Your response

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Question 1: Do you have comments on the overall approach to the review?	Confidential? – N CommScope agrees with Ofcom's overall approach with this review. Furthermore, we also believe that this review should provide a high-level framework which can then be further refined for specific sectors as needed.
Question 2: Have we captured the major trends that are likely to impact spectrum management over the next ten years?	Confidential? – N Yes, CommScope believes that this consultation captures the major trends in the evolution of spectrum management in the coming years.
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? – N Annex 6 of the Consultation identifies several emerging dynamic spectrum management technologies including AI/machine learning, SON and Blockchain. CommScope certainly believes these technologies could have exciting implications for the future of spectrum management. However, much more study is needed to determine the feasibility of these technologies considering the inherent complexities and potential implications of introducing and employing these technologies. Consider the example of Blockchain regarding the concern that it could drive exorbitant demand for power consumption (see, Fairley, P, The Ridiculous Amount of Energy It Takes to Run Bitcoin, IEEE Spectrum, Sept. 2018 and Sedlmeir, J., Buhl, H.U., Fridgen, G. et al. The Energy Consumption of Blockchain Technology: Beyond Myth. Bus Inf Syst Eng 62, 599–608, 2020). Many of these technologies are under study at the U.S. National Science Foundation's [Spectrum Innovation Initiative: National Center for Wireless Spectrum Research](#), (SII-Center). The goal of the SII-Center is to promote transformative use and management of the electromagnetic spectrum, resulting in profound benefits for science and engineering, industry, and other…interests. While these technologies and research programs show promise, we expect it will take several years before they can be effectively commercialized.

Spectrum is the lifeblood of the wireless industry, and each successive generation of wireless has required roughly double the amount of spectrum than in the past. This will need to occur again in 6G and since it often requires incumbents to vacate a frequency band, it is critical that we determine what spectrum will be used as quickly as possible. In addition, different spectrum has potentially different problems to resolve from an RF performance perspective. Again, the sooner the target bands are identified, the earlier real research can go into solving these often-unique problems.

If we look back in time, both in the licensed and unlicensed bands, we will also see that economically viable spectrum is almost never much more than twice as high in frequency as the prior generation. For example, in Wi-Fi, spectrum went from 2.4GHz to 5GHz to 6GHz, but 60GHz was never really implemented. Similarly, in cellular 450MHz to 850MHz to 1.9GHz and 2.1 GHz and now at 2.5GHz and 3.5GHz. It therefore seems logical to look at frequencies in the 7-8GHz range for 6G.

| **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? – N
CommScope agrees with Ofcom that there will be a growing demand for locally based licences. We believe these will fall into two main categories.
The first is the requirement for private networks for organisations that require the security and control of their own communications infrastructure. At the global level, we expect to see a preponderance of existing equipment ecosystems using 4G LTE (and 5G emerging) -e.g. CBRS in the US and local licensing in France, Germany, Netherlands, etc... Growth in both the take-up of CBRS and local licensing in Germany and the Netherlands is assisted by an existing equipment ecosystem as the spectrum in use is shared with the wider 3.4 – 3.8 GHz bands used globally by 4G LTE and 5G NR. Unfortunately, this is not the case with spectrum in the 3.8 – 4.2 GHz range and we believe it will take time for an equivalent equipment ecosystem to emerge as this is not a widely harmonised frequency range. Growth in IoT (Industrial, Enterprise, and Agricultural) applications is also expected to be a major driver especially in high |

	security applications where existing licence exempt spectrum used by short range devices does not provide enough security. The second will be an alternative to the national MNO's in currently underserved areas and will ideally utilise the same spectrum range as the national MNO's in order to leverage the existing equipment ecosystem, extremely important for the end user. This will need to be accommodated by granting local operators' part of the nationally awarded spectrum in specific geographic areas, either by limited trading and/or leasing arrangements.
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? – N CommScope agrees with Ofcoms views expressed in the consultation. Additionally, and with respect to using Notified Bodies, CommScope has noticed a reluctance for them to get involved in the absence of either a suitable standard or a very stable/mature draft standard. This has the effect of delaying take up and deployment of new services. One example of this is the recently announced lower 6GHz WAS/RLAN band (5925 – 6425 MHz), where the basic technical conditions are available from the ECC but the work on the harmonised standard is still continuing as the proponents of the various technologies continue to debate the details whilst trying to avoid one technology gaining a perceived or real advantage over another. However, whilst this process is ongoing products are being announced in the U.S. and South Korea supporting this band but are potentially not available in the U.K. whilst the standard is still not stable. This situation is what we believe the Notified Body route to market was established to resolve, but to date has not delivered. One option would be for Ofcom to publish a VNS in these situations, thus providing a reference that both manufacturers and Notified Bodies could use until such time as the required international/regional standards are available.
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**	Confidential? – N We applaud Ofcom's spectrum information initiatives and proposed approaches. We agree that the more information that is made available on spectrum usage, the easier it will be to manage spectrum usage. We do note

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**	there are a few issues that merit further consideration including protecting national security and safeguarding personal privacy. To address these concerns, it may be possible to make obfuscated information available in order to provide coarse information on spectrum usage. Measured spectrum occupancy data can also be used to identify spectrum usage. We also note that regulators' databases typically rely on spectrum licensees to provide data on their operations, which often introduces errors and inaccuracies. To an extent, these can be overcome by a combination of data entry verification tools and periodic data verification efforts with spectrum users. In addition, Ofcom might consider the availability of third-party commercial data sources to augment licensing databases.
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? – N CommScope believes that allowing innovators to access spectrum would helpful identify future potential use cases for the spectrum in question. We believe that this would especially true for bands above 100 GHz. For bands below 100 GHz CommScope believes that Ofcom's existing innovation and trial licence approach works well as crucially this provides the potential for licences to be issued on a short term basis in existing licenced bands so that proof of concept of new applications can be trialled and demonstrated. The benefit of dynamic coordination frameworks is the flexibility to shift allocations based upon changing to licensing arrangements (individual licensed, light-licensed or licensed exempt/general authorisation), evolving protection requirements and subsequent impact on transmitters parameters over time. This allows the regulator to open a band and allow the market to determine over a period of time "the highest and best use", which itself may also change over the long term.
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:	Confidential? – N CommScope agrees with Ofcom's proposals regarding all spectrum users to be "good neighbours". All three of the proposals identified are important and their relative importance will probably vary depending upon

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?**	the specific situation under investigation at a given time. We also believe that when trying to balance out the apportionment of resilience to interference vs ability to transmit consideration should be given to the cost and lifetime of the equipment under consideration. For example, it is reasonable to expect high cost radio equipment to be engineered to a higher resilience to interference than a low-cost consumer product. In addition, the expected lifespan of equipment also needs to be considered when changing the technical requirements for existing equipment and services. However, care also needs to be taken here that it is the life-cycle of the radio equipment that is considered as opposed to the lifecycle of the host, e.g. a train may have a life of 40+ years, but it would be very inappropriate to regard the radio equipment installed as having a 40+ year life. In these situations, the radio should be regarded as a replaceable component and treated accordingly.
Question 9: Are there any other issues or potential future challenges that should be considered as part of this strategy?	Confidential? – N No comment.
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? – N Ofcom have laid out a broad, insightful and aggressive vision for spectrum management in the next decade. This is certainly attainable and will benefit from broad stakeholder involvement.
Question 11: Is there anything else we should be considering doing, or doing differently, to promote our objectives?	Confidential? – N No comment.