Your response

Question	Your response
Question 1: Do you have comments on the overall approach to the review?	Confidential? – ~~Y~~ / N There is a disappointing sense that the approach is trying to find excuses for avoiding effective or consistent spectrum management. Continual repetition of buzzwords - "flexibility" and "innovation" - echo previous exercises, notably those associated with WRC Resolution 951 and the related agenda items at WRC-07 and WRC-12, which failed to demonstrate advantages of the options pursued by OFCOM. Indeed it became apparent that the "spectrum management light" approach could prejudice innovation by leaving key indicators of Quality of Service (QoS) and Quality of Experience (QoE) subject to chance or uncoordinated events. Unpredictability in service delivery could: – reduce the stability or reliability of service provision; – require services to observe new or unnecessary technical conditions; – compromise or complicate conditions of operation of existing services; – penalize the development of slow growth services; – restrict the ability to develop new sharing schemes in the future; Moreover, it became evident that the international spectrum management framework established through the ITU-R Radio Regulations did not close off flexible solutions and indeed was adept in adjusting to new requirements.
Question 2: Have we captured the major trends that are likely to impact spectrum management over the next ten years?	Confidential? – ~~Y~~ / N This is far from evident, indeed by recycling spectrum management concepts from the Cave Report and Re 951 studies, there seems to be a lack of fresh thinking. The current trend in spectrum management looks to be more focussed on diverting more and more spectrum for IMT use while overlooking uncontested estimates during the preparations for WRC-15 that ca. 70-90% of "mobile" communications were conducted indoors and mostly static. innovative solutions on home-networking

	should be a priority, especially on providing protected spectrum for WiFi type solutions, instead of reliance on unprotected, free-for-all spectrum designated for Industrial, Scientific and Medical (ISM) applications. This would be an effective and productive route for enhancing users' QoE. The frequent internet drop-outs during Covid forced home working, resulting from WiFi and Bluetooth contention, must by now be very obvious. Instead, priority for mobile telecommunications has been the preference in spectrum management for several decades, now. While this undoubtedly helps in reducing government deficits, it does not help services that lose access to spectrum. For example, companies have invested heavily in satellite networks and systems on the back of previous encouragement by governments, only to find the necessary spectrum diverted wholesale for IMT use.
Question 3: Could any of the future technologies we have identified in Annex 6, or any others, have disruptive implications for how spectrum is managed in the future? When might those implications emerge?	Confidential? – ~~Y~~ / N Annex 6 introduces some new buzzwords, "Artificial Intelligence" and "Blockchain". Such solutions posit the advantages of optimisation techniques in conjuring up a greater availability of spectrum for a variety of purposes. The question then is how well such techniques can manage demand in the real world. If considering that demand for various services is randomly spread out over time and space, and that demand for each service is independent of demand for others, then statistical analysis can indeed indicate that a wide variety of demand can be satisfied satisfactorily over time and space simultaneously. A problem that still remains is in determining what criteria will be used to set targets for QoS and QoE that will encourage service providers to invest and users to subscribe. There has to be some balance between what spectrum resources are available and what they can support at a certain level of QoS and QoE targets. Implicit in that is what % outage will a user tolerate? However, reliance on statistical approaches will fail under real world conditions where usage by different services converges over time or space – i.e., no longer or random or independent – in

	which case estimations of interference free operation can quickly collapse. Statistical methods still have to take account of real world factors, particularly those involving conditional relationships, just as with what might be called classical spectrum management methods. As regards use of spectrum above 3000 GHz, the service objectives need to be subjected to critical evaluation, not least on propagation factors. The prospects for 5G use, even in the low GHz ranges, are already acknowledged to be constrained by the high building attenuation exhibited by modern construction techniques.
Question 4: Do you agree that there is likely to be greater demand for local access to spectrum in the future? Do you agree with our proposal to consider further options for localised spectrum access when authorising new access to spectrum?	Confidential? – ~~Y~~ / N What does this mean exactly? User interest will be for service offerings that satisfy some personal or business requirement. To what extent will that vary from area to area? There may be consistent preferences when going from business areas to residential areas, but ultimately the user has to access the service by a mobile network or in-premises networking. As noted in question 1, greater attention to expanded WiFi type connectivity indoors and outdoors could satisfy actual user demand and interest to best effect.
Question 5: Do you agree with the actual and perceived barriers identified for innovation in new wireless technologies, and our proposed ways of tackling those?	Confidential? – ~~Y~~ / N From the foregoing, my view is that simple solutions would provide greater and more widespread benefits than esoteric concepts.
Question 6: Do you agree with Ofcom's proposals to improve our outreach and reporting activities, and spectrum information tools? • **Are there additional ways that Ofcom could better engage with existing and future users and providers of wireless communications?** • **Please explain any specific areas where you believe more or better provision of information could provide value to stakeholders**	Confidential? – Y / N Are people really interested in how it's done? The requirement is that things work, which is a technical function. Stakeholders will, by definition, be taking an interest in how OFCOM discharges such technical functions and will want to engage as necessary. The current briefing meetings for stakeholders do go a long way for doing that. However, a question has to be asked: for whose benefit does OFCOM develop policies? Is it for OFCOM itself, government or stakeholders. Now that UK is no longer constrained by excuses that EU legislation is limiting what can be done, there is a need for more transparency in how stakeholders can ensure that their diversity of interest is reflected in how OFCOM manages the radio spectrum and, in particular,

	whether this reflects a consensus of UK views or is subsumed to what serves OFCOM well in setting its own spectrum management policies.
Question 7: Do you agree that it is important to make more spectrum available for innovation before its long-term use is certain? Do you have any comments about our proposed approach to doing this?	Confidential? – ~~Y~~ / N This is a flavour of the month approach. Surely service providers and users will be more interested in the QoE - ensuring that service offerings, whatever they are, wherever they, will be stable and reliable enough for innovation and investment to take place.
Question 8: Do you agree that it is important to encourage spectrum users to be 'good neighbours' to ensure more efficient use of the spectrum? Do you agree with our proposals to: **a) increase realism in coexistence analysis at a national and international level?** **b) encourage spectrum users to be more resilient to interference?** **c) ensure an efficient balance between the level of interference protection given to one service and the flexibility for others to transmit?** **Do you have any comments on which of these will be the most important?**	Confidential? – ~~Y~~ / N These are strange questions. The implication is that, under the "spectrum management light" approach, service providers and users cannot expect interference free operation and should take a DIY approach to share the pain. Surely, tolerance is going to be rather lacking. What is the point of service that is likely to be interrupted when needed? Trends have moved on from "store and forward" methods of communications to demanding instant communication and response. This may be a somewhat unreasonable expectation, given the limitation on spectrum resources, but on what basis can a service that is interesting to innovators, investors and users be viable if it turns out to be unpredictable? As such, the answer to the specific questions is "none of the above".
Question 9: Are there any other issues or potential future challenges that should be considered as part of this strategy?	Confidential? – Y / N As noted above, concentration on multiply reusable spectrum for widely available small scale networking technologies, such as WiFi, could bring the greatest benefit to the population at large in providing dependable communications for all purposes. This is already apparent in how people behave, as noted in para. 4.8 of the consultation document.
Question 10: Do you agree that continued use of our existing spectrum management tools (as set out in sections 4-7) will be relevant and important for promoting our objectives in the future, in light of future trends?	Confidential? – ~~Y~~ / N Effective spectrum management would surely benefit from concentrating on the end point delivery means rather than airy concepts such as flexibility, AI and blockchain. Satellite communications depend absolutely on coordinating satellite orbits and associated frequencies at international level and precise

	spectrum management is vital for reliable service delivery. Much of user demand for internet access could be satisfied by localised delivery over small scale WiFi style outdoor networks and in-premises networking. Such solutions have the potential to support the bulk of demand for services carried over the internet without the cost overhead to users of IMT networks. This leaves IMT connectivity for otherwise unserved areas or actual in-motion demand.
Question 11: Is there anything else we should be considering doing, or doing differently, to promote our objectives?	Confidential? – ~~Y /~~ N Perhaps a more functional approach of ensuring that communication services with value to users are available reliably and dependably in all circumstances - treating spectrum management as an essential technical exercise, underpinned by physical processes - would be more beneficial than defining success by shoe-horning a variety of low value uses into the available spectrum. It is also noted that receiver performance is cited as a factor that limits free-for-all spectrum use. This is not a useful approach. Receiving equipment is designed to operate in bands allocated to the radiocommunication service in question. How it responds to other signals within the its passband will depend on the characteristics of the unwanted signals. Depending on the relative strengths of the wanted and unwanted signals there will be some degradation to receiver performance. Unless going to a universal regime of spread spectrum delivery of multiple services, and data extraction of the wanted service though synchronized pseudo-random number code sequences, some degradation to receiver performance is inevitable. That could be an interesting way to go, albeit at the price of replacing all current modulation technologies and equipment. There is also an implication that spectrum management problems result from poor receiver performance. Where is the evidence for this? If so, it would be necessary to take action through standards developing organisations. How would this be achieved? Standards for receiving equipment are predicated on what is expected to be received, not what other signals might be present in allocated bands or in adjacent bands. Such

	situations have to be managed to best effect by technical measures conditioning the use of frequency bands. In any case, giving greater attention to receiver performance standards, which is of course worthwhile in itself, demands engagement with the relevant international standards developing organisations, e.g., IEC, CISPR, ETSI, ISO and, nationally, BSI. This does not obviously appear within the remit of OFCOM via the Communications Act. Such mention of equipment standards, as there is, links with duties under EU legislation. What is the status of that now, post Brexit? The Radiocommunications Agency did engage to an extent with ETSI and BSI; that activity now seems to lie in government departments, but the extent of such activity is not obvious. All in all, there first needs to be a better definition of the role and scope of OFCOM under the Communications Act, including its relationship with government, engagement with stakeholders and various international organisations and bodies. Only then can there be a truly inclusive way of improving spectrum management, realising that this may not sit well with how OFCOM was created and has developed. The main objectives of creating OFCOM were to address standards in broadcasting and to implement EU legislation on telecommunications independent of government. Rolling up several specific technical regulatory bodies into OFCOM as well was, if not an afterthought, taking an advantage of a convenient opportunity and not the result of any pressing need.