in our thinking was putting a requirement on network operators to protect Australian networks from unauthorised access or interference that might prejudice our own national security. You can extrapolate from that, essentially, that if we felt that a particular vendor was beholden to the national legislation of its country of origin, we felt that that was not a risk that we could accept.



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At its heart, that was one of the primary elements of the consideration, but there were a whole multitude of other considerations that are, again, well documented. As far as our agencies were concerned, it did not represent a traditional cyber-security risk, because of the nature of the 5G network. The way in which we thought about 4G, for example, was about the core and the periphery. I am sure that you have been through these kinds of discussions already as a Committee. For us, the fact that you had, if you like, one network and that you could not really define the core and the periphery meant that the traditional concepts of cyber-security were not so applicable. Essentially, to oversimplify, it was a matter of giving away the keys to the car.

A real driver for that decision was market certainty for our telecommunications sector and the companies that operate in that sector. Certainly, we do not have the diversity of telecommunications companies that the UK has, but they were looking for a decision from the Government so that they could go ahead and make the necessary investments.

It does feel now that the feedback from the various telecommunications companies has been favourable, in that, at the very least, they have had that certainty about where to make their investment and progress their work. I am happy to talk a bit about some of the progress that has been made.

The heartbeat of the decision was around our national security consideration. We treated 5G as, essentially, one of the most, if not the most, important major infrastructure investment that we would be making over the next decade. On that basis, that range of considerations was there. Economic security was among them as well, because we felt that if that technology was going to underpin our future economy and we could not have trust in the security of that and the information and data that would be running through that network, our economy would suffer as a consequence. In a nutshell, that is where our decision came from.

Q411 Chair: Does it concern you that, because of the availability of equipment manufacturers on the hardware side, it may not be possible to police it in quite the same way as on the network side?

Dr Feakin: It is a really good question and one that gets asked quite often. For us, it is all about risk mitigation. You will not be able to extract every ounce of risk from your network, of course. As far as the tail of the supply chain goes, we are not going to be able to control the fullest extent of that, but if the company that is actually providing that is not answerable to the legislation of its own country of origin—last time I checked, I don't think Nokia or Ericsson have particular intent, or previous form, in that regard—that, for us, is still a risk, but one that is not as extreme as a supplier with, if you like, all those risks in one.

Q412 Chair: Is it possible that the vulnerability is not so much in the control and the corporate intention of the main supplier, but that, if there were a concern about future insecurity—whether that is a weakness of security or a possible malign intent—and if there were a broad set of means by



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which the manufacturer of the components could weaken the security of the network, surely it is not sufficient simply to be concerned about excluding particular companies?

Dr Feakin: That would imply that there is not a whole range of other security measures that we would be taking around 5G network implementation as well. The major part of the decision, if you like, was around the actual vendor itself, but then obviously a whole range of other security measures will be taken around a 5G network. That is the core of the decision, but absolutely, there are a whole range of security measures that will be taken around a 5G network. You cannot exclude risk entirely from that. You can only, if you like, lower the risk level that you are taking on.

Q413 **Chair:** Specifically on the hardware and the components for the hardware, much of which may come from China and other countries, do you have an active strategy and policy to scrutinise and police the deployment of those components?

Dr Feakin: If I may, and it's not a get-out, that responsibility would not lie with this position. We have a whole array of security measures in place that that question would be best asked to—our Australian Signals Directorate and our Communications Department. Put simply, to be able to assess risk in every single component put into the network would be nigh on impossible, and it would not be the requirement that we would put on our telecommunications companies.

Chair: Thank you very much indeed. I will turn to my colleague, Aaron Bell, who has some questions for Tareq Amin.

Q414 **Aaron Bell:** Thank you, Mr Amin, for joining us from Tokyo. Rakuten has been widely reported as deploying the world's first Open RAN network. Why did you decide to do that? What was the commercial case for doing that?

Tareq Amin: Thank you very much. Good morning, everyone. I am really privileged to be with you today. Let me start answering the question with a bit of the history of what led us to build the network in Tokyo in the way that we chose to build it. Almost seven years ago, I had an opportunity to visit one of the webscale companies in the US, Facebook. I went inside one of their data centres and I was shocked to see how they engineered, how they built, how they architected, how they deal with what we call standards.

Whether it is Facebook, Google or WhatsApp, they have voice/video messaging platforms available. But what they adapted into their DNA, which is very different from your traditional telecom industry, is a culture of driving innovation and service agility that I assure you, gentlemen, you will never find in any telecommunications company. That is a fact.

When I joined Rakuten in 2018, I was working for Reliance Jio, another massive start-up in India. I was fascinated that Rakuten is a webscale company, not a telecom company, and I was optimistic that Rakuten would give me the opportunity to do something for this industry that is



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well overdue—one, to open up the network as a whole, not just thinking only about the radio part.

On deploying networks, whether you track 1G, 2G, 3G, 4G to 5G, if you really look at the detail and ask, “How do we deploy networks today?”, it has always been about replacing proprietary hardware and putting in new hardware—it was never about software. However, we never think about why webscale companies have evolved or about why cloud has advanced IT industry.

The merit was simple: one, we needed to disrupt the cost and economics in Japan, before we even talked about the merits of security. We thought that the rate plans in Japan were some of the highest in the world. We thought that if we built a network on the same architecture that exists across the world, we would lose this game from the beginning—entering as a fourth mobile operator and deploying the same services that existed in Japan would never achieve our objective. The No. 1 thing that we wanted to do was disrupt costs and economics, and in fact, when we looked at the concept of open networks—not just the radio, but as a whole—we looked at moving radio, core, OSS, BSS, transport, and building everything as a softer workload in the cloud.

We have looked at and achieved that; the factual numbers are that capex savings are almost 45% versus a traditional mobile operator deployment. That is significant. We obviously pass those savings to consumers, so one of the initial motivations was all about cost efficiency and service agility. The last part, which is extremely critical to us, is that when we thought about security—it was a game of choices, by the way, and nobody really understood that—Rakuten had a choice to select a traditional vendor and, in fact, the behind-the-scenes story is that Rakuten was in the last stages of selecting Huawei as a vendor. I came in and one of my first jobs was to cancel the RFP. I cancelled all of the RFP and one of the things that I wanted to do was to reimagine how future networks should be built and the possibility that networks could be cost-efficient. A 5G network could come at the cost of deploying outdoor wi-fi—those are unimaginable statements.

We knew what our motivation was, and I was pretty confident that we could do this to lower cost economics, but I also wanted to address security. That was a critical part of security—whether with Ericsson, Nokia, Huawei, I honestly always felt that there are too many black boxes in traditional telecoms networks. If you look at your own house today and say, “I want to secure my house,” the first thing that you might think about is visibility, by installing cameras and different apparatus to monitor your security. For me, visibility included the radio. I wanted everything to be open so that we could dictate how we monitor this network and how we apply security, whether from components, software or even hardware itself. That is something on which we took a cognisant choice, and that started in 2018, which is not that far back. When we started this journey, we did not have an ecosystem.

Q415 **Aaron Bell:** So it was seen as a strategic, long-term risk—a gamble, if



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you like—and was not a commercial case saying specifically that it was the most cost-effective thing to do? You are taking a long-term view about where you think the industry, and your firm specifically, need to go.

Tareq Amin: Two things: we know it will be significantly cheaper than selecting an incumbent, and cheaper even than selecting Huawei in that case. We know that, on cost and economics, it is extremely compelling, but a risk that we were all willing to gamble on. Rakuten is not a small company; we are a very large company. With a global transaction value of 150 billion for Rakuten, it is a big risk for the company we are taking. So when people ask me, “What was your first strategic choice?” I said, “Well, Rakuten has done something that is unique: the courage to explore.” I use the word “courage”—you will not find that a lot in this industry. We wanted to challenge the status quo; we thought that we had the right skills, the right engineering capability and the right support from our parent company, in Rakuten, Inc, which is able to put in the funding and create that ecosystem.

In Japan, what we have is no longer a proof of concept; it is a reality. The reality is that cloud RAN is no longer a hypothesis that might or might not work. I invite everyone to come to Japan. Seeing is believing. We have been very open on every little development that we have done, because I really think that this is what the future looks like, and I wish people could see through the lenses of my own employees and our corporation about the advantages of such an architecture.

Q416 **Aaron Bell:** I believe your base stations are still manufactured by NEC, an established vendor. Has taking the decisions that you have allowed you to diversify your suppliers more generally?

Tareq Amin: Absolutely. Let me tell you the surprising thing. You might not even know about this; in 2018, my first conversation happened with the CEO of Nokia, the board of Nokia and the leadership of Nokia. I said, “I want to buy from you the remote radio head, which is an open interface radio head.” It took significant courage from Nokia to listen to what I want.

So the first phase in our 4G LTE deployment started by buying hardware from Nokia and software that was incubated by a start-up that nobody wanted to believe in, but which I believe had all the right things and all the right software architecture. Maybe people were afraid of the relative risk to take a gamble on a start-up that really could innovate. We invested very heavily in a US-based start-up called AltioStar and worked with Nokia. You can now imagine, we had a very traditional vendor, Nokia, and a small vendor, AltioStar. Our job was really to say, “You guys could make this happen.”

We convinced Nokia by showing them that the long-term potential for financials is very healthy. In fact, if you talk to the leadership of Nokia today, I would argue that they would tell you what I am telling you today: this project is financially healthy for them, even though they just sold me



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hardware with no software and we controlled the entire apparatus for software. That was for 4G.

For 5G, I started bringing in diversification of suppliers. I brought NEC and several suppliers in the US, to create hardware diversification and a very large ecosystem, from indoor to outdoor, and from micro-cells and macro-cells. We have very healthy suppliers that we have funded and incubated, and we have delivered a significant increase in Rakuten in Japan.

Q417 **Aaron Bell:** Can I ask what role the Japanese Government have played in any of this? Have they encouraged you or given any incentives?

Tareq Amin: Absolutely. They were incredible. I am sure you will appreciate that Japan is obsessed with quality. The first thing I had to do was convince the Japanese Government that what we are building is secure—what is called carrier grade, where reliability is achieved by certain architecture—and they were pleasantly open to listen to a new way of how the future network should be built.

The second thing they asked is, “This is a great idea, but what do you want?” I said, “To be frank with you, we are one of the few companies in the world, and the few operators that I know of, which go to a level of component engineering design that does not exist in this world or in our ecosystems from an operator point of view. I want to think about a world in which we create a diversification of chip set suppliers, because I believe that is what the future of the world and of competition is about.”

By the way, it is not about factories anymore. I think who controls the new silicon is what I want. That is the gap I am missing today. I spend 80% of my time talking to the US Government about this issue. They ask me about what the Government can do. The Japanese Government have provided subsidies to Rakuten to continue to build what is called Rakuten Communications Platform. They provided help and incentives, but I like how they provided these incentives. It was not just, “I’ll give you money and walk away”; it was incentives with caveats that we will deliver on the promise.

Their engagement has been healthy and positive. We look at it not only as a local problem in Japan, but as a global ecosystem problem. They started connecting us to quite a few Governments and private entities across the world, which maybe have the same interest as Rakuten in trying to really change the status quo of how cell phone networks are deployed, engineered and operated across the world.

Q418 **Aaron Bell:** You mentioned the subsidies. Were they critical to your delivering this project—that the Government supported you?

Tareq Amin: Frankly speaking, the subsidies, for me, were a mental award more than a financial award. It is a mental award by showing that someone is really supporting us to go create what we have done. I want to be very honest with you—it was not easy. It was not easy at all. Our company took a massive risk. It is good to have a Government behind you

to say, "You know what? This is a good idea. We will endorse you and support you."

The financial reward that we want isn't necessarily that I want it to go to Rakuten; actually, we want to see an ecosystem of healthy and diversified chip set suppliers that would exist. We even had an opportunity—we were really privileged—to talk to your UK ambassador in Japan, and he asked the same question. I said, "I hire so many people from the UK, because of the talent I need to access in the UK". I said, "It would be great to find a way of collaboration and partnership to create that next generation dream chip set."

Now, I don't need to manufacture it in the UK—manufacturing could happen everywhere—but the component is so critical to future success in telecoms. It is beyond critical, and believe me, that is the missing piece that this industry does not really realise yet. Open RAN is fantastic, but the component is not talked about enough in any of these forums.

Q419 Aaron Bell: You obviously have some knowledge of the UK and the ecosystem that we have in telecommunications. Do you think what you have done could be replicated in the UK and on the same sort of timescale, based on your understanding?

Tareq Amin: One hundred per cent. I mean, just think about it. When I started, the exact timeline was: June 2018, I arrived in Tokyo and we had nothing. There was no data centre, there was no infrastructure, no fibre—there was nothing. There was an idea—an idea that existed in my mind from that Facebook visit—and then we launched the network in 2020. That is not that complicated, and we will finish entire Japan by summer next year, as far as build-out goes, because of the simplicity of the architecture.

My advice to everybody thinking about this is to really start having a bit of an open mind that this is possible, first. Before we even built the first macro-base station, the whole world debated whether Rakuten will succeed or fail. Well, we never thought about a plan B; we thought that this is absolutely doable. And we believed in the will of the right, determined engineering mindset to go solve this problem. I mean, if we are able to send people to the moon, land rockets on a ship, I always thought that this is not going to be a difficult thing.

From the UK point of view, I think the first approach that needs to be taken is the mindset and the willingness to approach a different path, and to accept that the world in the future has to be embracing cloud, elasticity and security in how we build future telco networks.

Q420 Aaron Bell: Finally to you, sir, are the Open RAN standards now fully developed and agreed as far as you are concerned, or will there be further common standards that need to follow?

Tareq Amin: To be honest with you, yesterday was the first day I attended an Open RAN forum—yesterday. I have huge respect for standards forums and I have huge respect for what Open RAN is trying to



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do. From Rakuten's point of view, we saw an obstacle, and the obstacle is that we had to launch the network in two years. While standards are critical, valuable and important, we also have to be cognisant about the importance of agility. I think we are not doing enough to be agile—that is my own humble opinion. I think we take too much time to debate and too much time to really find out whether this is the right solution or not, and I really advise you to think about the cloud world.

Now, the cloud companies have been moving at lightning speed. What hinders us in telecoms from doing the same thing? There must be something. I think standards are important, but I also think a change in the mentality and mindset is well overdue, in order to find new platforms and new solutions.

Maybe I will end with this: I think the UK has unbelievable, brilliant talent. You have a national asset that we tapped into at Rakuten, to be honest with you. I have so many people who came to us and who we recruited from the UK to help us build this dream, and so many suppliers who are already thinking about how they could support Rakuten today and tomorrow. I am passionately involved in Open RAN, because that is what I believe the future needs to look like.

Q421 Aaron Bell: Thank you, Mr Amin—absolutely fascinating. Dr Feakin, what are the Australian Government's views on the feasibility and merits of Open RAN with regard to both vendor diversity and security?

Dr Feakin: We are all in favour of the developments in Open RAN that are currently going on. We see it as a clear part of our 5G mix going forward. We are fully supportive. It adds to our market diversity piece, which is something that we are obviously concerned about. As it currently stands, we have two vendors who supply our 5G equipment—Nokia and Ericsson—so Open RAN would absolutely be part of future solutions. I know that our telcos are already looking at Open RAN and how to incorporate that into the mix.

It is heartening to hear the speed at which Open RAN is developing in Japan. I guess we have had slight concerns, and so have some of our telcos, about whether it will develop quickly enough to resolve the current issues we have with the diversity mix in our own secure providers. The jury is out on how quickly this can be absorbed. Obviously the previous speaker would suggest that that is not an issue whatsoever, but I am led to believe by our telcos and their work on this, and our Government's work on this, that, yes, we see this as a potential avenue and it is being explored, but we are not entirely convinced as yet that it is completely ready to go and will arrive quickly enough to clear the problems that we have on market diversity.

Q422 Aaron Bell: It sounds like you are in quite a similar position to the UK then, as far as that is concerned. Are the Government actively doing anything to promote Open RAN in terms of subsidy or incentives at the moment?

Dr Feakin: No, we are genuinely leaving it to the telcos to drive it. From talking to some of the telcos here, if you think about Telstra, they first launched their 5G network in May 2019. November '19 was when Optus began their 5G network. I think Vodafone began in March this year. Certainly, they see it as almost a unique selling point globally, the fact that they have had a network up and running for some time. The maturity and stability of the Australian market and the geographic diversity of our country is pretty remarkable, which is also important when thinking about telecommunications infrastructure.

They are definitely incorporating concepts around Open RAN as part of that proposition and testbedding. They are already looking at it and trying to incorporate it into their mix, especially Telstra, but at the moment the jury is out. We are essentially leaving it to market forces to drive it. We made a very big decision back in 2018, which has helped the market to drive forward, but I know that all those companies are very much in the mix in looking at Open RAN.

Q423 **Chair:** Sticking with Dr Feakin, we have heard what is going on in Australia. As Aaron said, it sounds quite similar to where we are in the UK. What role do you think there is for inter-Government co-operation between like-minded nations to support market diversification in telecoms?

Dr Feakin: I would say that it is absolutely essential. One of the problems that we both face in this regard is that we are importing technology. We are a technology importer in this case, and I think there is a whole range of ways that we, as like-minded countries, need to be engaging, and we do internationally, whether it be around the standards piece, which obviously we all acknowledge we need to be doing more on and being more co-ordinated on. Standards is gritty, time-consuming work, but I think there has been a grand awakening among like-minded countries that we need to be doing more.

That is one area. One of your previous speakers mentioned R&D. Looking at ways that we can use R&D funding in a combined manner will have more strategic impact on this whole tech space.

Also, I think, as like-minded countries we can assist other countries in understanding some of the decisions they are making themselves. A bit of experience sharing goes a long way, if asked. We do get a lot of requests from other partners asking about this, because there are so many other countries that are going through similar decisions to those our Government have taken, so if there is a bit of shared experience we can offer, that is a good place to be. However, I certainly think we need to be co-ordinated in terms of how we drive a more diverse technology market, and a trusted technology environment as well. I know there is a very live discussion among like-minded countries on this front.

Q424 **Chair:** Thank you. Mr Amin, do you have a perspective on whether like-minded countries can and should co-operate more? Does the fact that you have made a breakthrough in Japan suggest that you can do it in one



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country, and then perhaps deploy it elsewhere?

Tareq Amin: Collaboration and co-innovation is extremely critical across geographical boundaries—it is way too critical. On this topic of telecommunications, in my view, of course the private sector has to drive it, but I also believe we have to link geographies to talk about lessons learned, and we spend a lot of time talking about this with Governments in North America and Asia. For example, in our world—this is pre-covid—we said, “Come to Japan and see what we have done. We are not saying it is the best thing in the world, but it is another alternative; it is another option.” We knew that for this to become credible, an ecosystem needs to be created, and we have been asked and invited to become a formal member of O-RAN because of what we have done in Japan.

Now, we are very anxious and eager to link the dots. We think we have done things that are big breakthroughs on technology, but for this to become accepted as a mainstream, we have to bring Governments and private entities together to say, “I am willing to adopt this.” We are seeing some extremely encouraging early days from operators across the world, saying that this is something we should try to do. At least we have opened the debate, and that, to me, is very healthy; it is healthy that we are finally debating a different alternative.

Q425 **Chair:** But what if we went further? You have been very generous in your appraisal of the skills that are available here in the UK; you say you have recruited people to work for your company and support the roll-out of your network. What about coming into the UK to offer the service that you do in Japan? Is that something you have considered? Is it feasible in this country?

Tareq Amin: Yes, we consider it. I will tell you what we ended up doing: over the last two years of our life journey, we quickly realised that the technical assets and know-how—the analogy I will give you is what Amazon did for IT when it created AWS, and the revolution that that started. We really think that is analogous to the communication platform we created and the cloud layer, and the offer we made was, “We want to co-innovate on the cloud. We do not want to be another vendor; that is not our approach.”

We started talking, and it was a long-time conversation. We even had a discussion with Ofcom to say, “Why don’t you take what we have? We don’t want anything, other than someone who can adopt, evaluate, and independently judge that what we have done is worth exploring.” Believe me, we have made some amazing breakthroughs, and all we are asking for is opportunities to really deploy them.

Q426 **Chair:** What did Ofcom say?

Tareq Amin: The discussion happened in 2019, and—I am going to tell you my honest opinion about this—I really believe that in the telecom industry, we are driven primarily by four vendors: Ericsson, Nokia, Huawei and ZTE, and now maybe Samsung. However, maybe there is a different view; maybe people like ourselves think of the world a bit differently. We



are people who believe in diversification, and the analogy I gave Ofcom was "Look how brilliantly you guys do when you build Airbus. You have different countries participating in Europe to build different components. Why couldn't we do the same thing for telecoms?" At the beginning, there was doubt: "This doesn't work. It is risky and it is invalidated." Well, we cannot argue that Japan is not a mature, quality-obsessed country. My viewpoint is that if it is working and serving the heart of Tokyo, which is one of the densest areas on the planet, in terms of traffic and consumers, one might argue that maybe this technology is actually real and has merits that should be explored and encouraged. I really would use the word "encouraged". In this case, I believe that the Government has a big role to play in encouraging the promotion of such technologies.

Q427 **Chair:** You made that proposal and shared that thinking with Ofcom. Did you get a response? What did they say?

Tareq Amin: I think mostly they were watching to see whether this technology was going to materialise. They were very keen to see, learn and understand whether this technology will have merits. Today, we are fully commercial and we have a significant number of customers. By the way, we carry twice as much traffic as your average data consumer in Japan, because we have given the rate plan at 70% less cost, not because we want to go bankrupt but because this technology has driven costs and economics that telecom operators could not imagine. Imagine this: today, I am exactly 70% cheaper than traditional incumbents in Japan because of this architecture. Isn't that a good thing for consumers? That, I argue, is a good idea. The Government is happy, of course. Consumers are happy, and we are going to create new verticals and industries that are going to take advantage of this disruption.

Chair: Thank you very much indeed to both our witnesses for giving us a very helpful international perspective. It is very good to have that today. I am delighted to know that the Australian Parliament is sitting as we speak, and we can be in commonality with that. Dr Feakin, we can release you back to my colleagues in the Australian Parliament to continue their questioning of you. I thank them for loaning you to us for 45 minutes. We are very grateful for the assistance that you have given to the inquiry. Thank you very much indeed.

Examination of witnesses

Witnesses: Dr Yih-Choung Teh and Dr Ian Levy.

Q428 **Chair:** I am pleased to welcome our final set of witnesses. They are Dr Ian Levy, who is the technical director of the National Cyber Security Centre and, as Lord Livingston mentioned earlier, technical adviser to the telecoms diversification taskforce; and Dr Yih-Choung Teh, who is the group director of strategy and research at Ofcom, the UK telecoms regulator. Thank you very much indeed for joining us.

Perhaps I can start with Dr Levy. What are the security risks that arise



from having too few vendors of telecoms infrastructure equipment?

Dr Levy: Good morning. We believe that a number of security risks that arise from that. The first is strategic dependence. If you have only two vendors, and it is hard to switch between them and anyone else, you are reliant on them for everything. If one of them goes out of business or starts to do interesting commercial practices, you have a resilience risk for the long-term security and resilience of the network.

The second is a systemic risk, in that it is very hard to build resilient networks—we are talking about the systems, rather than individual components—with just two vendors for the whole of the UK. Obviously, if there is a vulnerability or a failure in a particular piece of equipment, that is much more impactful in the UK if you have only that piece of equipment and one other type. It also means that you reduce innovation, competition, security pressure, feature pressure and so on, so you end up with quite a stagnant market. If you are requiring every operator to take two vendors in their radio network, for example, there is no pressure to do anything if there are only two people who can supply that.

Q429 **Chair:** How many vendors do you think the Government should be aiming to have supplying the UK mobile and fixed network markets?

Dr Levy: It depends on what target architecture you are looking at. If you are looking at the current the current large macrocell incumbents' vertically integrated ecosystems, you need at least three. That is not what we think is a sensible long-term state, because it will always degrade back down to two or three. We want to try to push much more for a more diverse modularised ecosystem—much more like how the internet is built today, where you can have an IBM laptop or an Apple laptop, and they both work on the internet in the same way. We want to do the same sort of modularisation and interoperability for telecoms.

If you get to that, it depends which parts of the networks you are talking about. In the software space, you would expect to have quite a large number of vendors, because there is a relatively low entry cost. In the radio access network, where you are building physical things, there is still quite a high entry cost. You would expect more than two—maybe five, six, seven; that sort of number—but it would certainly be more than the two that we are left with today.

Q430 **Chair:** Before I come to Graham Stringer, do you intend to specify in the future telecoms security requirements minimum vendor diversity requirements?

Dr Levy: There are some minimums in there, but they are minimums as of the market today, because there is no point in saying, "You must have five," if there are only two. The good thing about the TSRs is that they are intended to be evolved often, so every year or two, we will evolve them as the market changes.

Q431 **Chair:** So they will start, essentially, as a reflection of the fact of what is available but with the intention to increase that in anticipation. Do you



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expect the requirements to drive the diversity and push people in that direction or to reflect the diversity that is available? Would it be push or pull?

Dr Levy: We would expect the requirements that are levied through regulation, as Yih-Choung will talk about later, and things like the telecoms security requirements—the detail—to set the economic and market conditions so that new entrants can succeed. It is a bit of both.

Q432 **Graham Stringer:** Good morning. You talk about diversification giving us greater security, which obviously makes eminent sense, but there is a bigger picture in which China is separating out from western Europe and north America, and Japan for that matter, in terms of all sorts of international relations. I think I have heard you say before that there is a real possibility of China having separate standards to the rest of the world. What are the security implications of that? Does that not work against the diversification objective of different suppliers?

Dr Levy: I do believe that, at the moment, we are likely to end up with two competing tech stacks in a number of spaces, including telecoms—one western-driven, one China-driven. Whether they end up being completely separate standards or profiles of the same standard is to be seen. I hope that we can maintain lots of commonality, so that we end up with a common platform with specialisations on top for each stack. That may or may not be possible.

In terms of diversification, what really matters is market size. It is only worth building something for a particular market if you are going to get a decent return on investment. What we have to do—I just heard Dr Feakin say something similar—is make sure that like-minded countries come together to make sure that they have compatible regulatory, security and diversification requirements, so there is a big addressable market to make sure that the things that we want are available long term.

Q433 **Graham Stringer:** You talk about size. At the moment, China is growing while most of the rest of the world is shrinking because of the response to covid. Is there an implication that, if China becomes dominant and has a different regulatory system, that in itself will be not just a commercial problem but a security problem?

Dr Levy: Certainly. Software codifies values at the moment, so if you have Chinese companies providing the software or the hardware for everything that you do, you are implicitly going to get the Chinese values encoded in that. We have to make sure that the standards bodies are multilateral and appropriately driven to make sure that everybody gets a fair voice, and that there are alternatives.

Q434 **Graham Stringer:** Can you be slightly more explicit about what you mean by Chinese values? What are the implications of that difference? I am not quite clear.

Dr Levy: One potential outcome is you end up with whoever sets the standard ensuring that their commercial companies are best positioned to deliver that, so you end up skewing the market quite considerably. If you



skew the market towards something that, for example, puts at the heart of its standard censorship of domestic traffic, that would then come for free in everything you bought, because that is what they are building. That is not something that we care for in the UK, for example.

Q435 Graham Stringer: Is there something we can do to defend against that? I am positive that it really comes from the sheer size, or potential size, of the Chinese economy. Is there anything we can do, apart from outgrowing China, that would protect us from that threat?

Dr Levy: As I say, getting like-minded countries together to make sure there is an addressable market that makes sense to commercial companies; making sure that we have like-minded countries and companies coming together to ensure that those standards codify the values that we want and codify the standards that we want; and ensuring that we have the right kind of R&D pull-through and industrial strategy to make sure we have the delivery vehicles for those standards. If you can do that, you can make sure that there are always alternatives, and those alternatives in some cases will be better than the Chinese one, even though they have a massive home advantage in terms of their market size.

Q436 Chair: Thinking about security, Dr Levy, is it the case that we are concentrating, if not on the wrong thing, then on only half the problem? We have rules on vendor diversity and who can participate, but if vendors' products can be manufactured in China or other countries, to what extent have we solved the security problem if we have not addressed the manufacturing issue?

Dr Levy: One of the benefits of diversification is that you can diversify the supply chain as well. You can say that certain parts are manufactured in China and certain parts are not manufactured in China. You want to be able to say, as a system, that there is not a simple route through for somebody who has done something nefarious in that supply chain. Everything has risk, and that is always going to be the case. To some degree, manufacture location is a relatively low risk in terms of how complex these things are and how difficult it is to insert something during the supply chain. It is much easier to go much further up the stack and go for the software. That is traditionally much easier because it is attacking people rather than attacking physical supply and physical manufacture.

Q437 Chair: So the location of manufacturers you say is a low risk—

Dr Levy: Lower risk.

Chair: Lower risk, so we should be less concerned—appropriately less concerned—about where components are manufactured than we are about the location of a vendor's headquarters and operations, for example?

Dr Levy: If I take the ends of the spectrum, at one end of the spectrum, would you want the chip that is the heart of a particular piece of equipment being designed, manufactured and tested all in China? Would that be an appropriate risk? Probably not. If you have something that has

been designed in a western country and is tested in a western country but is just physically put together on a Chinese production line, that is a very different risk.

Q438 **Chair:** How can you—or can you—codify that in terms of requirements? We have had a debate about the exclusion of Huawei, and that is relatively straightforward to do in policy terms—it needs to be operationalised—but are we developing similar rules when it comes to the more diverse manufacturing supply chain?

Dr Levy: Where we want to get to is that we are not overly reliant on any geography, any company or any particular technology in the UK telecoms sector, so that if something bad happens to any one of those things—a particular plant catches fire or a particular company goes bust—there is no significant impact on the UK’s telecoms network. That is pretty much how the internet works today for the vast majority of component supply.

Q439 **Chair:** I understand that is where we want to get to, but are steps being taken to require diversity of manufacturing in componentry?

Dr Levy: There are steps being looked at about how we get to that point without affecting the market in ways that we do not really intend. There are some potential second-order consequences. If you are not careful, you end up doing state aid in a way that does not help.

Q440 **Chair:** Say a bit more about what the measures being contemplated might be.

Dr Levy: That is a DCMS lead. You spoke to Lord Livingston this morning about the diversification taskforce. There is a diversification strategy being written at the moment, so I do not want to talk about the details of that, but the sorts of things that we are talking about are incentivising companies in lots of different ways to do things that are advantageous to the UK and her allies long term in terms of telecoms. That might be providing R&D grants. It might be changing some of the commercial requirements in the UK regulatory system to make it easier for operators to adopt new technology. It may be asking operators to ensure diversification across their supply base. There are lots of different things being looked at, but as I say, getting it optimal is quite tricky.

Q441 **Chair:** It is the character of these things, generally. Take R&D grants: they are facilitative and helpful in promoting diversity of manufacture, but will they be regulatory? Would you expect to specify that a vendor or an operator had to limit the manufactured components to be only a certain proportion for different countries?

Dr Levy: Probably not at the moment, to be honest.

Q442 **Chair:** Why not?

Dr Levy: Because it would be hard to specify anything that made sense.

Q443 **Chair:** So it is not that it would be an undesirable or unreasonable aspiration; it is the practicality of doing that that is the constraint.



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Dr Levy: The practicality, plus the actual benefit that you get from it. If I say you must manufacture in Mauritania, I have to be able to objectively say that Mauritania is a better place to manufacture than, for the sake of argument, China. That is quite a hard thing to say, because you are talking about local law, you are talking about hostile state intervention in that country through agents and spies, you are talking about the quality of the cyber-defence facility that you are using, and so on.

Q444 **Chair:** If we turn it the other way around, could you envisage it being useful to specify a market share cap—to use a familiar phrase—for manufactured components for a particular country?

Dr Levy: You could. That may be a useful thing to do for certain high-value, high-impact components. It is a question of whether that is useful for the assembly of boards—just sticking components on boards.

Q445 **Chair:** So these things are being looked at. Is this something that you expect the diversification taskforce to recommend to DCMS? Is it DCMS Ministers separately or Ofcom that you would expect to make these decisions?

Dr Levy: I will let Yih-Choung talk about Ofcom's role. I would expect DCMS Ministers to be setting a policy for what they want to achieve and why, and over what timeframe; the diversification taskforce to help provide expert views about the best way to do that; and DCMS and Ofcom together to work out the best way to regulate, enforce or incentivise, whatever it turns out to be.

Q446 **Chair:** I see. Finally, as the NCSC, your advice to Ministers would be to have some rules to be determined on the manufacturing side, as has been adopted on the vendor side.

Dr Levy: Yes, we would absolutely wish to have a diverse supply base and manufacturing base across the telecoms sector.

Q447 **Chair:** And there should be measures taken to achieve that.

Dr Levy: If the market won't gravitate there by itself, yes, we would ask for incentivisation.

Q448 **Chair:** Not to labour the point, but do you expect the market to go there by itself and therefore obviate the need for it? Or do you expect to have policy measures needed, at least in the short or medium term?

Dr Levy: If the market goes the way that we would like it to, in terms of lots of interoperable, modular vendors that can be interchanged quite quickly, you would naturally get a much broad supply base. If we succeed in getting the diversification outcomes that we want, it is much more likely that that will have a broader supply base in terms of manufacturing and assembly, but until that happens and we understand the companies that are involved, I cannot be sure.

Q449 **Chair:** But would you say not yet for regulations, or regulations now but with the prospect that they might be removed when we migrate to—



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Dr Levy: I would say not yet.

Q450 **Aaron Bell:** If I could turn to Dr Teh about Ofcom's role, which you briefly touched on, Chair. Ofcom's role is to further the interests of citizens and consumers in relation to communications markets, including through promoting competition. What has stopped Ofcom so far from maintaining better vendor diversity? Why have we got to the situation we have?

Dr Teh: Good morning. It is important to start with what Ofcom's role is. As you know, Ofcom's role is to regulate telecoms operators and to manage the UK's spectrum. As such, we do not have a direct role with equipment vendors, although we do provide independent technical advice to the Government and others, given our expertise as a sector regulator and our experience in convening the industry together. So it is partly about the powers that we have at present, as given to us by Parliament. As we heard from Lord Livingston earlier today, I think it is very much to your question of how did we get here. There is the nature of the economies of scale globally in the manufacture of this sort of equipment, and the very large R&D requirements. For example, it was reported that last year Huawei invested close to \$20 billion in R&D, so naturally the market gravitates in that direction. Fifteen years ago Nokia was effectively five different vendors. The important question is, what do we do about this moving forward? As we have been discussing, that is very much about how we disaggregate and diversify that supply chain.

Q451 **Aaron Bell:** The Communications Act 2003 says that one of its principal uses is to further the interests of citizens. I accept the point that you have been focused on the end user and the commercial element of that, but have you been considering the security of citizens over the last 17 years in terms of vendor diversity and the implications of that for citizens' security and the security of the nation as a whole?

Dr Teh: That, of course, is a consideration we are very concerned about. We are not only focused on the consumer aspects. Obviously, a lot of our work is about how we ensure spectrum is allocated in an efficient way for optimal use and how we look at ensuring that we support the roll-out of infrastructure. Obviously, the deployment of full-fibre networks and 5G is an important consideration. We have a lot of wholesale regulation, for example, over Openreach, which is designed to try and facilitate that. Increasingly we are focused on security issues, as you know. Following the Government's supply chain review, the intention is for us to have greater powers, and we are working very closely with Ian and NCSC in terms of the cyber-security technical lead and DCMS as the policy lead on an enhanced regime around telecoms security requirements.

Q452 **Aaron Bell:** You intend to auction off the rights for some 5G frequencies in January. I don't know if that is still the date that you are working towards. Your policy objectives for that include sustaining strong competition in mobile markets, but there is no reference to diversification of the vendor market, open standards, Open RAN or anything like that. Do you think that needs to change, or are you saying that your role is specifically about the actual competition at the user end?



Dr Teh: As you say, the intention is that, or we hope that, bidding in the auction will start in January. The question, which I think this session has demonstrated, is a much broader one about diversification. It is very much a global question as much as a UK one. We have looked quite hard at whether we can advance that objective as part of the auction, and we do not believe that that is possible at this stage. Our duties in the context of the auction are very clear. It is about the efficient use of the spectrum and getting it out as quickly as possible in an appropriate and proportionate way. So I think there is a broader question about how we meet the objective, which, as we have heard from Lord Livingston, is very much what the telecoms diversification taskforce is doing, and then we will see as that comes forward where different responsibilities are best met.

Q453 **Aaron Bell:** I understand that you have to act in accordance with your statutory responsibilities. Do you believe that the network operators currently have sufficient incentives to drive diversification of the vendor market?

Dr Teh: I do think that that is a very important component of this. As we have touched on, they have a very strong commercial incentive. One thing that struck me in talking to the operators following the developments with Huawei is that that is not a situation that they want to be in, where they are concerned about pricing power from the remaining incumbents, Nokia and Ericsson. You just do not want to be in a commercial position where you are beholden to a single supplier, so we do think that the commercial incentives are strong, in terms of looking for greater vendors. Actually, as we have heard, I think the biggest issue at the moment is the lack of credible vendors on the supply side. That is where we really need to focus attention and where approaches like Open RAN, in terms of disaggregating the supply chain and allowing more innovation and newcomers to participate, are a really important part of the strategy.

Q454 **Aaron Bell:** I do not know if you heard the evidence from Rakuten in the previous session, but the chief technology officer there clearly thought that a UK operator could take the same approach that they have. Do you think there is a structural reason in our regulation that explains why that has not happened in the UK to date?

Dr Teh: Certainly in terms of what we are responsible for, I do not see any regulatory constraints that we oversee that cause an issue. One thing I would observe is that it is a different situation when you are a brand-new player and you can build from a greenfield site versus being an incumbent with a bunch of legacy technologies that you are going to be very keen to make sure you interface with.

However, as you heard, we have been talking to Rakuten. I am very keen that we invest in our understanding of emerging technology. As Ian has said, we very much see, in the coming years, that the architectural solutions will start to change. One thing that I think Open RAN enables is a greater degree of virtualisation and so, as we heard from Rakuten, a greater degree of software-based solutions. That is something that I very much expect to come to the UK, although there is a question about the



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timeframe. So yes, we share that optimism about how we can end up in a situation that is much more agile. The question is how we manage the migration of various existing technologies in a way that does not leave consumers high and dry because of a loss of continuity of service or other issues of that nature.

Q455 **Aaron Bell:** My other question is: why hasn't that happened yet? You are saying that there is nothing stopping any UK operator doing that; it has just been a commercial decision for them.

Dr Teh: Yes, and I think that the commercial business case is clearly different if you happen to be an incumbent operator with an existing revenue stream and customers than if you are new entrant. Obviously, the challenges for a new entrant, depending on the competitive intensity of that market, may make that a less or more attractive proposition.

Q456 **Aaron Bell:** I will come to interoperability in a moment. I would just like to offer Dr Levy the chance to comment on that, and on whether he thinks there is an element of the commercial operators in the UK having not been willing to go down the same route as Rakuten because of the structure and oligopolistic nature of our market.

Dr Levy: Yih-Choung has made the main points: that the Rakuten deployment model is very different from, say, BT or Vodafone taking that in the UK. The fact that Rakuten has a virgin spectrum, virgin network and a complete greenfield site with no legacy is a very different proposition. The other thing I would say is that I do not think there is a huge amount of money in the UK telecoms sector at the moment. We have levied quite a lot of cost on them in various ways, and so investing in something such as standalone 5G in the way that Rakuten has done would be a big commercial risk for them at the moment while we are asking us to do all these other things as well.

Q457 **Aaron Bell:** Thank you. I will move on to interoperability. Why does the UK depend on 2G on Single RAN more than some other countries? Is there a sense that we have always been more keen to be backwards compatible?

Dr Teh: The first thing I would observe is that, just to be clear, there are no regulatory requirements for the operators to continue to run their 2G or 3G networks. That is very much a commercial issue, but there are important reasons why that is a consideration for them. The reason Single RAN, which covers all those technologies from the same vendor, has been deployed in the UK, as has been the case in most cases around the world for 5G, is that those were the standards first agreed in terms of the 3GPP body, and therefore commercially available. Support of those older technologies is important because of a certain number of use cases. In terms of older phones and handsets, I think there was a report from Real Wireless last year that suggested that the best part of 10% of phones are still not 4G compatible, so you have to worry about how you support those.



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There are clearly visitors to the UK who may be in a similar situation. Importantly, we have non-consumer, or business-to-business, applications, which still sit on those older networks. That will include smart metering as well as eCalls, which are the emergency calls from vehicles, which sit on those networks. You have to think about how you will migrate those things, including some critical national infrastructure questions, to move away from it.

Q458 Aaron Bell: How do we reduce that dependency, and at what point do we do what we did in television, which was essentially to say, “We’re not going to support the old way of doing things any more, and we will help people who haven’t been able to move over to move over”? Is that point coming soon, do you think?

Dr Teh: I think those are very live questions, and ones that we very much want to collectively consider, simply because it helps in terms of avoiding parallel running, which has more costs and complexity. It adds to security risks. As you note, we have some experience of this, if you go back 10 years-plus to digital switchover. Questions that we are currently thinking about in the telecoms environment include, for example, switching off the public switched telephone network as we move to an IP-based model or, in due course, copper retirement as we move to a full-fibre network.

As I say, there is a degree of complexity here because it is not just regulatory. There are various legal and commercial questions in that migration, but one observation I make is that it takes quite a lot of time, because there are a lot of logistical things that you have to co-ordinate, and you have to think about the end-use cases. Now is very much the time where I think we need to think about things like 3G retirement, probably in the first instance—something that the operators are very keen to work on as well.

Q459 Aaron Bell: Samsung are one of the obvious potential entrants into our market. In the evidence that they have given us they have said that the requirement from operators—as you say, it is not a legal requirement but an operator requirement—that they should be Single RAN equipment with backwards compatibility effectively excludes new market entrants. They have also suggested that they could enter the UK market if they get overlay 5G equipment on existing 4G networks using the Open X2 interface. What obstacles are there to using that solution in the UK, and could our network operators be compelled to use it?

Dr Teh: Ian will have views as well, but to start, there are different implementations of 5G. As I said, we have started with the non-stand-alone variant, because that is what is available quicker. There are then solutions that look like overlays, which then do not require the same degree of support from a vendor like Samsung of 2G or 3G networks, or indeed stand-alone 5G implementations, which ultimately I suspect we will see because if you want to access the benefits and features that 5G offers us—for example, ultra-low latency—that needs to be built on a stand-alone 5G core.



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There are different ways in which this might happen. We talked earlier about private networks for some of those factory manufacturing sensor-type applications. That may be a great opportunity for smaller private networks to deploy some of those technologies quicker and allow vendors to enter in that way without necessarily having to support 2G or other legacy technologies.

Dr Levy: Taking Open X2, or the X2 interface, as an example, I do not think it is a particularly hard technical problem. It is a much harder commercial incentive problem. If you think about what you are asking, you are saying to, for the sake of argument, Huawei, "Tell us exactly how your 4G to 5G interface works so that we can take away your market." That is effectively what you are asking them to do. Remember that both sides of the X2 interface have to co-operate, so whoever's 4G platform you are trying to plug the Samsung thing into has to co-operate as well. There is a real commercial incentive question around that. That is the sort of thing that we have to address as we go forward in diversification/interoperability, so that there is a sensible set of incentives for every party in the system.

Q460 **Aaron Bell:** I agree. It is always about incentives. Just to finish on Open RAN, Dr Levy, do you think Open RAN is a feasible solution to increase market diversity and mitigate security risks, or is it something that is always only ever going to be a very small part of our infrastructure?

Dr Levy: I think Open RAN and technologies like it—because it is not the only way to do this—certainly have the potential to help us modularise and massively change the market dynamics and the number of vendors involved. If we get it right, that will raise security as well as functionality, interoperability and resilience, so I think it is quite important for us work closely with the Open RAN ecosystem, to work closely with the operators, to try and make sure that those incentives can be constructed in a way that operators, vendors, regulators and IP holders can all work together to try and make this optimal for the UK.

Q461 **Aaron Bell:** You said, "If we get it right." Is there a risk that elements of Open RAN could make things worse? There could be an increased number of suppliers. There is more network infrastructure and it is more complicated to manage, and more of the manufacturing moves to the far east while maybe the west concentrates on software. Are there security risks from Open RAN as well?

Dr Levy: Potentially, yes. With any complicated technical standard, there are always risks. Making sure that the right kind of people are involved to ensure there is security in there, and making sure the right kind of people are involved to ensure that there is diversity of views into the standards, are all necessary in order to make this a sensible, implementable, secure standard.

Aaron Bell: Thank you, Dr Levy. That is all from me, Chair.

Q462 **Chair:** Thank you, Aaron. During the time, including now, that we have the Huawei evaluation centre, one of the arguments made was that it



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was possible to understand what are very complex systems through a dedicated inspection and evaluation centre. We are obviously going to lose that when Huawei is no longer supplying to the network. To take Aaron's point, is it the case that much greater diversity is actually something that improves our security, or does it not fatally undermine our ability to keep tabs on what is being stored in the UK?

Dr Levy: I will answer that in two parts. First, the Huawei Cyber Security Evaluation Centre, as part of our mitigation for Huawei, will exist in the UK for as long as there is Huawei equipment in the UK networks, so it is tied to the fact of Huawei equipment being here, rather than them continuing to sell.

Q463 **Chair:** Not just new equipment but existing equipment.

Dr Levy: It is there for the duration and Huawei have agreed to that at the oversight board.

In terms of the diversification, of course you will get good and bad vendors, just like you do on the internet. You will get people who are very competent, security conscious and who do really well. You will get vendors who are not security conscious and who just lash things together and try and sell them. The difference that we will have with the interoperability and the openness is that security researchers will be able to look at these pieces of equipment in a very different way from the way they can do today. So if I want to do security research on a base station, it is going to cost me about £1 million to spin it up. That changes as you move to much more software and virtualisation. I can run a base station on my laptop to do security research. So you get a very positive effect of security researchers globally looking at this equipment and helping vendors make it better, just like we have done in commodity IT for the last 10 years.

Q464 **Chair:** Is that part of the purpose of the new national telecommunications lab?

Dr Levy: It absolutely is. The national telecoms lab, which is a DCMS lead, is being defined at the moment. Our intention is that it will be there to do a number of things. The first is to ensure that we can do interoperability testing, so that we can actually put real-world scenarios together and say, "This vendor and that vendor work together in a sensible way".

The second is to try to de-risk new entrants into the market. Operators are very risk averse when it comes to a new entrant, so how can we help them by doing common testing, funded by Government, to ensure that we can do the majority of that commercial acceptance for them up front so that they don't have to do it themselves?

Security is another part of this: giving security researchers and others access to representative networks so that they can do proper research, whether that is security research, new protocol research, development—whatever they want to do. Finally, trying to build some skills: how do we build integration skills in the UK, to help the operators but also more generally as well?



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Q465 **Chair:** What is the timetable for this?

Dr Levy: As I say, it is a DCMS lead; I expect that they will announce it soon. I would hope that within the next few months we will hear something concrete about timing.

Q466 **Chair:** Is there a gap? We have heard of concerns throughout this inquiry that on the manufacturing side there are potential sources of insecurity. Obviously, through the Huawei evaluation centre, you have got a good ability to have a lens on that. Until we have this lab, though, are we missing the ability to delve into other suppliers with quite the same detail?

Q467 **Dr Levy:** We talk, as do Ofcom and others, to all the major suppliers into the UK telecoms market, and we work with them to understand the security characteristics of their equipment—from how they build software, to how they design it, to how they have it manufactured. Obviously, there is a difference between our accepting Ericsson's word versus accepting Huawei's word.

Therefore, we have an understanding as a community in the UK—between Ofcom, DCMS, us and the operators—about how the supply chain works, so I do not think that we are blind to it at the moment. What the national telecoms lab will do is give us a way of systematising that as the number of vendors goes up.

Q468 **Chair:** Thank you. Perhaps we could hear from Dr Teh on that. Do you see Ofcom as having a role in validating, for the purposes of licensing, equipment that has been tested at this facility, this lab?

Dr Teh: Yes, I do. We are very much engaged in the national telecoms lab initiative, and I think it is important that we are, though, obviously, less so from a security perspective, where NCSC will lead. But from the diversification perspective, in trying to help smaller vendors to enter, as Ian said, I think it is a very important asset that provides a facility to test in a more representative, real network operator-type environment. For example, what are the things that are important for interoperability?

Right now, for instance, we are working with Digital Catapult on putting together a testbed specification—essentially a neutral platform—to be able to test how Open RAN works in terms of interoperability. I think that would be helpful, in terms of vendors getting to participate in that. And actually it is helpful for us, in terms of our learning about what the regulatory implications are, so that we can advance our thinking about the role that we may have to play in this architecture.

Q469 **Chair:** I can understand that in terms of diversity, but why would you not also play a part in in accrediting, from a security point of view, technologies that have been through this centre?

Dr Teh: I think that is quite possible. Again, it depends on the diversification strategy and what elements of that the Government want to see, and therefore the role that we may have to play. I kind of see it, I suppose, in a similar way to other telecoms security requirements, namely



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that the lead in terms of policy with DCMS—the cyber-security technical expertise—comes from Ian and his colleagues. If there is a regulatory system to be built around that—where we need to worry about how compliance works, whether enforceability is practicable and all those sorts of questions—then, yes, we are very open to the role that we might be able to play.

Q470 **Chair:** Thank you. Dr Levy, you said earlier, in an answer to one of my colleagues, that there is not a lot of money in the domestic telecoms industry—the sector—at the moment. Why is that?

Dr Levy: I blame Yih-Choung! [*Laughter.*] It is a regulatory thing. The regulatory system has been all about consumer prices, so you have seen consumer price pressure being pushed down, which is great for people like us who actually pay for this stuff, but it leaves the operators with less and less capital reserves.

You then see what we call the over-the-top services. A few years ago, you would pay your operator to be your voice service, your messaging service, your video service and everything else. Now, you pay your operator mainly to be a dumb bit pipe, and you have WhatsApp and Netflix as the paid-for services. All the high-value services are moving away from the operators.

As a result, you see these market effects, meaning that the operators in the UK find it harder and harder to make significant money, and the investment cycles around the infrastructure are very expensive, capital-intensive things that are very slow to repay that initial outlay, and so on.

Q471 **Chair:** What about the spectrum auctions? Are they part of that squeezing-out of revenues and capital?

Dr Levy: I would note only that spectrum is expensive and defer to Yih-Choung.

Dr Teh: I feel the need to come back on Ian—

Dr Levy: I was joking earlier! [*Laughter.*]

Dr Teh: I want to point out that we feel our responsibilities are not just about consumers, in the sense of the immediate static benefits of lower prices. Rather, as I said, we are concerned with longer-term investment in the infrastructure that the country needs. I think that has been made very clear through certain things, such as our wholesale fixed telecoms market review that we are working on at the moment, in terms of how we encourage investment through things like wholesale pricing, where we regulate Openreach.

There is, of course, a judgment about the trade-off between those longer-term dynamic benefits and the static benefits of immediate reduced consumer prices. I guess that is one of my points: as you try to understand the industry as a whole, there are different trade-offs to be made, given a finite amount of cash. You are trying to consider the



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incentives to invest, to protect consumers, but also to look after the security and resilience of the network, and those things need to be considered in the round. That is very much a consideration that we have in mind.

Q472 Chair: We find ourselves in this situation, do we not, where we have less diversity in the market than we want, to the extent that we are now having to convene a taskforce to rapidly consider measures to promote future diversity—that is one thing. We have Dr Levy from the National Cyber Security Centre saying that there has not been enough money in the system to allow the big new investments that are needed for security and for innovation, and Dr Levy referred earlier to industrial strategy. I do not want to put words into your mouth, but I think the implication was that we perhaps could and should have thought about some of these things earlier, to design them. Would that be a reasonable reflection?

Dr Levy: We could have. I am not sure the market conditions or technology conditions were right up until a year ago, maybe.

Q473 Chair: Okay, so we would have done it in an ideal circumstance, but there are reasons why we might not have. The role of Ofcom is relevant here, is it not? Given the reflections that the Government are making on the way forward, without at all wanting to be critical of decisions made, is it not time to look again at some aspects of the remit of Ofcom and perhaps the way in which it interprets its role? Would you agree with that?

Dr Teh: I would certainly agree that we are moving into a period where, as we touched on, the architectural systems start to look different. We are increasingly in a global environment, and there are some complexities around that in terms of regional scale. I do think we need to understand what is going on here holistically, and it is certainly not the case that all the levers to address some of these questions exist with us. We obviously heard from Lord Livingston about the nature of the global vendor situation, which makes it quite difficult for the UK on its own. That very much leads us to agree that we need to work in partnership with other like-minded countries.

As Ian was touching on—and I agree with him—as we look five or 10 years forward at how the supply chain works, you just have to look at the average revenue per user of our telecoms providers, and it is staying flat or going down in the case of mobile, despite the fact that we are getting much greater benefit as consumers. Increasingly, we see over-the-top providers playing a greater role. As we move towards virtualisation and software-based solutions, we can see the likes of the cloud hyperscalers—who have been referred to—having more of a role in that, whether that is Microsoft having recently acquired a firm, Metaswitch, or AWS, Amazon, being interested in edge computing. What does that balance look like, and where does that leave us in terms of our telecoms providers?

Those are questions I am very interested in, as well as how we make sure that we have a healthy, vibrant telecoms industry that then delivers for people. That is clearly very close to our heart in terms of our mission, but



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it requires a different mindset for how we work together, not just with our traditional levers but with Government and other bodies like the NCSC, as well as like-minded regulators and Governments around the world.

Q474 Chair: The Communications Act 2003, as Aaron Bell referred to, established Ofcom with two principal duties. The first is to further the interests of citizens in relation to communications matters, and the second is to further the interests of consumers in relevant markets, where appropriate, by promoting competition. We can only assume that in giving it two separate duties—one referring to citizens and a second separate one referring to consumers—there was something in the mind of our predecessors in Parliament that was beyond citizens as consumers. In other words, it gives rise to questions of national security, one would think, and other things.

What we have heard is that we are in a situation in which we have had to take action because of concerns about national security. We have a problem of national security, in the sense that the diversity is narrower than we would like; we would rather not be in this position. Is it a fair reflection that Ofcom has been interpreting its role with more emphasis on the second, as an economic regulator acting in the interests of consumers, and has not paid sufficient attention to furthering the interests of citizens in relation to communications matters?

Dr Teh: I don't believe so. I absolutely agree that those are our dual duties. For example, we are not just an economic regulator. Obviously, we are also a media regulator and we care deeply about public service broadcasting. Indeed, we are looking at a future review of how that will be sustainable in the future.

We have duties in terms of security, which I agree with you are very much about how we fulfil those citizen duties. It turns out that we have some existing duties in section 105 of the comms Act around security, but through quite extensive exploration of that, including a case that we took forward, we have found that those powers are insufficient to deliver the outcomes that we all want. That is why the supply chain review has resulted in policy being taken forward by DCMS on the telecoms security requirements, which will give us a greater set of powers and stronger enforcement, because essentially what is there in the statute is not good enough at the moment.

Q475 Chair: You mentioned, Dr Teh, the forthcoming spectrum allocations, and no doubt revenue is expected to come from that. You have heard Dr Levy say that one of the problems is a lack of capital available for investment there. Within the organisation—you are not constrained to ignore the connections between those two duties—how have you evaluated the implications of the spectrum auctions for the required investment in security, for example?

Dr Teh: I certainly accept the point. In my role, in terms of leading on strategy, I am, as I said, concerned about how we make the trade-offs between the various objectives that we are looking to achieve from the industry.



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Looking specifically at spectrum release, our objectives and duties are clearly set out. We have certainly explored that to try to see what we can do. Those duties are around how we make the spectrum available for optimal use, as I said; how we set fees; and again, how we set prices that reflect the opportunity cost of the spectrum at a market-based price, which takes us in a certain direction.

I do not think we are interpreting our duties too narrowly. We have certainly tried to explore that for the broader strategic benefit. There is then a question in the system as a whole—and certainly with Government in terms of the policy lead on some of these issues, such as security—about how we find the right ways to ensure that we can invest in the sector.

Q476 Chair: In 2018, Ofcom published its strategy for its role in enabling 5G in the UK, but that made no reference to vendor diversity, for example, or still less Open RAN. In 2018—not long ago—shouldn't it have been foreseen by Ofcom, our principal communications regulator, looking forward, as a strategy by definition does? Ought not the question of vendor diversity, which is so important that the Government has had to develop a taskforce for it, have been part of Ofcom's strategy for 5G?

Dr Teh: Looking forward in what is a very fast-moving and accelerating technology sector is always very challenging. I observe Ian's answer. Maybe we could kind of have seen things about a year ago; much before that, that is a bit more debatable. Again, we can get quite focused on how many suppliers or vendors you need. That is clearly a relevant question, which a lot of thought has gone into, and we have participated in that in the last year or so.

Looking forward, which is what we have been doing, one of the things that I am very struck by is the fact that we will see a different architectural shift. What does that mean, in terms of having sufficient diversity, and not just in those boxes that you get at the end of it? As we have heard, it applies to semiconductors and managed software solutions, which is an increasing concern. There are a number of parts of the system where we are facing not just an incremental change—you can predict those sorts of questions to some degree—but quite disruptive change. I am just saying that the question is actually quite difficult to see coming.

Q477 Chair: Isn't it bizarre and rather concerning that Ofcom's strategy for enabling 5G in the UK, published in 2018, should have made no reference to infrastructure vendor diversity? Surely, to be worth its name, a strategy has to be forward-looking. We now have a sufficient crunch in 2020: we are removing one major supplier and a taskforce has been established. Was it not possible for Ofcom to see that as part of its strategy in 2018? To my earlier point, doesn't that rather indicate that Ofcom's focus has been on the consumer side, which is obviously necessary, to the exclusion of its statutory duty to consider the needs of UK citizens?



Dr Teh: I don't think so. As I said, we need to look at this question at the right level. There is a risk that individual bodies have certain parts of the puzzle. Where we are getting to—this is the right place—is that we are working together, for example, on the TSR with NCSC and DCMS. We need a more holistic view to pick up those broader strategic concerns, because not all the responsibilities sit in one place, and that is increasingly what we are doing.

For example, in a different part of our remit, we are thinking about harmful content online in the context of the duties that we are about to have on video-sharing platforms, and potentially more widely than that. We cannot necessarily formulate a strategy on that on our own, because there are different bodies engaged in that question, whether it is the Information Commissioner's Office or others. We need a rather more holistic conversation about some of these issues.

Q478 **Chair:** But obviously things happen through the application of your regulations and powers. We mentioned earlier the spectrum auctions. You have an auction that is going to take place for the major frequencies for 5G in January 2021. The stated policy objectives for that auction include sustaining strong competition in mobile markets, but again it makes no specific reference to diversification of the radio infrastructure vendor market, nor open standards, nor interoperability, nor Open RAN. If your responsibilities are to citizens and consumers—you are the UK telecoms regulator responsible for this—how can you conduct an auction in which no mention is made of these important aspects of your responsibilities in the objectives of the auction?

Dr Teh: What I would focus on is the fact that there are certain requirements that we have and are set out in statute for how we make spectrum available. We clearly have to live by that. Our remit is bound by Parliament. It is not the sum total of what we are doing, though. I would want to observe that, as I said, we care deeply about how we ensure that the market works and has appropriate controls, both for delivering consumer benefits and for citizens more broadly. Some of the things we are doing, even in the spectrum domain, support that. We have issued the ability to do spectrum sharing in the 3.8 to 4.2 GHz band. That allows local access. We have issued over 300 test and innovation licences, which allow parties that come forward to do more innovate sandboxing and things of that nature. Where we are able to, our broader response is to try to support those wider issues that support the security agenda.

Q479 **Chair:** Do you think that in order to regulate perhaps more clearly for the aim of vendor diversity, which is now a matter of public policy, it needs to be stipulated by the Secretary of State in your remit for Ofcom? Or do you think you have sufficient powers to do that at the moment?

Dr Teh: As I think I implicitly referred to in the context of the telecoms security requirements, it really depends specifically on the objective that we are collectively trying to achieve. In some cases, we may find that our existing responsibilities are sufficient with a bit more guidance, though I have discovered that this is a sector that is very litigious. If there is any



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kind of greyness in terms of what our powers are, there are commercial incentives to exploit that. In some cases, such as the telecoms security requirements, we discover, when we really push it, that we do not have sufficient powers. It is therefore for Parliament or the Secretary of State to issue a direction on how that might happen, but I am very much looking forward to seeing where the telecoms diversification taskforce gets to in terms of what role we can play.

Q480 **Chair:** Have you asked for those additional powers?

Dr Teh: Again, it depends on coming together for a strategy, given all the complexity that we face, including the global challenges. What is that strategy? Then we can understand which bodies are best placed to take it forward, at which point we can examine whether we have the right powers.

Chair: Thank you very much indeed. We are very grateful to our expert witnesses. You have been very helpful with your time and information. We will reflect very closely on what you have said when making our recommendations to Government. Thank you very much indeed for the work that you do and for your appearance today.