Your response

Question	Your response
We invite interested parties to consider the initial analysis we set out in this document and to let us know their own views.	Confidential? – No In recent years, the UK has seen an average 40 per cent year on year growth in demand for mobile data traffic delivered over public mobile networks. This growth, which has been driven by the development of new applications and enabled by evolving technologies and consequent changes in consumer behaviour, techUK agrees is expected to continue in an upward trend. These pressures to meet the ever-increasing demand for mobile data are not just found in the UK, they are global and regulators and industry stakeholders around the world will also be exploring their own strategies to satisfy the possible future demand for mobile services for the next decade, including investigation of additional internationally harmonised spectrum. This discussion document and consultation are hugely significant, as they set out potential options for how those networks could meet future demand taking account of spectrum, technology developments and potential deployment strategies. While the proposed policies will predominantly engage with companies designated to provide mobile internet, the effects of the regime will be felt across consumers and business in the UK due to our collective reliance on mobile broadband. We welcome the opportunity to respond to Ofcom's discussion paper on Meeting future demand for mobile data. However, it is important to note that techUK's membership includes a range of spectrum users and technologists (not just those in mobile/cellular ecosystem). Therefore, our response reflects our belief that it is also important to understand the role that mobile connectivity plays in a wider ecosystem of increasingly integrated connectivity types that will serve consumer and business needs, including Wi-Fi. It is important that thinking on the future of mobile networks takes place through this broader lens of wireless technology and market development. **Proactive policies are required to support wireless infrastructure deployment**

techUK supports Ofcom's statement that substantial growth in mobile network capacity will be needed to meet future demand. techUK members have flagged that in the long term they may not be able to cover all future demand, at least in an affordable way.

In the same vein, we consider that making available additional spectrum (especially in mid-bands) is important to help meet future demand but would not be sufficient on its own. Upgrading to the newest technologies, making more extensive deployment of existing spectrum and densification might all have an impact. On the latter, this could require more proactive policies to support wireless infrastructure deployment, but members caution that extreme densification in the absence of additional mid-band spectrum could be economically prohibitive.

To create a competitive environment that ensures availability of innovative networks and consumer choice, regulatory frameworks should ensure that:

- Adequate nationally available spectrum is released for the future requirements of national public mobile networks, while also protecting other technologies' spectrum needs in view of diverse use cases and the need to extend coverage to under- and un-connected areas and tens of millions of simultaneous users. Shared spectrum bands and licence-exempt spectrum currently provide a useful compliment to national spectrum licences and a cost-benefit analysis is needed before further expanding these, including regular audits of the degree these are used and any evidence of congestion.
- Licensing frameworks ensure that new entrants can provide services on an equal footing with incumbent operators. In the international satellite regulatory arena, at the International Telecommunication Union, methods have been proposed for satellite network operators to coordinate the shared use of spectrum fairly and efficiently, enabling digital inclusion, consumer choice, and competition.
- Spectrum allocations consider the evolving requirements for all technologies that make up the 5G ecosystem, including satellite in bands such as the 28 GHz band.
- A standards-based, technology neutral approach is maintained wherever connectivity requirements are specified, such that government and consumers have access to the best technology available to suit the need.
- Support for unconnected and under-connected populations continues to be provided through the government's subsidy programmes, such as vouchers and the Shared Rural

Network SRN) where commercial investments are not otherwise viable.
- Secure, resilient networks are promoted, particularly in light of new and evolving security threats and challenges.

Government should work with Ofcom to review the spectrum pricing framework in relation to mobile networks and consider repealing the 2010 Directions to Ofcom in this regard. This review may help to address the concerns over the cost of spectrum and the negative impact this has on investment in networks and the detrimental effects for consumers.

Regulation is presently too focused on achieving lower consumer prices rather than creating a climate that supports greater investments in mobile infrastructure. This needs to change if the UK is to truly achieve leadership in 5G networks and in future 6G.

techUK would encourage the UK government to act as an enabler for increased research and development in advanced connectivity, using tax policy, publicly funded tests and trials, regulatory proposals, as well as direct investment, to support the market.

Spectrum management will continue to play a crucial role in our future networks and advanced connectivity. Spectrum is a valuable and limited resource and demand is ever-increasing as new wireless technologies and systems are developed.

Ofcom should work with government to develop and publish a roadmap for releasing more spectrum for mobile networks, with the mmWave 26GHz band as an immediate priority, and it is also important to address needs for low frequency (sub-1GHz) and especially mid-band spectrum, including positive actions to support this via the ITU WRC-23 process and European harmonisation measures via the CEPT/ECC.

Some members highlight that, in the absence of additional mid-band spectrum, mobile communication networks would need to be substantially densified (numbers of base station sites increased) in order to deliver the IMT-2020 5G data rate targets across UK cities, and that this would lead to a significant increase in energy consumption, increased carbon footprint in equipment manufacture, and radio network cost.

We note industry as met and exceed the 10:1 cost vs. macro challenge set, but also that this is considerably higher challenge than other international markets as a result of the UK's challenging economics

Small cell deployment remains a costly investment for network deployment. While industry has met and exceeded the "10:1 cost versus macro" challenge set – this remains a considerably higher challenge compared with other international markets as a result of the UK's challenging economics. techUK is optimistic that technology innovation will improve the technical and commercial feasibility of small cell deployment, to help meet increasing demand in urban areas, but this improvement will rely on policies in place that support such investments. Some members view small cell deployment densification as a means for meeting the demands of high-capacity urban mobile networks is still an economically and environmentally costly investment and is not a viable proposition, and furthermore its impact on indoor coverage may not provide the expected improvements Ofcom suggests. On indoor coverage, for public buildings this is largely building owner funded and Ofcom and operators could support this trend through the development of economic multi-operator solutions.

techUK welcomes DCMS (Department for Digital, Culture, Media and Sport) efforts in reducing barriers to deployment (e.g., Proposed changes to planning laws, barrier busting work among others), but continued support might be necessary to reach the full potential of small cells before demand picks up, given the current circumstances of the UK mobile market. Interpretation of these efforts at a local level remains a blocker.

techUK points to developments in other markets, specifically the United States, as a valuable lesson for Ofcom to consider. In the US, the 'move to the street' (i.e., greater densification) occurred primarily due to lack of macro options ahead of, firstly, more mid-band spectrum being made available, and secondly, technology such as M-MIMO being available. In the UK, operators have not had such restrictions so have been able to implement a 'macro first' strategy for deployment. However, industry profitability in the US market is considerably higher than in Europe so was better able to sustain the investment required.

UK operators are concerned that they have reached the limits on the extent to which the macro cell grid can be densified further, because most of the densification has taken place during the 3G era and operators do not see the possibility of any feasible densification at a macro level, as this may result in increased inter-cell interference rather than provide any increased capacity. Adding additional new spectrum to existing sites is an effective means of adding capacity and reducing or delaying the need to build small cells. In some cases, especially sites supporting multiple operators,

there may however be limits to what is possible in terms of adding additional frequencies due to ICNIRP considerations.

For such reasons, some members consider it critically important Ofcom releases new mid-band spectrum, specifically the upper 6 GHz band, to be used on the existing macro network sites and meet the demands of high-capacity citywide mobile communications using the existing macro cell grid. This new mid-band spectrum could also be used where a high level of densification is needed to create a focused small cell layer in certain locations in urban areas. For the 4.2 GHz to upper 6 GHz range, techUK members note that this range would benefit from harmonisation to benefit from economies of scale via the global telecoms supply chain.

The role of neutral hosts

The open access neutral host model is likely to be increasingly relevant in the future, particularly in urban scenarios where dense deployments will be required and current planning restrictions or landowner disputes would prevent MNOs from deploying further sites.

Today, many neutral host models in the UK utilise MNO spectrum but provide shared infrastructure and active equipment to maximise economics of sharing while retaining simplicity for end users and flexibility for MNOs. An example, Freshwave's open access scheme in Croydon, allows open access to Croydon's assets.[1] One use case that is of interest, and in contrast to these models, is Sunderland Smart City[2], whereby the model is utilising non-MNO spectrum to serve end users. Even so, it is a helpful example of a model in which the local authority is collaborating with third-party providers to modernise local infrastructure and accelerate digital transformation, creating a 'Smart City' with the benefits that better connectivity can deliver.

In the vast majority of cases, municipalities already own and manage the urban spaces to host small cells, which are already equipped with backhaul and power, and deployment of wireless infrastructure will almost certainly be eased. Neutral hosts also offer an additional approach to in-building connectivity. The need for in-building wireless connectivity is increasingly a requirement for enterprise and business communications, as well as consumer applications across society.

[1] https://news.croydon.gov.uk/more-areas-to-benefit-from-councils-ground-breaking-4g-deal/
[2] https://www.sunderlandoursmartcity.com/

	Difficulties in accessing and setting up sites mean that mobile operators would in most cases take an outdoor-to-indoor approach – which could potentially lead to inefficiencies in spectrum and energy use, as the mobile signal would have to through the walls of the building. Neutral hosts, on the other hand, can be designed and deployed additional capacity and indoor coverage by sharing across the full infrastructure landscape, including spectrum, radios, cabling/network infrastructure and backhaul. Neutral hosts are an attractive solution where they primarily complement rather than duplicate existing public mobile networks. Similarly, publicly funded private networks are also likely to be more a more sustainable proposition if they are targeted at areas or applications that public networks do not cover or are able support.

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