
Review of the authorisation regime for spectrum access

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About this document

As part of the Government 5G strategy, set out in 'Next Generation Mobile Technologies: A 5G Strategy for the UK', Government asked Ofcom to review and report back by the end of 2017, "the scope for the spectrum licensing regime to facilitate better 4G and 5G deployment at national, regional and local scales, including in-building usage." This request built on recommendations the National Infrastructure Commission set out in its 'Connected Future' Report that called on Government and Ofcom to enable greater shared access to spectrum with a view to encouraging deployment of local networks by new wireless service providers.

This document sets out our duties and the factors we take into account when authorising access to spectrum. It highlights how we have previously used several different authorisation approaches to meet our policy objectives in relation to national and local networks, and how we are approaching the future authorisation of spectrum for 5G.

1. Review of the authorisation regime for spectrum access

Introduction

- 1.1 As part of the Government 5G strategy, set out in ‘Next Generation Mobile Technologies: A 5G Strategy for the UK’, Government asked Ofcom to review and report back by the end of 2017, “the scope for the spectrum licensing regime to facilitate better 4G and 5G deployment at national, regional and local scales, including in-building usage.”¹ This request built on recommendations the National Infrastructure Commission set out in its ‘Connected Future’ report that called on Government and Ofcom to enable greater shared access to spectrum with a view to encouraging deployment of local networks by new wireless service providers.²
- 1.2 Our policy objectives for public mobile voice and data services are to extend coverage and increase network capacity while maintaining effective competition and promoting investment and innovation. We also want consumers and businesses across the UK to benefit from next generation 5G networks as early as possible. We have an objective to ensure that access to spectrum is not an inhibitor and that spectrum users can access the spectrum they need when and where they need it. As part of this we recognise that small standalone networks may need to be deployed to support new 5G services, for example, connected factories. We will achieve these objectives using a range of spectrum authorisation approaches.
- 1.3 This document sets out our duties and the factors we take into account when authorising access to spectrum. It highlights how we have previously used several different authorisation approaches to meet our policy objectives in relation to national and local networks, and how we are approaching the future authorisation of spectrum for 5G services.

Relevant duties and functions when authorising spectrum

- 1.4 Under section 3 of the Communications Act 2003 (the “Act”), Ofcom’s principal duty in carrying out all our functions, is to further the interests of citizens and consumers, where appropriate by promoting competition. Of particular relevance to authorising spectrum, we are also required, in carrying out our functions, to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum.

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/597421/07.03.17_5G_strategy_-_for_publication.pdf

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/577906/CONNECTED_FUTURE_ACCESSIBLE.pdf

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- 1.5 The Act also sets out matters to which Ofcom must have regard in performing its duties. These include the desirability of promoting competition, of encouraging investment and innovation and encouraging the availability and use of high speed data transfer services throughout the UK
- 1.6 Section 3 of the Wireless Telegraphy Act 2006 (“WTA”) sets out additional duties which apply when Ofcom carries out spectrum functions. We must have regard to spectrum availability in light of both current and likely future demand. We must also have regard to the desirability of promoting efficient management and use of spectrum, the economic benefits that may arise from use, the development of innovative services, and competition in provision of services.
- 1.7 Ofcom has a number of functions in relation to spectrum authorisation. This includes licensing (or exempting from the requirement to have a licence) different uses of spectrum in the UK (section 8 of the WTA).³ We define and publish the UK spectrum authorisation plan in the “United Kingdom Plan for Frequency Authorisation” (“UKPFA”).
- 1.8 It is noted that there is some potential for duties to come into conflict with one another in carrying out relevant functions. In these cases, we take a balanced approach to resolving that conflict in light of our principal duty, assessing what will bring the greatest benefit to UK citizens and consumers. Our overall objective on authorisation is to ensure the appropriate spectrum is available to meet demand from both new and existing uses and minimise the scope for spectrum to remain underutilised.

Fit for purpose framework for spectrum access

- 1.9 In line with our duties and taking into account all of the above factors, Ofcom deploys or implements a wide range of authorisation approaches to achieve specific policy objectives and meet demand from different users. By way of example, below we highlight a number of ways by which we have secured widespread availability of communications services in the UK, encouraged innovation and enabled more efficient use of spectrum:

Ensuring the availability of wireless broadband services (mobile and fixed) across the UK

- 1.10 **Encouraging investment in mobile networks:** When making spectrum available for mobile, one of our primary policy objectives has been to ensure citizens and consumers across the UK can access services. Through the award of dedicated, national licences we afford operators the flexibility to plan, deploy and upgrade their networks with minimal need to coordinate with other spectrum users. This is particularly the case for low frequency and/or high power mobile, where the risk of interference between mobile base stations would be higher if the spectrum were not awarded on a dedicated per operator basis.

³ All spectrum use in the UK is authorised by Ofcom. Crown bodies are exempt from requiring authorisation.

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- 1.11 **Extending mobile coverage:** In order to ensure wider availability of mobile services, we have also included coverage obligations in some national licences to extend coverage further and/or faster than the market would otherwise deliver. For example, at 800 MHz we included a 98% indoor coverage obligation on one of the lots (purchased by Telefonica) to be achieved by the end of 2017. We noted that competition in the market should encourage other operators not subject to the licence obligation to build networks with similar coverage.
- 1.12 **Enable fixed wireless broadband:** High quality broadband is fundamental to the way people live and work, however there are still areas where broadband speeds available via fixed line networks are not yet sufficient for the needs of consumers. One way of delivering broadband to consumers and businesses in difficult to reach areas is Broadband Fixed Wireless Access (“BFWA”). Because there is demand at community levels for this type of service, Ofcom licences spectrum at 5.8 GHz on a site by site basis in order to enable a wide range of BWFA providers to build localised networks. This licensing approach has proved popular, with around twelve thousand sites currently registered with Ofcom. To meet the demand for greater broadband capacity, we recently announced our decision to make additional frequencies available in this band for BWFA.⁴

Enabling innovation and optimal use of spectrum

- 1.13 In a number of instances, our duties in relation to encouraging innovation have had a particularly notable influence on how we have made spectrum available. We have done this by lowering the barriers to access spectrum, for example by enabling spectrum sharing through licence exemption,⁵ or by offering local geographic licences. This has allowed new players to enter the market, consumers to deploy their own wireless equipment and has ensured more efficient use of spectrum. Examples include:
- **Licence exempt access to spectrum at 2.4 GHz** has helped enable the development of a number of highly successful technologies including Wi-Fi and Bluetooth. As technologies have evolved and demand for capacity and speed have increased, Wi-Fi technologies have also been developed for licence exempt use in the 5 GHz and 60 GHz bands. Where innovative technologies have become mass market we have taken steps to ensure increased demand can be met. For example, in response to increased demand for Wi-Fi, we were the first country in Europe to extend Wi-Fi use in the 5.8 GHz band.
 - **Licence exempt and light licence access at 870 - 873 MHz:** To enable innovation in the Internet of Things and smart applications we have enhanced access to the licence exempt 870-873 MHz band by allowing higher performance devices to be deployed under a low cost licence, alongside licence exempt devices.⁶ This change to the way the

⁴ https://www.ofcom.org.uk/data/assets/pdf_file/0019/108235/5.8GHz-statement.pdf

⁵ Where the use of the equipment has been exempted from the need to hold a licence by regulations

⁶ https://www.ofcom.org.uk/data/assets/pdf_file/0023/63437/nrp_statement.pdf

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band is licensed enables faster roll out of mesh networks whilst minimising the regulatory burden on operators and the need to identify additional spectrum for these devices.

- 1.14 In some instances when licence exemption would not enable certain services to work we can consider more coordinated forms of spectrum sharing.
- **Local mobile:** We have issued 12 licences to operate local mobile telephony systems in the 1781-1785 & 1876-1880 MHz band.⁷ Each licensee is able to deploy network anywhere in the UK, but licensees are required to work together to coordinate network deployments and thereby avoid radio interference. We are currently considering the case for allowing more wireless operators to access to this spectrum and increase the permitted power levels in certain situations with a view to enabling and encouraging the deployment of community mobile networks. Such an approach could benefit communities that are poorly served by the national mobile providers.
 - **Private mobile networks:** We can allocate users a licence for a defined area (ranging from a 50 km square up to a national level) on a coordinated basis. This grants access to spectrum allowing the licensee to deploy transmitters within the licensed area, for example the utilities industry use this type of licence for data gathering and network control. This approach allows licensees to deploy secure local, regional or national networks with guarantees over the quality of service they receive.
- 1.15 Another example of a more coordinated approach to spectrum sharing is dynamic spectrum access (DSA).
- **TV White spaces:** Our first implementation and test of DSA approaches was TV white spaces. Innovation was our primary policy objective in the development of this new approach to authorising access to unused parts of valuable, low frequency spectrum in the 470 to 790 MHz band. We have implemented a tiered, dynamic approach to allow licence exempt TV White Space devices, which meet a minimum technical specification and are authorised or controlled by data base, to make use of unused spectrum.⁸ This approach meets our objective of enabling new players to innovate and enable shared use of the spectrum.
- 1.16 We have a policy of offering technology and service neutral licences. This allows licensees to be able to innovate by changing the technology or service it wishes to deploy without the need to approach Ofcom, providing the technology falls within its existing licensed technical parameters.
- 1.17 To facilitate innovation, we can make any spectrum available to enable testing, development, research or demonstration of radio equipment, when requested, and have an established licensing process in place to support applicants seeking frequencies for trials. For example, we have granted a number of non-operational licences to support 5G

⁷ <https://www.ofcom.org.uk/consultations-and-statements/category-1/DECTGB>

⁸ https://www.ofcom.org.uk/_data/assets/pdf_file/0034/68668/tvws-statement.pdf

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trials at various frequencies. These licences can be coordinated with incumbent users to allow access to spectrum on a non-interference basis.

- 1.18 It should be noted that all the existing licences Ofcom has issued are awarded on a non-exclusive basis. Ofcom reserves the right to grant additional licences for the use of some or all of these frequencies, with appropriate safeguards to appropriately manage the risk of interference.

Authorising spectrum for future 4G and 5G mobile services

- 1.19 Our overarching objective for mobile services is to ensure that spectrum is not an inhibitor to continued mobile broadband growth, effective competition between the network operators and early 5G roll out. We aim to achieve this by ensuring that the right spectrum bands are available for 5G, with the appropriate authorisation in place, to meet demand for deployments at national, regional and local level.
- 1.20 Demand for mobile broadband capacity has increased significantly over recent years and is expected to continue to grow. In addition, new applications are being developed which will enable industries to integrate wireless connectivity, and as such, we need to meet these changing demands.
- 1.21 In response to increased consumer demand for mobile broadband services, network operators will deploy newer iterations of 4G within their existing spectrum holdings and these may evolve into 5G once that becomes available and increased demand requires it.
- 1.22 New spectrum is expected to be a critical enabler of innovative 5G services. Some of the use cases may require the deployment of 5G in mid (e.g. 3.4 - 3.8 GHz) and high-frequency spectrum (e.g. 26 GHz), where larger chunks of contiguous spectrum are available. High frequency spectrum has not been used for mobile before, but technological developments have enabled these band to be included in mobile handsets.
- 1.23 5G could be used in conjunction with other technologies such as automation and artificial intelligence to serve new use cases. New services such as virtual reality and industry automation may require “instant response” networks enabled by 5G.
- 1.24 New uses and new technologies, particularly in high frequency spectrum, will likely create opportunities for existing operators to offer different services and for new players to enter the market. Therefore, demand for spectrum may come from a wider range of service providers delivering different wireless connectivity solutions ranging from national mobile networks offering greater capacity and increased reliability to citizen and consumers across the UK, to site specific solutions to address connectivity within, for example, factories and shopping centres. The way we authorise spectrum therefore needs to reflect changes in demand.
- 1.25 Deployment of 5G using low, mid and high frequency bands offers the potential to deliver our policy objectives in relation to improving the coverage and capacity of the existing mobile networks while enabling further investment and innovation in new services, potentially by new market entrants:

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- **Improving outdoor mobile coverage:** As set out in in the Annual Plan 2017/18⁹, one of Ofcom’s policy objectives is to improve mobile coverage. 700 MHz is one of the three “pioneer” bands identified for 5G by the Radio Spectrum Policy Group (RSPG), and our view is that it will be an important band for providing wide area coverage for mobile broadband. We will consider including coverage obligations in the licences, as a way of extending mobile coverage in areas where the market alone would not deliver. Coverage obligations could include targets that are UK wide and which relate to the Nations and / or could be targeted at more localised areas (e.g. a particular geographic area, or on the UK road system). We will consult on the award, and the detail of any coverage obligations in due course.
- **Improving indoor mobile coverage:** As well as improving outdoor coverage, 700 MHz will also help indoor coverage as lower frequency signals are not degraded as much as higher frequency spectrum when passing through walls. We also expect to see in-building solutions being designed as the demand for data increases.

In addition, in October 2017, we made a decision to make regulations that will allow consumers to operate mobile phone repeaters for indoor and in-car use on a licence exempt basis to improve mobile reception.¹⁰ The regulation will take effect in early 2018.

- **Improving mobile network capacity:** 5G is being designed to deliver huge capacity and faster data speeds, and as such, we are making available spectrum at mid and high frequencies in order to meet this demand.

We expect to award spectrum in the 3.4-3.6 GHz (and the 2.3 GHz band) early in 2018 and the 3.6-3.8 GHz band before 2020.

26 GHz, the pioneer mmWave band for Europe, will also be an important band for delivering very high capacity in areas of high demand. In addition, the propagation characteristics of mmWave spectrum, raises the possibility of greater sharing. As such our approach to authorisation will balance the policy objectives of making the spectrum available to deliver capacity where it is required, and ensuring that innovation can occur in the band. We recently published a Call for Inputs on making this band available for 5G,¹¹ and are currently in the process of analysing stakeholder responses.

- **Promoting Innovation:** We recognise that access to spectrum on a licence exempt basis will be important for enabling innovation. As such, we recently identified 66-71 GHz as a priority study band for 5G because of the potential for it to be made available

⁹ <https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-archive/completed-awards/800mhz-2.6ghz>

¹⁰ https://www.ofcom.org.uk/data/assets/pdf_file/0019/107254/Repeaters-Statement-2017.pdf

¹¹ <https://www.ofcom.org.uk/consultations-and-statements/category-2/5g-access-at-26-ghz>

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on a licence exempt basis.¹² We are considering commencing work shortly to develop the necessary regulation to facilitate licence exempt use in this band.

Access to mid-range spectrum, which has a good balance between coverage and capacity, will also be important for innovation. In 2016 we identified 3.8-4.2 GHz as a band with the potential for increased sharing for potential new innovative applications¹³ For example, a company could offer wideband IoT services to enable smart city applications in urban areas, whilst another company could offer high speed broad wireless broadband services in other areas using the same spectrum.

We plan to publish a consultation on enabling further sharing in the band in 2018, with a view to enabling innovative uses while taking into account existing use.

Conclusion

- 1.26 Our overarching objective for mobile services is to ensure that spectrum is not an inhibitor to continued mobile broadband growth, effective competition between the network operators and early 5G roll out.
- 1.27 The evolution from 4G to 5G technologies is likely to enable different applications and services; as a result demand for spectrum may come from a wider range of service providers delivering different wireless connectivity solutions ranging from national mobile networks offering greater capacity and increased reliability to citizen and consumers across the UK, to location specific solutions to address connectivity within, for example, factories, shopping centres and business parks.
- 1.28 The WT Act grants Ofcom the flexibility to authorise spectrum to ensure its efficient use, meet its policy objectives and take account of the changes in demand.

¹² p31 https://www.ofcom.org.uk/data/assets/pdf_file/0014/104702/5G-spectrum-access-at-26-GHz.pdf

¹³ <https://www.ofcom.org.uk/consultations-and-statements/category-2/opportunities-for-spectrum-sharing-innovation>