Ofcom Advisory Committee for Scotland – Context

The Advisory Committee for Scotland (ACS) is one of a number of committees and advisory bodies, established under the Communications Act (2003) to inform the work of the Ofcom Board and Executive.

The ACS is one of four committees representing each of the UK's nations, specifically to *'advise Ofcom about the interests and opinions, in relation to communications matters, of persons living in Scotland.'*

Therefore, in the responses below, comments highlight specific considerations particular to Scotland wherever possible.

This submission draws on the knowledge and expertise of ACS members and is informed by our individual experience and through discussion at our meetings. It does not represent the views of Ofcom or its staff.

Spectrum Management: The Scottish Context

Spectrum management, and in particular the concept of shared spectrum, can be judged as being rather technical topics. Spectrum management policy has, however, real-world implications that could benefit people far and wide across Scotland and the wider United Kingdom. Spectrum is a limited resource, that delivers substantial social and economic value to all, and Ofcom are rightly justified in managing this carefully. It is therefore very important that the UK takes every opportunity to extract maximum value from this finite resource, and an agile spectrum management policy is an important mechanism in this regard.

Scotland remains a connectivity challenged country, with the Ofcom December 2020 Connected Nations Report for Scotland[1] documenting that only 44% of Scotland's landmass has 4G coverage from all 4 major UK mobile operators, and indeed 19% has no coverage at all from any operator – although significant strides have been made recently with announcements of progress on the Shared Rural Network (SRN)[2,3]. Spectrum sharing presents an additional toolset to enable improved coverage in disadvantaged and rural areas of Scotland.

Nowhere is this more true than in the upcoming 5G opportunity. With the low 4G coverage today all too evident across Scotland, the country has a real challenge in deciding how and where 5G coverage will be provided. The main operators are taking an "inside out" approach, which, given the investment required, is understandable. It is incumbent on those in the industry, in the regulator and in political circles to ensure that rural and socially disadvantaged areas are not left behind.

Spectrum sharing gives local community groups, public sector organisations, and – more realistically – local Internet Service Providers (ISPs) – the ability to acquire local spectrum at very reasonable

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[1] Ofcom December 2020 Connected Nations, Scotland Report: https://www.ofcom.org.uk/__data/assets/pdf_file/0021/209442/connected-nations-2020-scotland.pdf

[2] EE SRN Announcement: https://www.ispreview.co.uk/index.php/2021/02/ee-uk-set-to-expand-4g-mobile-to-579-rural-areas-in-2021.html

[3] O2, Three UK, and Vodafone SRN Announcement: https://www.ispreview.co.uk/index.php/2021/01/o2-three-uk-and-vodafone-to-share-222-rural-4g-mobile-masts.html

prices. For the first time, especially as new technologies such as Open RAN and 5G Mobile Core as a Service drive down the cost of physically providing a mobile network, the ability of smaller organisations to acquire sufficient spectrum to operate a local (say) 5G service in areas of needs becomes feasible. In this regard, Ofcom's proposals for spectrum sharing, including automated spectrum sharing, are empowering local network provision in a way that has never before been achievable. The Ofcom spectrum sharing proposals should therefore be commended.

There are already real examples of investigative work in Scotland exploiting the concepts of spectrum sharing. The UK Government part-funded 5G RuralFirst[4] and (now) 5G New Thinking[5] projects, led by Cisco Systems with principal partner, the University of Strathclyde, are pioneering practical use of dynamic spectrum sharing, with the 5G New Thinking project in particular now investigating the challenges of how to commercialise such an approach via a Community Benefit Society[6] or "Bencom" concept. These projects give hope that rural communities in Scotland, where there is a need, have a mechanism by which they can empower themselves to deliver their own local 5G service. The ACS encourages Ofcom to engage with these projects in order to understand any other regulatory barriers (including for example the cost of microwave backhaul radio licenses as discussed later in this submission) that could impact the commercial viability of such an empowering approach.

Further, the Scottish business community has a reason to be very interested in the success of Ofcom's spectrum management proposals. Scotland has a growing space industry sector. Putting in place the most appropriate spectrum management policy to support this industry is important. Likewise, positioning the country to be able to take advantage of satellite broadband, for example, is also important.

On the other hand, Scotland is home to a number of technology-heavy industries that have been competitively disadvantaged by lack of good connectivity – certainly when compared to other countries, which have already invested in connectivity solutions for their industries. The Scottish Salmon industry, and the Renewable Energy sector in particular are connectivity-challenged. Private 5G should be a strong option for some of these organisations to deploy in order to address their business connectivity challenges, so it is important that Ofcom's spectrum management strategy supports this opportunity.

A flexible spectrum sharing policy has the potential to enable Scotland and the UK to take advantage of the benefits of private cellular networking technology, for 4G as well as for 5G. Already, Ofcom's prompt action on 5G spectrum sharing for 3.8-4.2 GHz announced in 2019[7] has already placed the UK and Scotland at a relative competitive *advantage* compared to other countries, who in many cases are still developing their spectrum management policies to support private cellular. The spectrum management consultation discussed in the remaining of this document therefore has the potential to catapult Scotland and the wider UK to the forefront of early deployments of enhanced connectivity solutions, in turn driving positive business competitive advantage, productivity and economic success.

[4] https://www.5gruralfirst.org/
[5] https://www.5gnewthinking.co.uk/
[6] https://www.stoneking.co.uk/blogs/stone-king-blog/what-community-benefit-society-or-bencom
[7] https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2019/airwaves-opened-up-to-support-wireless-revolution

Your response

None of the following responses are considered confidential.

Question	Your response
Question 1: Do you have comments on the overall approach to the review?	This is a very comprehensive discussion of the subject matter and relevant implications.
Question 2: Have we captured the major trends that are likely to impact spectrum management over the next ten years?	No. There is only limited mention of the implications of spectrum policy to help enable the success of the private 4G/5G markets/nor is there limited coverage of the challenges of how to address existing conflict in existing spectrum allocations. The growth in the private 4G/5G market is significant and discussed later in this submission. There could be challenges related to "hybrid" public/private networks, which may impact future spectrum management. Likewise, there is a growing opportunity for 5G services in the 26 GHz bands. Any spectrum management strategy, while it should be generic in nature (as this Ofcom proposal is), should also call out specific technology trends and show how the strategy is applicable to, and helps support, these key trends. Alternative views such as those expressed by Real Wireless are worth of consideration (https://www.real-wireless.com/26-ghz-a-radical-approach-to-licensing-in-higher-frequencies-to-increase-spectrum-efficiency/) As an example of the latter, spectrum usage conflict, as Internet of Things (IoT) technologies continues to evolve (for example, "20-mile Bluetooth") and become more widely deployed by both service providers and enterprises, there is real potential for spectrum conflict regarding higher power technologies operating in unlicensed bands. For example, there are vocal interests promoting use of the 2.4 GHz band – currently available for unlicensed Wide Band devices including WiFi - on very different technical terms than the existing rules permit – namely allow more 'Narrow Band' users in the 2.4 GHz band by removing the restriction of the

	power density requirement to allow more 'Narrow Band' users in the 2.4 GHz band by removing the restriction of the power density requirement. Such usage by even a handful of devices could render the 2.4 GHz band unusable for polite Wide Band devices. While this is a very specific example, it underlines a key point that when devising regulations for emerging technologies, regulators including Ofcom need to take particular care not to "break" existing widely deployed applications.
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?	The real challenge in some of these future looking technologies will become apparent when devices and/or radio equipment is able – or not as the case may be – to take advantage of such technologies. One reason for challenges in growing the TV White Space market as a broadband alternative has been the lack of business case for many technology producers to collectively grow the ecosystem of providers for that market. Ofcom should learn lessons from this market and ensure that future spectrum management proposals are considered sufficient to generate interest among the *global* community of technology providers, as the UK as a market is usually too small to support "UK proprietary" spectrum approaches.
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?	Yes, with the forecasts of significant growth for Private 4G/5G deployments, coupled with the prospect of "hybrid" public/private 5G networks, there is almost certainly likely to be demand for local spectrum access from businesses and public sector organisations. As a data point to reinforce this point, market research firm TBRI, in their "Private Cellular Networks Market Landscape" report of April 30th, 2020, forecasts that private 5G deployments will grow with Compound Annual Growth Rate (CAGR) of 97% over the 2020-2025 period, creating a global market opportunity growing from $250M in 2020 to $7.5 Billion in 2025. Germany, for example, has seen a significant interest in private cellular use in manufacturing, with 88 licenses granted in 2020 (see https://telecoms.com/507600/germany-sees-

	great-interest-in-private-5g-networks/) – and with appropriate regulation and awareness raising, it is anticipated that the UK will also see such adoption. As an aside, in order to show how Ofcom spectrum policy is fostering innovation and supporting UK businesses, the ACS would advise Ofcom to issue appropriate informational updates (e.g. white papers and in-person or virtual workshops, perhaps at local levels as discussed below), as as the regulations come into force. And as in the German example above, the ACS advises Ofcom to publish insights into the numbers of licenses awarded in order to show how Ofcom regulatory policy is translating into business and economic success. When considering pricing of spectrum, Ofcom should bear in mind that wireless spectrum for say private 5G RAN may not be the only spectrum cost in such a deployment – there may also be a need in such deployments to use microwave backhaul - which could affect the overall viability of a business plan to exploit private 5G. Ofcom may wish to consider pricing based upon the total deployment spectrum cost, and not just that part of the spectrum used for private 5G RAN. With RAN sharing options being re-considered by the industry, and the unlikelihood of 5G deployment in rural locations (bear in mind that 98% of Scotland's land mass is considered to be rural, with 70% being classed as remote rural[8]), it could be possible in the future that a new business model will emerge with a hybrid public / private network model deployed, with the private network actually a local network extension to deliver 5G locally to specific locations and/or businesses. If total spectrum requirements are not considered, for example the combination of private 5G spectrum and microwave backhaul, the overall price just for spectrum could affect the financial viability of the local provider of the private 5G network,

[8] https://www.gov.scot/publications/rural-scotland-key-facts-2018/pages/2/#:~:text=The%20total%20land%20mass%20of,28%25%20in%20accessible%20rural).

	impacting the ability of local communities, or more likely local ISPs, to "build their own" local 5G. One policy Ofcom may wish to consider related to spectrum, is "*Use It or Lose It*", or "*Use It or Share It*", which could be more palatable to license holders. With national licenses for the 700 MHz 5G band (and indeed others) being such a key band for rural areas, it is likely that MNOs will choose not to deploy 5G in rural areas. In such cases, it would be more efficient use of the UK's spectrum if local ISPs and businesses (e.g. salmon farms) could make use of this key spectrum when it is not used in local areas by MNOs. The process for acquiring local access licenses could benefit from further finessing. Anecdotal evidence of high administration costs imposed by MNO's, and unhelpful "decline to supply" with unspecific reasoning adds additional barriers for a community Wireless ISP or even neutral host provider to source spectrum, for network innovation that may ultimately benefit the MNO. MNO staff should be made available for pre-dialogue between acquirer and the community ISP/organisation, in order to smooth the process, leading to more successful applications for use of unused spectrum.
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?	As the range of wireless users increases, in particular via private 5G, one barrier for innovation will be understanding how to acquire spectrum for private and/or local uses – as indeed you have mentioned in your consultation document ("Ensuring that companies – particularly smaller ones – are aware of the flexibility"). See below, Question 6, for a discussion on this "**Improving Information Flow to Potential Stakeholders**"
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?**	Key success criteria for Ofcom's proposals will include how they align to, or help lead and drive, similar regulations in other countries and in economic blocks such as the EU. Manufacturers have and will struggle to justify supporting country-specific spectrum measures. For example, UK extensions to WiFi spectrum have not been adopted by major manufacturers of WiFi equipment precisely

• **Please explain any specific areas where you believe more or better provision of information could provide value to stakeholders**	because the spectrum allocation has not been followed by the EU: often there is not a sufficient business case for building country-specific technology products. In this regard, while understandable, it is disappointing to see that Ofcom is no longer an active participant in EU's Radio Spectrum Policy Group (RSPG) [see page 21 of your consultation]. This, unfortunately, is likely to decrease Ofcom's influence in driving and/or supporting EU and possibly even global spectrum policy decisions. **Improving Information Flow to Potential Stakeholders: Engaging with existing and future users and providers of wireless communications:** It's one thing to have spectrum policies defined, it's another thing to have an empowered population of local businesses able to exploit the Ofcom regulations and innovate new mobile network approaches. This need is particularly acute in Private 5G, where an increasing number of enterprises will start (are starting) to investigate how a private 5G network can help achieve their business objectives. Ofcom, in the view of ACS, needs to carefully consider how to roll out an education program (including workshops and educational materials on the Ofcom website) to help such organisations exploit existing and planned spectrum regulation, and in particular help educate them on how to acquire spectrum (e.g. via shared spectrum) to fit their business needs. Ofcom in Scotland held a meeting in early 2020 which was very effective in engaging a range of industry stakeholders – from salmon farming to forestry – who have a business interest in flexible spectrum management. ACS recommends that Ofcom adopt this type of cross industry collaboration workshops to help educate and inform industry of the opportunities that Ofcom's updated spectrum management strategy enables. (See, for background, https://www.eventbrite.co.uk/e/get-connected-stay-ahead-on-wireless-technology-tickets-81709891485)

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?	Yes. Regarding "We propose to make some spectrum available for innovation when its future use is still uncertain" – the key is for Ofcom to communicate very clearly the limitations and time bound nature of using such spectrum. Hence your work item "Expanding our work to understand, assist and inform" is particularly important. However, regarding "appropriate assurances of continued access for existing and new users" (p57), Ofcom needs to carefully match the time period for spectrum allocation to the asset financial return timeframes. Informal feedback from one Scottish Wireless ISP suggests that the 3-year license period for current shared spectrum policy gives insufficient time to earn appropriate return on investment from new mobile network infrastructure. Rather than 3 years, a time more aligned to the fibre return on investment timeframe (7 years), may be more appropriate.
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?**	Yes, without question, good neighbour behaviour is key to overall spectrum management. To be honest, all proposed mechanisms seem to be useful and important.
Question 9: Are there any other issues or potential future challenges that should be considered as part of this strategy?	A key area for spectrum sharing should be in the 700 MHz 5G band – which looks to be completely allocated only to national licenses for MNOs, with no spectrum sharing in the 2021/22 auction. This could be particularly restrictive for local ISPs in rural areas, particularly in Scotland with a large proportion of the landmass being classed as "rural", where the lower frequencies provide wider coverage

	and be particularly appropriate for filling coverage gaps in rural areas.
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?	Yes. In particular, as newer spectrum users emerge – for example via private 5G – automated spectrum management tools could help not only achieve further spectrum efficiency, but also help improve efficiency of some of Ofcom's operations.
Question 11: Is there anything else we should be considering doing, or doing differently, to promote our objectives?	See above in previous question responses – in particular, see the Question 6 above response under "**Improving Information Flow to Potential Stakeholders: Engaging with existing and future users and providers of wireless communications**"