
Annual Licence Fees for 900 MHz and 1800 MHz frequency bands

STATEMENT:

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About this document

This document contains Ofcom's decision on the level of annual licence fees we have set for 900 MHz and 1800 MHz spectrum used by mobile network operators.

Contents

Section

1. Executive summary	1
2. Introduction and legal framework	2
3. Approach to determining ALFs	7
4. Market value	12
5. Further consideration of ALFs, in light of our statutory duties	30
6. Conclusions and implementation	63

Annex

Annexes 1-6 are published separately alongside this statement

1. Executive summary

- 1.1 This document sets the levels of annual licence fees (ALFs) for 900 MHz and 1800 MHz spectrum, to be paid by mobile network operators (MNOs) from 31 January 2019. The operators use these spectrum bands to provide mobile voice and data services, using a mix of 2G, 3G and 4G technologies.
- 1.2 In setting the ALF levels, we have acted in accordance with the Government's Direction, issued in December 2010, to revise fees for mobile spectrum in the 900 MHz and 1800 MHz bands to reflect the full market value of those frequencies as well as our statutory duties.¹ We have also considered and taken into account detailed consultation responses from the four MNOs.²
- 1.3 Consistent with both the Direction and our existing general policy on spectrum pricing (which was itself established in order to meet our statutory duties when imposing spectrum licence fees), we have first assessed the market value of the spectrum concerned. We have had regard to evidence from previous UK spectrum auctions and to international benchmarks.
- 1.4 We have then converted these lump-sum values into an equivalent annual payment by applying an annualisation rate. This is derived from a post-tax discount rate (taking into account the extent of risk sharing between licensees and the government) and a tax adjustment factor (reflecting the more favourable tax treatment of annual fees compared to lump-sum auction payments). We have throughout taken a conservative approach to interpreting the evidence as we consider the risks of setting fees above market value are greater than of setting them below market value, even if this means the fees ultimately payable are lower.
- 1.5 We have then assessed whether, in light of our statutory duties, fees should be set not at this level but at some other level.
- 1.6 We have concluded that, taking account of the Direction and our statutory duties, it is appropriate for us to set fees at the market value of the frequencies, and that the appropriate ALFs for these bands (expressed in April 2018 prices) are:
- a) 900 MHz: £1.093m per MHz per annum
 - b) 1800 MHz: £0.805m per MHz per annum
- 1.7 We have made regulations setting ALFs at those values accordingly, a copy of which is provided in Annex 6. These ALFs will become effective on 31 January 2019.

¹ <https://www.legislation.gov.uk/ukdsi/2010/9780111500767?view=plain>

² (8 June 2018), https://www.ofcom.org.uk/data/assets/pdf_file/0022/114736/consultation-alf.pdf (the **2018 Consultation**)

2. Introduction and legal framework

Spectrum holdings

2.1 Licences to use 900 MHz and/or 1800 MHz spectrum are currently held by Vodafone Ltd (**Vodafone**), Telefónica UK Ltd (**Telefónica**), Everything Everywhere Ltd (**EE**) and Hutchison 3G UK Ltd (**H3G**) (collectively, the **MNOs**). The MNOs use these frequencies to provide voice and data services using a mix of 2G, 3G and 4G technologies.

2.2 The holdings of 900 MHz and 1800 MHz spectrum are as follows:

Figure 2.1 900 MHz and 1800 MHz spectrum holdings by operator

	Vodafone	Telefónica	EE	H3G
900 MHz	34.8 MHz	34.8 MHz	-	-
1800 MHz	11.6 MHz	11.6 MHz	90 MHz	30 MHz

The legal framework

Background

2.3 In December 2010, the Government directed Ofcom to award 4G licences in the 800 MHz and 2.6 GHz bands, and thereafter revise fees for mobile spectrum in the 900 MHz and 1800 MHz bands to reflect the full market value of those frequencies (the “**Direction**”). Ofcom awarded licences for the 800 MHz and 2.6 GHz bands in 2013. In September 2015, Ofcom set new annual licence fees (ALFs) for the 900 and 1800 MHz bands.³

2.4 In November 2017, the Court of Appeal quashed Ofcom’s 2015 decision on the basis that in implementing the Direction, Ofcom should have considered its statutory duties, in particular the Article 8 objectives in the Framework Directive which are reflected in section 4(2) of the Communications Act 2003 (the “**Communications Act**”).⁴ In doing so, the Court of Appeal quashed the 2015 Regulations, which resulted in the fees reverting to a lower level which had applied for many years.⁵

2.5 We have therefore considered again at what level ALFs should be set for the 900 and 1800 MHz bands, having regard as appropriate to the Direction and our statutory duties.

³ The Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) (Amendment and Further Provisions) Regulations 2015 (the **2015 Regulations**).

⁴ [2017] EWCA Civ 1873.

⁵ The 2011 Regulations consolidated previously applicable legislation setting charging rates without amending the rates applicable to these licences. The rates currently payable were set in 2002.

Ofcom's power to set fees

- 2.6 Under section 12 of the Wireless Telegraphy Act 2006 (the “**Wireless Telegraphy Act**”), Ofcom has the power to require licensees to pay fees to Ofcom on the grant of a licence and subsequently. The requirement to pay fees at times after the grant of a licence must be imposed by way of regulations made by Ofcom. The timing of the fee payment must be set out in the regulations, and the amount of the fee can be prescribed in the regulations, or alternatively the regulations may provide for the amount to be determined by Ofcom in accordance with the regulations.
- 2.7 Section 13 of the Wireless Telegraphy Act provides for Ofcom to set fees at an amount that is higher than the cost to us of carrying out our radio spectrum functions. This power may be exercised if we think fit in the light (in particular) of the matters to which we must have regard under section 3 of the Wireless Telegraphy Act.
- 2.8 Section 122 of the Wireless Telegraphy Act is a general provision about matters relating to Ofcom's powers to make statutory instruments (including fees regulations under section 12 of that Act). It includes a requirement that where we are proposing to make regulations we must publish a notice setting out the general effect of the regulations and give a period of at least one month within which representations on the proposed regulations may be made to us.
- 2.9 The legal framework for the setting of fees derives from our duties under both European and domestic legislation, specifically from:
- a) the Common Regulatory Framework⁶ for electronic communications networks and services, in particular the Framework Directive and the Authorisation Directive; and
 - b) the Communications Act and the Wireless Telegraphy Act, which transpose the provisions of those directives into national law.
- 2.10 However, in the case of licences for frequencies in the 900 MHz and 1800 MHz bands, the Direction is also relevant. We discuss this below before setting out our statutory duties under the Common Regulatory Framework, the Communications Act and the Wireless Telegraphy Act.

The Direction

- 2.11 Under section 5 of the Wireless Telegraphy Act, the Secretary of State may by order direct Ofcom to exercise its powers in such cases, in such manner, subject to such restrictions and constraints, and with a view to achieving such purposes as may be specified in, or determined by the Secretary of State in accordance with, the order.

⁶ The Common Regulatory Framework comprises the Framework Directive (Directive 2002/21/EC), the Authorisation Directive (Directive 2002/20/EC), the Access Directive (Directive 2002/19/EC), the Universal Service Directive (Directive 2002/22/EC) and the Directive on privacy and electronic communications (Directive 2002/58/EC), as amended by the Better Regulation Directive (Directive 2009/140/EC).

- 2.12 In December 2010, as part of a package of reforms of spectrum management, the Government directed Ofcom to award 4G licences in the 800 MHz and 2.6 GHz bands, and thereafter revise fees for mobile spectrum in the 900 MHz and 1800 MHz bands to reflect the full market value of those frequencies. The Direction also required that, in revising the fees, Ofcom must have particular regard to the sums bid for licences in the auction of 800 MHz and 2.6 GHz spectrum (the “**4G Auction**”).
- 2.13 We awarded licences for the 800 MHz and 2.6 GHz bands in 2013. In September 2015, we set new ALFs for the 900 and 1800 MHz bands using our powers under section 12 of the Wireless Telegraphy Act.⁷
- 2.14 Both the validity and the correct interpretation of the Direction were considered in a legal challenge brought by EE to our September 2015 decision, as was the underlying section 5 Wireless Telegraphy Act power. In November 2017, the Court of Appeal quashed our 2015 decision. It did so on the basis that in implementing the Direction, Ofcom should have considered its statutory duties, in particular the Article 8 objectives in the Framework Directive which are reflected in section 4(2) of the Communications Act.⁸ We set out these statutory duties from paragraph 2.17 below.
- 2.15 Specifically, the Court stated that whilst the Secretary of State has powers to issue directions to Ofcom under section 5 of the Wireless Telegraphy Act in relation to Ofcom's exercise of its radio spectrum functions, section 5 does not empower the Secretary of State to exercise those radio spectrum functions himself. As such, Ofcom is not relieved of the requirement to act in accordance with its statutory duties when exercising its radio spectrum functions, such as when setting fees, even when it is directed in that regard.
- 2.16 However, the Court of Appeal did not find the Direction to be unlawful and it therefore remains in force.

Common regulatory framework

- 2.17 Article 8 of the Framework Directive sets out the objectives which national regulatory authorities must take all reasonable steps to achieve. These include:
- a) the promotion of competition in the provision of electronic communications networks and services by, amongst other things, ensuring there is no distortion or restriction of competition in the electronic communications sector and encouraging efficient use of radio frequencies; and
 - b) contributing to the development of the internal market by, amongst other things, removing obstacles to the provision of electronic communications networks and services at a European level, and encouraging the interoperability of pan-European services.

⁷ See footnote 3 above.

⁸ [2017] EWCA Civ 1873.

- 2.18 In pursuit of these policy objectives, Article 8 requires national regulatory authorities to apply objective, transparent, non-discriminatory and proportionate regulatory principles by (amongst other things):
- a) ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services; and
 - b) promoting efficient investment and innovation in new and enhanced infrastructures.
- 2.19 Article 8 also requires Member States to ensure that in carrying out their regulatory tasks, national regulatory authorities take the utmost account of the desirability of making regulations technologically neutral.
- 2.20 Article 9 requires Member States to ensure the effective management of radio frequencies for electronic communications services in accordance with Article 8, and to ensure that spectrum allocation used for electronic communication services and issuing general authorisations or individual rights of use of such radio frequencies are based on objective, transparent, non-discriminatory and proportionate criteria. Article 9 also requires Member States to promote the harmonisation of use of radio frequencies across the Community, consistent with the need to ensure effective and efficient use of frequencies. It requires Member States to ensure technology and service neutrality.
- 2.21 Article 13 of the Authorisation Directive states that Member States may impose fees for the rights of use of radio frequencies which reflect the need to ensure the optimal use of that resource. Fees must be objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and must take into account the objectives in Article 8 of the Framework Directive.
- 2.22 Recital 32 to the Authorisation Directive states that in addition to administrative charges, usage fees may be levied for the use of radio frequencies as an instrument to ensure the optimal use of such resources and provides that such fees should not hinder the development of innovative services and competition in the market.
- 2.23 Recital 33 to the Authorisation Directives states that Member States may need to amend charges and fees relating to rights of use of radio frequencies where this is objectively justified and provides that such changes should be duly notified to all interested parties in good time, giving them adequate opportunity to express their views on any such amendments.

The duties imposed by the Communications Act

- 2.24 Section 3 of the Communications Act sets out Ofcom's general duties including its principal duty:
- a) to further the interests of citizens in relation to communications matters; and
 - b) to further the interests of consumers in relevant markets, where appropriate by promoting competition.

- 2.25 In carrying out its functions, section 3(2) provides that Ofcom is required, amongst other things, to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum, the availability throughout the UK of a wide range of electronic communication services and the availability throughout the UK of a wide range of television and radio services.
- 2.26 Section 3(3) of the Communications Act provides that in performing its duties, Ofcom must in all cases have regard to the principles of transparency, accountability, proportionality and consistency, as well as ensuring that its actions are targeted only at cases in which action is needed.
- 2.27 Section 3(4) of the Communications Act requires Ofcom, in performing its duties, to have regard to a number of factors as appropriate, including the desirability of promoting competition, encouraging investment and innovation in relevant markets, encouraging the availability and use of high speed data transfer services throughout the UK, the different interests of persons living in rural and in urban areas and the different needs and interests of everyone who may wish to use the spectrum for wireless telegraphy.
- 2.28 In performing our duty under section 3 of furthering the interests of consumers, we must have regard, in particular, to the interests of those consumers in respect of choice, price, quality of service and value for money.
- 2.29 Section 4 of the Communications Act requires us to act in accordance with the six Community requirements, which give effect to the requirements of Article 8 of the Framework Directive, when carrying out certain specified functions, including our functions under the Wireless Telegraphy Act.

The duties imposed by the Wireless Telegraphy Act

- 2.30 Section 3 of the Wireless Telegraphy Act imposes a number of further duties relating to spectrum management. Amongst other things, in carrying out its spectrum functions Ofcom is required to have regard to the extent to which spectrum is available for use, and the demand (both current and future) for the use of spectrum.
- 2.31 Section 3 of the Wireless Telegraphy Act also requires Ofcom to have regard to the desirability of promoting the development of innovative services and competition in the provision of electronic communications services.

3. Approach to determining ALFs

Background

- 3.1 As set out in Section 2, we have a power to impose fees for the use of spectrum. That power includes a power to set fees greater than those necessary to recover the administrative costs that Ofcom incurs in connection with its radio spectrum functions, having regard in particular to Ofcom’s general duty to further the interests of citizens and consumers by securing the optimal use of the spectrum and its specific duties when carrying out its spectrum functions.
- 3.2 In order to meet these duties, we set out our general policy position for setting spectrum fees in our Strategic Review of Spectrum Pricing (the “SRSP”) in 2010⁹, which we said would be used in future as a guide to setting fees above administrative cost (which we referred to in the SRSP as administered incentive pricing or “AIP”). We explained that the purpose of AIP was to set fees for spectrum holdings to reflect the value of the spectrum (based on its opportunity cost) in order to promote the optimal use of spectrum. We set out a high-level framework for setting AIP fees, and noted that we would need to take account of the particular circumstances of a case when setting specific fees. In this statement, we use the terms AIP and ALF interchangeably.
- 3.3 We also considered the question of the potential interplay between setting spectrum fees and spectrum trading, and concluded that many secondary markets are unlikely to be sufficiently effective to promote the optimal use of the spectrum without the additional signal from AIP fees, and that fees based on AIP principles are likely to continue to be needed to play a role complementary to spectrum trading for most licence sectors.
- 3.4 In most markets, firms pay the market value for inputs to the goods and services they produce, and in the absence of market failures we would expect this to provide firms with appropriate incentives in making commercial decisions, such as about which assets to hold, output, pricing, investment, and input mix.
- 3.5 This also applies to spectrum licences – for example, mobile operators typically pay the market value of spectrum which they acquire in auctions, such as the 4G auction in 2013 of the 800 MHz and 2.6 GHz bands and the auction earlier this year of the 2.3 GHz and 3.4 GHz bands. Indeed, one of the reasons we use spectrum auctions to assign spectrum is their role in allocating spectrum efficiently and providing efficient signals to holders of that spectrum. Each UK MNO has a portfolio of spectrum licences which includes some spectrum acquired at auction and some in the 900 and 1800 MHz bands.¹⁰
- 3.6 Efficient use of radio spectrum is an important means of meeting the large and growing demand for mobile data, and the efficient use of spectrum by mobile operators has

⁹ Ofcom, *Strategic Review of Spectrum Pricing: The revised Framework for Spectrum Pricing*, December 2010, https://www.ofcom.org.uk/data/assets/pdf_file/0024/42909/srsp-statement.pdf

¹⁰ H3G also has spectrum which it has acquired from Qualcomm and EE, and Vodafone has spectrum it acquired from Qualcomm. BT, following its acquisition of EE, holds licences which were previously acquired by EE, Orange and T-Mobile.

implications for the mobile sector, other spectrum users, and the UK economy. It is important to ensure that each mobile operator has appropriate incentives to retain spectrum rights only if it is the highest-value user of the underlying spectrum. While spectrum licence fees are a direct cost on mobile operators, as noted above, this is also true of other inputs they use to provide mobile services.

- 3.7 We consider that there remain good reasons to set fees based on the opportunity cost for spectrum, in accordance with the policy position in the SRSP, even where spectrum trading is possible, in order to meet our statutory duty of securing optimal use of the radio spectrum. In relation to the 900 and 1800 MHz frequencies, this approach of setting fees based on opportunity cost, which we adopt in this case, is consistent with and reinforced by the Government's Direction which requires Ofcom to revise the relevant fees so that they reflect the full market value of the frequencies.^{11 12}

Structure of our assessment

- 3.8 In the 2015 Statement¹³, we considered that because of the terms of the Direction we had no discretion to assess whether setting fees at market value would be appropriate having regard to our duties more generally.
- 3.9 However, following the Court of Appeal's judgment, in our June 2018 consultation, we considered both the market value of the spectrum and whether, in light of our statutory duties, we should set ALFs at a different level.¹⁴ In light of that assessment, we then reached a provisional view on the appropriate level of ALFs.
- 3.10 As well as being consistent with the Direction, our decision to first assess the market value of the spectrum was consistent with our position in the SRSP which, as noted above, provides that fees set to reflect the value of the spectrum (based on its opportunity cost) will ordinarily be appropriate for spectrum that is expected to be in excess demand. As explained at paragraph 3.2 above, the SRSP was itself set in order to meet Ofcom's statutory duties when setting spectrum licence fees.
- 3.11 Further, when interpreting the evidence on market value, we considered that it was right to adopt a conservative approach due to the risk asymmetry of the situation (i.e. the greater cost of erring on the side of overvaluation).¹⁵ In reaching this view, we were informed by and acted consistently with our statutory duties.

¹¹ In the unanimous judgment, Lord Justice Patten commented that he was inclined to consider that "reflect" in the Direction means "based on" or "by reference to" but noted that the background material is inconclusive.

¹² We explain later (paragraph 4.2) how we define market value to mean market-clearing price in a well-functioning market, or the forward-looking marginal opportunity cost.

¹³ Ofcom, *Annual licence fees for 900 MHz and 1800 MHz spectrum: statement*, September 2015, https://www.ofcom.org.uk/__data/assets/pdf_file/0033/79764/statement.pdf

¹⁴ Ofcom, *Annual licence fees for 900 MHz and 1800 MHz frequency bands: consultation*, June 2018, https://www.ofcom.org.uk/__data/assets/pdf_file/0022/114736/consultation-alf.pdf

¹⁵ See June 2018 consultation, paragraph 4.35 and 2015 Statement, paragraphs 1.38-1.43.

- 3.12 We also considered this structure to be consistent with the Court of Appeal’s judgment, which, in our view, envisages a staged analysis.¹⁶

Responses to consultation

- 3.13 Neither Three nor Telefónica objected to the structure of Ofcom’s analysis. However, BT and Vodafone said that consideration of Ofcom’s statutory duties cannot be “bolted on” as a discrete step; instead it must inform all stages of the analysis (including the calculation of market value).¹⁷

Our assessment

- 3.14 As explained at paragraphs 3.9 – 3.11 above, we have considered our statutory duties when assessing the market value of ALFs, and to the extent that such duties bear on the assessment of market value, we are satisfied that the methodology adopted is consistent with them. We recognise that there are areas requiring regulatory judgement and, when doing so, we have been informed by and acted consistently with our statutory duties. In the analysis below, we explain how and why we have taken the view that we do in the areas requiring regulatory judgement.
- 3.15 As explained above, we consider that the Court of Appeal’s judgment clearly envisages a staged analysis. Article 6 of the Direction directs Ofcom to set ALFs so as to “reflect” full market value. It is difficult to see how that Direction could be followed unless, at some point in the analysis, there is a discrete assessment of what full market value amounts to. We accept that the assessment of market value must itself be conducted by reference to our statutory duties, to the extent that it involves regulatory judgment, as already explained. And we accept that any decision about whether to set fees at the level of full market value is subject to a further assessment of the impact of setting fees at that level in light of our statutory duties.
- 3.16 We are satisfied that the structure of our analysis is appropriate, in that it ensures that we have carried out such a further assessment, and that we have fully considered our duties in determining the appropriate level of ALFs.

¹⁶ See paragraph 45: “[Administered Incentive Pricing] is a formula for assessing the value to be attributed to spectrum based on opportunity cost. It is not **and cannot be** a calculation which takes into account the relationship between opportunity cost (and therefore value) and the impact that fees set at that level would have in relation to competition or individual users of the system: i.e. the Article 8 considerations. As Ofcom explains in its policy statement, **those factors have to be taken into account after the calculation of AIP when deciding how to apply the AIP to the setting of licence fees.** The issue therefore in relation to Article 6 of the 2010 Direction is whether the requirement to apply the AIP in the setting of licence fees should be read (by necessary implication) as excluding the obligations which would otherwise exist for Ofcom to carry out **the second stage of the exercise** described in its policy statement.” (Emphasis added).

¹⁷ BT p.5 §2.1; Vodafone pp.4-9

Market value

- 3.17 For the reasons set out above, and consistent with both the Direction and the SRSP, we consider that it is right to assess the market value of the 900 MHz and 1800 MHz spectrum before considering whether to set fees at that level.
- 3.18 We consider that the general approach we used in 2015 to assess market value continues to be appropriate.¹⁸
- 3.19 Neither the 900 MHz nor the 1800 MHz spectrum has been auctioned in the UK. Rather, we have evidence of the market value of 800 MHz and 2.6 GHz spectrum which has been auctioned in the UK (in 2013), and of the market value of the 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz bands in other countries where they have been auctioned.
- 3.20 Our approach to setting ALFs at market value in our 2015 Statement can be summarised as follows:
- a) We estimated the UK lump-sum market value of the 800 MHz and 2.6 GHz bands (the 'auction bands'), based on analysis of the sums bid in the UK auction in 2013.
 - b) We considered auction prices for 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz spectrum in European countries from 2010 onward, from which we derived the relative values of the 900 MHz and 1800 MHz bands to 800 MHz and 2.6 GHz spectrum in these benchmark countries. We used these relative values, in combination with our estimates of the UK market value of 800 MHz and 2.6 GHz spectrum to derive a set of benchmarks for the lump-sum market value in the UK of the 900 MHz and 1800 MHz bands.
 - c) Next we considered the impact on the market value of ALF spectrum of the Geographic Coverage Obligation (the "**Coverage Obligation**") agreed between the licensees and the Government in December 2014.¹⁹ We concluded that the Coverage Obligation was unlikely to affect the market value of either 900 MHz or 1800 MHz spectrum for the purpose of ALF. Accordingly, we decided not to amend the lump-sum values for either 900 MHz or 1800 MHz in light of the Coverage Obligation.²⁰
 - d) We derived lump-sum values of the 900 MHz and 1800 MHz bands, principally using the UK and benchmark evidence described above (including consideration of the relative quality of the evidence from different benchmarks and the risks of understatement or overstatement of market value) and, in light of our statutory duties

¹⁸ We note that, as part of its appeal against Ofcom's 2015 decision, EE asserted that Ofcom had failed to consider evidence from avoided cost modelling in determining the market value. The High Court dismissed this part of EE's appeal, and EE was refused permission by the High Court to appeal this part of its judgment. See [2016] EWHC 2134 (Admin), paragraphs 105 to 113.

¹⁹ See <https://www.gov.uk/government/news/government-secures-landmark-deal-for-uk-mobile-phone-users>

²⁰ See 2015 Statement, paragraphs 4.110 and 4.111.

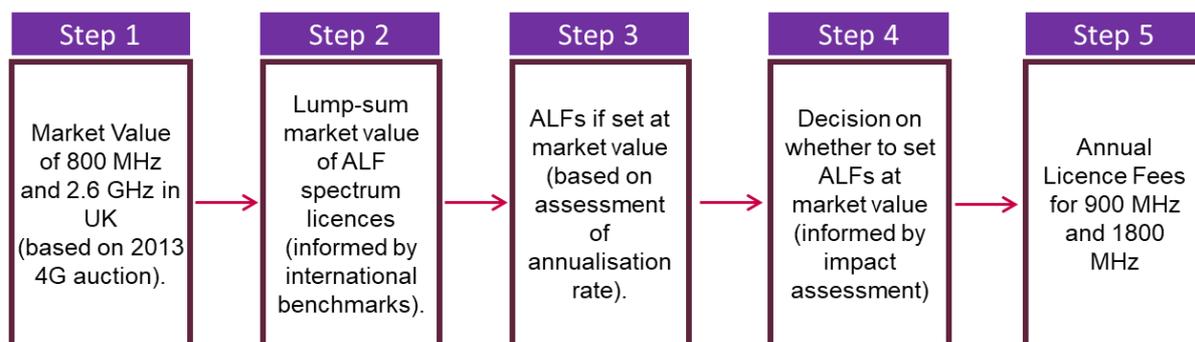
to secure the optimal use of spectrum, adopting a conservative approach to the interpretation of this evidence.²¹

- e) To convert the lump-sum values into an equivalent annual payment, we applied an annualisation rate, derived from a post-tax discount rate (which took into account the degree of risk-sharing between licensees and the Government) and a tax adjustment factor (reflecting the more favourable tax treatment of annual fees compared to lump-sum auction payments).

3.21 We have updated our 2015 assessment, particularly in light of auctions in other European countries which have taken place since September 2015, and changes which affect the discount rate and tax adjustment factor.

3.22 The framework we have adopted for deriving an appropriate level of ALF is illustrated in Figure 3.1. This framework broadly follows that in our 2015 Statement, except that it includes a further assessment of our duties in Step 4.²²

Figure 3.1: Framework for setting the appropriate ALFs



Source: Ofcom

3.23 Section 4 of this document sets out our assessment of market value for 900MHz and 1800MHz spectrum and corresponding annual amounts. Section 5 sets out our assessment of the impact of setting ALFs at that level in light of our statutory duties. Section 6 sets out our final conclusions on ALFs.

²¹ See paragraph 1.38(a) of our 2015 Statement, in which we noted the asymmetry of risk as between the effects on spectrum efficiency from inadvertently setting ALFs either above or below market value, given the uncertainty about the correct estimates for market value.

²² As we have previously reached a view that the Coverage Obligation does not have an impact on the market value of 900MHz and 1800MHz spectrum, we have not presented this as a separate step in Figure 3.1. We consider the arguments made by the MNOs in relation to the Coverage Obligation in our assessment at Step 4 (which is discussed in Section 5 of this document).

4. Market value

- 4.1 In this section we set out our approach to establishing the market values of the 900 MHz and 1800 MHz spectrum and the equivalent annual licence fees (steps 1 to 3 of our framework of steps set out in Figure 3.1 above). The detailed evidence and analysis on which we rely is set out in a number of annexes which also form part of this statement, and to which we cross-refer as appropriate in this section.
- 4.2 We define market value for this purpose as the market-clearing price in a well-functioning market, or the forward-looking marginal opportunity cost of the spectrum, and we use the terms "full market value", "market value" and "marginal opportunity cost" interchangeably in this document.²³

Step 1: UK Market Values of 800 MHz and 2.6 GHz spectrum

June 2018 consultation position

Overview of methods

- 4.3 In the June 2018 consultation, we set out how, as in the 2015 Statement, we derive the market value of each of the 800 MHz and 2.6 GHz bands through analysis of a range of methods to assess the evidence from the UK 4G auction:²⁴
- a) Prices in the 4G auction, which were determined as the higher of (i) reserve prices and (ii) the incremental bid value²⁵ of the bidder's highest losing bids for additional spectrum compared to that bidder's winning package.
 - b) Opportunity cost in the 4G auction, which is the incremental bid value for additional spectrum in the highest losing bids compared to the winning packages of the bidders submitting these highest losing bids (i.e. unlike the actual prices in the auction, they are not influenced by reserve prices).
 - c) Linear Reference Prices (LRPs), which estimate the linear prices that were closest to market-clearing prices (by a linear price we mean the same price per MHz in a given band, such as 800 MHz; to all operators and for all block sizes); and

²³ In some contexts, it is possible that the market clearing price could differ from the marginal opportunity cost to another user for the unit of spectrum being priced. For example, as set out in our consultation on ALFs for UKB's 3.4 GHz and 3.6 GHz spectrum, in that case, we have clear evidence of a difference between the market clearing price in the 3.4 GHz auction and the marginal opportunity cost to another user for the spectrum being priced (in that case H3G's UKB 3.4 GHz spectrum). See section 3 of *Annual Licence Fees for UK Broadband's 3.4 GHz and 3.6 GHz spectrum*, Ofcom, December 2018 <https://www.ofcom.org.uk/consultations-and-statements/category-2/annual-licence-fees-3.4-ghz-3.6-ghz-spectrum>. We do not have clear evidence that this issue arises in the case of 900 MHz and 1800 MHz spectrum.

²⁴ For the detail underlying the analysis summarised here, see our 2015 Statement, section 2 and annex 6.

²⁵ i.e. the bidder's difference in bid value between two different packages for a specified increment of spectrum.

d) Marginal bidder analysis to analyse opportunity cost by assessing the bids of the highest losing bidder for additional spectrum.

4.4 We derive candidate value(s) from the opportunity costs in the auction, which we compare against the LRPs, and we use the marginal bidder analysis either as a cross-check (in the case of 800 MHz) or to select the market value figure from within the range of candidate values (in the case of 2.6 GHz). The differences in the detail of our analytical steps for the 800 MHz and 2.6 GHz bands reflect differences in the circumstances, notably the absence for the 2.6 GHz band of most of the complicating factors that arise in the analysis of the 800 MHz band.²⁶

Market value of the 800 MHz band for the purpose of ALF

4.5 In our 2015 Statement we derived measures of market value for the 800 MHz and 2.6 GHz bands using the methods described above. Based on that analysis, we concluded that an appropriate market value of the 800 MHz band for the purpose of ALF was £30m per MHz (in March 2013 prices). We explained our view that this would be more likely to understate market value than overstate it.²⁷

4.6 This market value figure for the 800 MHz spectrum was expressed net of expected DTT co-existence costs, reflecting the observed bids in the 4G auction for 800 MHz spectrum. The corresponding value gross of expected DTT co-existence costs was £33m per MHz.²⁸

4.7 The equivalent April 2018 prices, updated for CPI inflation in the five years since the 4G auction, are:

- a) £32.2m per MHz net of expected DTT co-existence costs;
- b) £35.5m per MHz gross of expected DTT co-existence costs.

Market value of the 2.6 GHz band for the purpose of ALF

4.8 Applying the same methodology to the 2.6 GHz band results in somewhat more closely-grouped prices from the different methods. In March 2013 prices:

- a) 4G auction prices ranged from £3.8m per MHz to £5.7m per MHz.
- b) Our estimates of the opportunity cost in the 4G auction ranged from £5.1m per MHz to £5.7m per MHz.
- c) Our LRP estimates were £4.99m with the revenue constraint, £5.7m per MHz without the revenue constraint and £5.5m avoiding excess supply.

²⁶ As set out in paragraphs 2.16 – 2.22 of our 2015 Statement, these complicating factors included the effect on the auction prices for 800 MHz spectrum of reserve prices set by Ofcom; changes in circumstances since the 4G auction; differences in circumstances between the 4G auctions and the 900 MHz and 1800 MHz bands; the relevant marginal increment of spectrum; and the (at that time) proposed mergers between participants in the 4G auctions.

²⁷ 2015 Statement, paragraph 2.58.

²⁸ 2015 Statement, paragraph 2.203 and Annex 6, Table A6.37.

d) Our conservative estimate based on marginal bidder analysis was £5.5m per MHz.

4.9 Based on that analysis, we concluded in our 2015 Statement that an appropriate market value of the 2.6 GHz band for the purpose of ALF was £5.5m per MHz.²⁹ We also explained our view that this would be more likely to understate market value than overstate it.³⁰

4.10 The equivalent in April 2018 price terms is £5.9m per MHz.

Consultation position

4.11 The UK 4G auction concluded in March 2013. Based on a conservative interpretation of bids in that auction, we reached a conclusion on forward-looking market values in September 2015.

4.12 In our June 2018 consultation, our view was that:

- a) market developments did not provide clear evidence that the real value of either 800 MHz or 2.6 GHz had changed since 2013;
- b) recent European mobile spectrum awards of 800 MHz and 2.6 GHz bands did not provide a reason to revise our estimates of the UK values of 800 MHz or 2.6 GHz;³¹
- c) the auction price of the 2.3 GHz band in the April 2018 UK PSSR auction was broadly similar to the market value for 2.6 GHz in our 2015 Statement;³² and
- d) the UK 4G auction remains the best available evidence on the current market value of 800 MHz and 2.6 GHz in the UK for the purpose of ALFs, and that the lump sum values (in April 2018 prices) of £32.2m per MHz for 800 MHz, or £35.5m per MHz gross of expected DTT co-existence costs, and £5.9m per MHz for 2.6 GHz spectrum were the appropriate estimates of the lump-sum market value of these bands based on the sums bid in the auction.

Responses to consultation

4.13 Vodafone noted that the methodology for deriving the market value of 800 MHz and 2.6 GHz spectrum was the subject of a large number of submissions in the process leading up to the 2015 Statement. While it did not propose to re-open this debate it did note that the fact there was significant discussion, with different methods producing a relatively wide range of values for 800 MHz spectrum, reinforces the fact that there is some uncertainty over the appropriate value of 800 MHz spectrum, and that regulatory judgements need to be made before a value can be determined.³³

²⁹ 2015 Statement, paragraph 2.207(e)

³⁰ 2015 Statement, paragraph 2.228

³¹ We identified two awards of 800 MHz and 2.6 GHz spectrum, in Cyprus and Poland. In Cyprus (2016), band-specific prices were not obtainable as prices were for packages including spectrum from both bands. In Poland (2015), the price of 800 MHz spectrum was £144m per MHz in UK equivalent terms, several times higher than our UK estimate, while the 2.6 GHz price was £3.7m per MHz.

³² The lump-sum auction price of 2.3 GHz was £5.1474m per MHz compared to our estimate of £5.9m per MHz for 2.6 GHz. Both prices in April 2018 prices.

³³ Vodafone response to June 2018 consultation, page 19.

- 4.14 No other respondent commented on the methodology for deriving the market value of UK 800 MHz and 2.6 GHz, based on bids in the 4G auction.
- 4.15 BT and Three criticised our approach of increasing our estimates of the UK market value of 800 MHz and 2.6 GHz from 2013 values (from the 2015 Statement) to 2018 values by inflation, in other words, our assumption that the market value of this spectrum had remained constant in real terms. They said there is no evidence that the nominal value of 800 MHz and 2.6 GHz UK spectrum had increased in line with general inflation. BT noted that its financial statements show no change in nominal spectrum values arising from inflation.³⁴

Our assessment

- 4.16 We agree with Vodafone that determining the UK market value of 800 MHz and 2.6 GHz spectrum involves regulatory judgement. We remain of the view that the approach set out in our June 2018 consultation (summarised above), consistent with the approach taken in the 2015 Statement, is the appropriate way to estimate the UK market value of 800 MHz and 2.6 GHz using the information from the 4G auction in 2013.
- 4.17 We remain of the view that 800 MHz and 2.6 GHz lump-sum values should be maintained constant in real terms (i.e. increase in line with inflation). First, we note that mobile revenues have been broadly flat in real terms, although there was a small decline from 2013 to 2014 (see Figure A3.3 for more details). Second, MNO profits are likely to be a better indicator of value for mobile spectrum licences than revenue and, as shown in section 5, real EBITDA for the 4 MNOs was at least as high in 2017 as in 2013.³⁵ Third, all four MNOs use a measure of inflation to increase contract prices each year and do so by reference to RPI³⁶, which has exceeded CPI in each year over the period 2013 to 2018.³⁷
- 4.18 We recognise that stakeholders have argued that the *real* value of spectrum has fallen over time. We have assessed the impact of technical and commercial developments on real spectrum values in Annex 3. Where we consider that specific developments since 2015 may have affected the market value of spectrum, we have taken account of them in our overall interpretation of the benchmarking evidence below. We consider this approach is more appropriate than holding values constant in 2013 nominal terms, which would constitute a largely arbitrary real terms adjustment that is unlikely accurately to reflect the

³⁴ BT response to June 2018 consultation, page 13. Three response to June 2018 consultation, page 23.

³⁵ Section 5, Figure 5.1. EBITDA was £5.16bn in 2013 and £5.19bn in 2017 (both in April 2018 prices).

³⁶ For 2018 price increases see: EE <https://ee.co.uk/help/add-ons-benefits-and-plans/price-plans-and-costs/ee-price-plans/pricechanges> (Page accessed 26 November 2018); O2 <https://www.o2.co.uk/prices> (Page accessed 26 November 2018); Three [http://support.three.co.uk/SRVS/CGI-BIN/WEBISAPI.DLL?Command=New,Kb=Mobile,Ts=Mobile,T=Article,varset_cat=billing,varset_subcat=3770,Case=obj\(15395\)](http://support.three.co.uk/SRVS/CGI-BIN/WEBISAPI.DLL?Command=New,Kb=Mobile,Ts=Mobile,T=Article,varset_cat=billing,varset_subcat=3770,Case=obj(15395)) (Page accessed 26 November 2018); Vodafone <https://www.vodafone.co.uk/explore/costs/rpi/> (Page accessed 26 November).

³⁷ The RPI increased by 12.1% over the period from April 2013 to April 2018 whereas the CPI increased by 7.2% over the same period.

magnitude of market developments. It is also consistent with the approach taken to technical and commercial evidence in our 2015 Statement.³⁸

- 4.19 As such, we continue to adjust 800 MHz and 2.6 GHz values by CPI inflation for the purposes of deriving lump sum values. The UK market values of the 800 MHz and 2.6 GHz bands (in April 2018 prices) are therefore: £35.5m per MHz for 800 MHz³⁹ and £5.9m per MHz for 2.6 GHz.

Step 2: Benchmarks for 900 MHz and 1800 MHz

June 2018 consultation position

Proposed approach

- 4.20 In our June 2018 consultation we set out how, as in our 2015 Statement, we identified spectrum awards in European countries since 2010, which included one or more of the 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz bands. Where possible, we have used prices from these awards to derive UK-equivalent absolute value benchmarks by band⁴⁰ and relative values between bands in the benchmark countries. We have combined these relative values with our estimates of the UK market value of 800 MHz and 2.6 GHz, to derive a set of relative value benchmarks for the value of 900 and 1800 MHz spectrum in the UK.
- 4.21 Several country-specific factors have the potential to affect auction prices in comparator countries relative to the UK. Licence holders previously argued that, for this reason, absolute auction prices may not provide reliable indicators of the value of spectrum in the UK. Some country-specific factors, such as general price levels, will be reflected in the estimates which we have used to derive absolute benchmarks. However, other differences in auction values are more difficult to address in a robust way – for example the good propagation characteristics of lower-frequency bands may be more or less important depending on the level of urbanisation and population density in a country. In general, we expected that relative values are less likely to be affected by country-specific factors than absolute values.⁴¹
- 4.22 For the 900 MHz band, we focused on the relative value of 900 MHz to 800 MHz licences in countries where both bands have been auctioned. We considered this is likely to be the most informative benchmark evidence for the value of 900 MHz in the UK, particularly in light of the similar underlying technical characteristics of these two bands.⁴²
- 4.23 For the 1800 MHz band, we adopted what is referred to as “the distance method”, proposed by Analysys Mason and Aetha (in a report for EE and H3G) as our preferred method for deriving benchmark values of 1800 MHz spectrum. Benchmark values of 1800

³⁸ See Annex 9 of the 2015 Statement, particularly A9.33 and A9.34.

³⁹ This is gross of DTT co-existence costs. The corresponding market value net of DTT co-existence cost is £32.2m per MHz.

⁴⁰ These prices include adjustments to reflect differences from the UK 4G auction licences such as annual spectrum fees, licence duration, delayed availability of spectrum, currency and population.

⁴¹ See August 2014 consultation, paragraph A7.37 to A7.41.

⁴² See August 2014 consultation, paragraph 3.23 and 2015 Statement, paragraph 3.47.

MHz generated by the distance method reflect the UK auction values of both 800 MHz and 2.6 GHz spectrum. We considered that, in principle, this is an advantage over the paired ratios of 1800 MHz to 800 MHz and 1800 MHz to 2.6 GHz spectrum. The distance method consists of:

- a) calculating the Y/X ratio (calculated as the difference in value between 1800 MHz and 2.6 GHz (“Y”), divided by the difference in value between 800 MHz and 2.6 GHz (“X”), which is referred to as the “Y/X ratio” and expressed as a percentage); and
- b) relating this to the corresponding 800 MHz and 2.6 GHz values in the UK to solve for the UK value of 1800 MHz.⁴³

4.24 We focused on these relative value benchmarks as evidence for the market value for 900 MHz and 1800 MHz spectrum, and used absolute value benchmarks as a cross-check on our findings.

4.25 We categorised the available relative value benchmarks into three tiers, which reflect how informative of UK market values we considered them to be, with Tier 1 most informative and Tier 3 least.

4.26 In addition to our assessment of which tier a benchmark is in, we assessed whether there was a risk that each benchmark was an understated or overstated estimate of the UK value of the relevant band.

Assessment of lump-sum values

4.27 In our June 2018 consultation we considered that the approach to deriving ALFs by reference to market value used in the 2015 Statement remained appropriate. This involved:

- a) reaching a view of the lump-sum value of 900 MHz and 1800 MHz spectrum by considering the international relative value benchmarks in the round; and
- b) applying the following cross-checks:
 - i) Absolute-value benchmarks.
 - ii) Within-country ratios of the value of 1800 MHz to 900 MHz.
 - iii) Averages of benchmarks in Tier 1, and across Tiers 1 and 2.

4.28 The first of these steps, at (a) above, involved using our judgement as to how most appropriately to assess the available benchmarks, rather than relying mechanistically on summary statistics such as simple or weighted averages. In using our judgement, we adopted a conservative approach to interpreting the evidence, as we previously did in our 2015 Statement.⁴⁴

⁴³ Further details on these calculations are set out in Annex 1.

⁴⁴ See 2015 Statement, paragraphs 1.38 to 1.43.

Consultation position

- 4.29 In addition to the auctions considered in our 2015 Statement, in our June 2018 consultation we considered some additional relevant European auctions that had taken place since the publication of our 2015 Statement, in particular the:
- a) Norwegian 1800 MHz auction in January 2016;
 - b) Danish 1800 MHz auction in September 2016; and
 - c) Norwegian 900 MHz auction in May 2017.
- 4.30 **For 900 MHz** we did not identify any new or revised 900 MHz / 800 MHz ratio benchmarks and did not revise our view of the forward-looking value of the 900 MHz band or the 800 MHz band in the UK.⁴⁵ We considered that the evidence and analysis in our 2015 Statement remained relevant and we did not identify any reason to change our interpretation of the benchmarks (i.e. their appropriate tier, and risk of understatement or overstatement) or of the appropriate lump-sum values based on an in-the-round assessment of these benchmarks. We did not consider that our cross checks provided a basis to revise this estimate. We therefore considered that the lump-sum value we derived in our 2015 Statement remained the appropriate market value for 900 MHz spectrum (after updating for inflation since 2013).⁴⁶ Accordingly, we considered that an appropriate lump-sum value for 900 MHz spectrum if set at market value was £19m per MHz (in April 2018 prices).
- 4.31 **For 1800 MHz** we were able to derive a distance method benchmark of the value of 1800 MHz spectrum from auctions in Denmark, and our view was that it was a Tier 1 benchmark, with a risk of either understatement or overstatement.⁴⁷ Considering this additional benchmark alongside the existing evidence from our 2015 Statement, we considered that a value of £15m per MHz (in April 2018 prices) was appropriate.⁴⁸ We did not consider that our cross-checks provided a basis to revise this estimate.
- 4.32 On balance, we did not consider that recent technological or commercial developments provided clear evidence as to whether the forward-looking value of 900 MHz or 1800 MHz spectrum was higher or lower than in our 2015 assessment.

Responses to consultation

- 4.33 All MNOs argued that the real value of 900 MHz and 1800 MHz spectrum had declined since 2015, due to technical and commercial developments.

⁴⁵ We were not able to derive a relative value benchmark for Norway as we did not have data on the price of the 800 MHz band.

⁴⁶ In our 2015 Statement we expressed values in March 2013 prices.

⁴⁷ We were not able to derive a relative value benchmark for Norway as we did not have data on the price of the 800 MHz or 2.6 GHz bands.

⁴⁸ By comparison, uprating the 1800 MHz lump sum value from the 2015 Statement value for inflation would lead to a value of £14m per MHz in April 2018 prices.

- 4.34 BT agreed in principle that the distance method remained a valid approach to estimating the UK 1800 MHz lump sum value. However, it considered that the limitations of the method needed to be more fully considered, particularly as some of the auction data is up to 8 years old and, in BT's view, technological developments would have affected the relative value of bands on a forward-looking basis.⁴⁹
- 4.35 BT also criticised our interpretation of the benchmark data and argued that, under our proposed approach, Tier 2 and 3 benchmarks "*have no impact whatsoever on Ofcom's proposed valuation of 1800 MHz spectrum*". It proposed an alternative approach to deriving the lump sum value that took the weighted average of the midpoints of the average and lowest value of each Tier, with Tier 1 having a weight of 2; Tier 2 having a weight of 1; and Tier 3 having a weight of 0.5. In BT's view, this would lead to a lump sum value of 1800 MHz spectrum in the range of £8m-£12m per MHz.⁵⁰
- 4.36 Vodafone argued that, given the change in our approach to setting ALFs to take explicit account of our duties, it was reasonable to re-examine the appropriateness of the final step, where we determine a single point estimate of the ratio, to estimate market value.
- 4.37 Vodafone noted the high degree of variability in 900/800 MHz ratios in the Tier 1 countries and argued that there was no reason to assume the value for the UK was more likely to be in the middle of the range than other countries.
- 4.38 Vodafone argued that we had not explicitly taken account of the uncertainty underlying this point estimate, nor the implications of our wider duties. It considered that it was incumbent upon us to take a conservative approach in choosing a lump sum value.⁵¹
- 4.39 BT and Telefónica highlighted other relevant auctions that we had not included in our analysis⁵², namely:
- a) The Czech Republic 1800 MHz and 2.6 GHz auction in June 2016;
 - b) the Swedish 1800 MHz auction in October 2016;
 - c) the Greek 1800 MHz auction in November 2017; and
 - d) the Turkish multi-band auction in August 2015.
- 4.40 We evaluate the information on market value from these auctions in Annex 2.
- 4.41 Respondents also made comments on the Danish and Norwegian auctions discussed in our June 2018 consultation, as well as the Austrian, German and Swedish auctions covered in our 2015 Statement. We also discuss these in Annex 2.

⁴⁹ BT response to June 2018 consultation, page 15.

⁵⁰ BT response to June 2018 consultation, pages 20-26.

⁵¹ Vodafone response to June 2018 consultation, pages 28-29.

⁵² BT response to June 2018 consultation, pages 17-19. Telefónica response to June 2018 consultation, page 21.

Our assessment

Relative value benchmarks

- 4.42 In our June 2018 consultation, we derived the following specific relative value benchmarks for:
- a) 900 MHz:⁵³
 - i) three Tier 1 benchmarks - Austria (2013), Germany (2015) and Ireland (2012);
 - ii) two Tier 2 benchmarks - Portugal (2011) and Spain (2011); and
 - iii) three Tier 3 benchmarks -Denmark (2010), Greece (2011) and Romania (2012).
 - b) 1800 MHz:⁵⁴
 - i) six Tier 1 benchmarks - Austria (2013), Denmark (2016), Germany (2015), Ireland (2012), Italy (2011) and Sweden (2011);
 - ii) one Tier 2 benchmark - Germany (2010); and
 - iii) five Tier 3 benchmarks -the Czech Republic (2013), Greece (2011), Portugal (2011), Romania (2012) and the Slovak Republic (2013).
- 4.43 As explained in Annex 2, we have considered auctions in the Czech Republic, Greece, Sweden and Turkey; which were raised by stakeholders. Furthermore, we have also considered results from the 2013 and 2015 auctions in Croatia. From this we have derived the following additional relative benchmarks for 1800 MHz⁵⁵, noting that no new relative value benchmarks for 900 MHz were identified:
- a) one Tier 1 benchmark - Czech Republic (2016); and
 - b) three Tier 3 benchmarks - Croatia (2015), Greece (2017) and Sweden (2016).
- 4.44 We continue to focus on relative value benchmarks as evidence for the market value for 900 MHz and 1800 MHz spectrum, and use absolute value benchmarks as a cross-check on our findings.
- 4.45 We have refreshed the input data used for all our international benchmarks and, in light of Telefónica's response, we have amended the way we adjust for inflation in the relative benchmarks when auctions occur in different years. We discuss these changes and their impact on the benchmarks in more detail in Annex 1.

⁵³ The year in brackets after each auction is the year of the 900 MHz auction. In some cases, the 800 MHz auction that is used to derive the 900 MHz relative value benchmark takes place in a different year. Table A2.1 in Annex 2 sets out the dates of each auction used in deriving the 900 MHz relative value benchmarks.

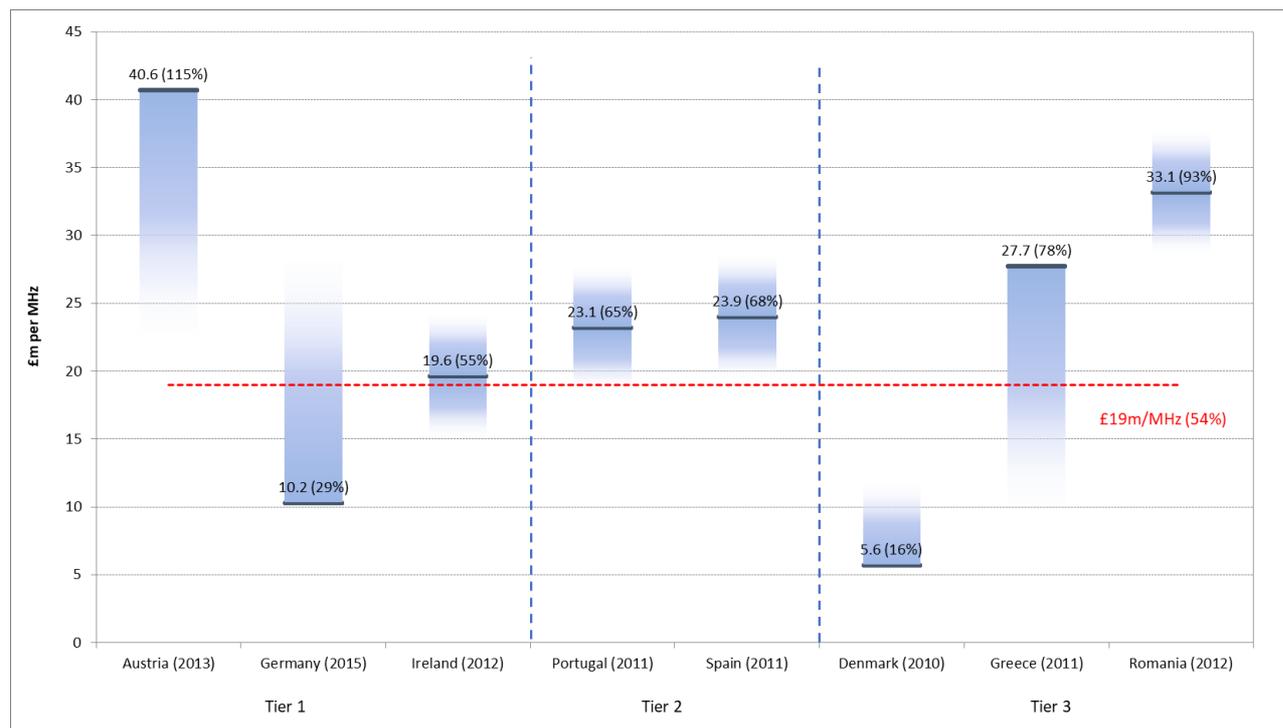
⁵⁴ The year in brackets after each auction is the year of the 1800 MHz auction. In some cases, the 800 MHz and 2.6 GHz auctions that are used to derive the 1800 MHz relative value benchmark take place in different years. Table A2.2 in Annex 2 sets out the dates of each auction used in deriving the 1800 MHz relative value benchmarks.

⁵⁵ We have not included an additional benchmark for Turkey for the reasons set out in Annex 2.

900 MHz

4.46 The relative value benchmarks for 900 MHz are shown in Figure 4.1, grouped by tier. The shaded areas illustrate our assessment of the likelihood or scale of possible understatement or overstatement associated with each benchmark.⁵⁶ Percentages in brackets represent the 900 MHz / 800 MHz ratio.⁵⁷ The dashed horizontal line in the figure shows our estimate of the lump-sum value of 900 MHz spectrum in the UK, the derivation of which is discussed below.⁵⁸

Figure 4.1: 900 MHz paired ratio benchmarks in £m per MHz



Source: Ofcom

⁵⁶ The length of these shaded areas reflects a combination of the likelihood and scale of potential understatement or overstatement (with a larger risk of a larger understatement or overstatement being represented by a longer shaded area, although the resulting length of the shaded areas is not drawn to a specific scale and so is only illustrative). This follows our approach on the risk of potential understatement or overstatement in the 2015 Statement which we still consider to be relevant. See 2015 Statement, Annex 7, paragraphs A7.146 – A7.186.

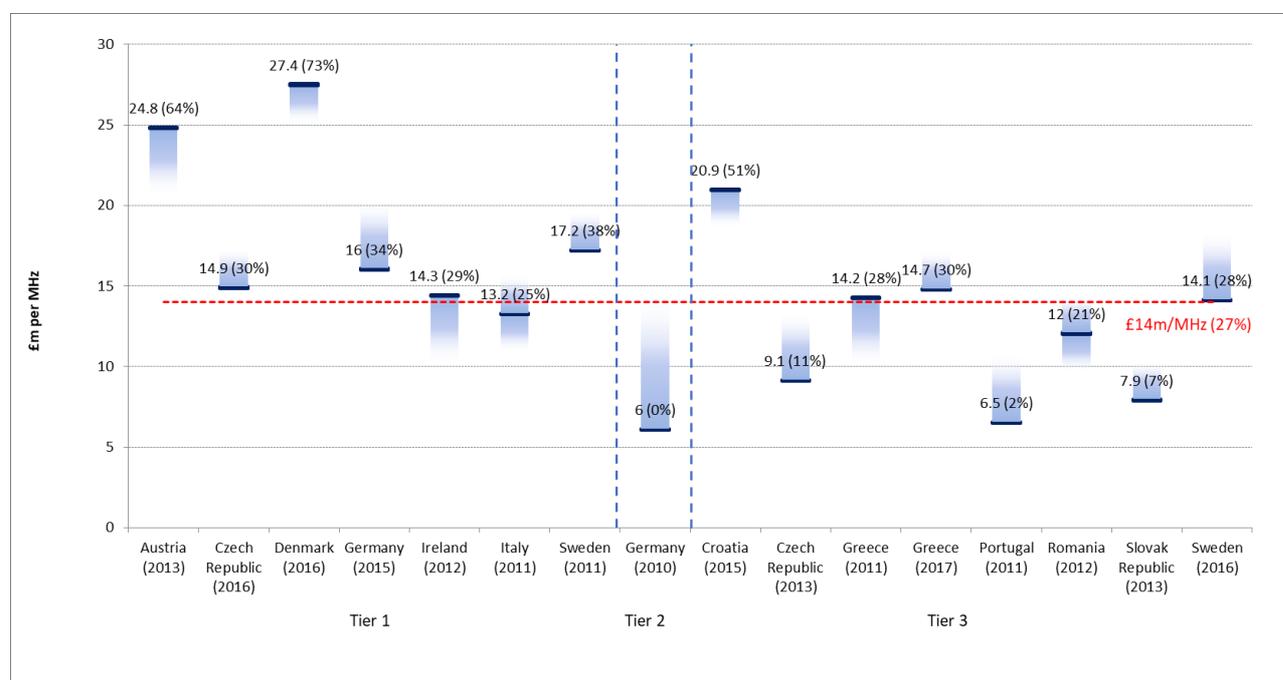
⁵⁷ In deriving the relative value benchmarks, we use different UK 800 MHz values to reflect whether the benchmark country 800 MHz spectrum was gross or net of expected DTT co-existence costs and with or without coverage obligations. So that the ratios in Figures 4.1 and 4.2 are directly comparable between countries, all the ratios in the figures are expressed relative to the UK value of 800 MHz that is gross of expected DTT co-existence costs and without coverage obligation (£35.5m per MHz). This means that, for the countries for which we use a different UK 800 MHz value (for example, the value of 800 MHz that is net of expected DTT co-existence costs and with a coverage obligation), the ratio shown in Figures 4.1 and 4.2 are different from the ratio used to generate the relative value benchmark shown in £m in Figure 4.1 and 4.2.

⁵⁸ There are some differences in the benchmark values for some countries compared to the figures presented in our June 2018 consultation. This is due to the refreshed input data and the change to how we adjust for inflation when auctions occur in different years. See Annex 1 for more detail.

1800 MHz

- 4.47 As explained in paragraph 4.43 above, we have derived additional distance method benchmarks for the value of 1800 MHz spectrum from auctions in the Czech Republic, Croatia, Greece and Sweden.
- 4.48 The 1800 MHz distance method benchmarks are shown in Figure 4.2, grouped by tier. Percentages in brackets represent the Y/X ratio (which, as described earlier, is the difference in 1800 MHz value and 2.6 GHz value relative to the difference in value between 800 MHz and 2.6 GHz value). The dashed horizontal line in Figure 4.2 shows our estimate of the lump-sum value of 1800 MHz spectrum in the UK, the derivation of which is discussed below.⁵⁹

Figure 4.2: 1800 MHz distance method benchmarks in £m per MHz



Source: Ofcom

Assessment of lump-sum values

- 4.49 We remain of the view that it is not appropriate to derive lump-sum values mechanistically, for example by using an average of benchmarks weighted by tier as proposed by BT. Such an approach does not take into account our assessment of the risk that particular benchmarks might understate or overstate the UK market value of the relevant spectrum. We also do not consider that the alternative suggested is more objective than the approach we have adopted – in particular, the resulting averages will be

⁵⁹ There are some differences in the benchmark values for some countries compared to the figures presented in our June 2018 consultation. This is due to the refreshed input data and the change to how we adjust for inflation when auctions occur in different years. See Annex 1 for more detail.

dependent on the choice of weighting ascribed to each tier, which itself is a subjective choice.

- 4.50 We also disagree with BT's characterisation of our approach in stating that Tier 2 and 3 benchmarks have no impact on our proposed lump-sum values. We consider first the evidence from Tier 1 countries and then consider whether the evidence from the Tier 2 and 3 countries provide a sufficient basis for making an adjustment to the lump sum value we derive from the Tier 1 benchmarks. For example, considering only Tier 1 countries for 1800 MHz and disregarding the Tier 2 and Tier 3 benchmarks could point to using a value above the £14m per MHz estimate that we identify later on in this section. (As explained below, the mid-point between the average and lowest Tier 1 value is over £15m per MHz in April 2018 prices).
- 4.51 We agree with Vodafone that there is a degree of variability in the 900/800 MHz ratios and we consider that this supports our approach of considering the evidence in the round in reaching our decision on the lump sum value. Given the aim is to set a specific value for the ALF, it is necessary for us to determine a point estimate for the market value in each band (i.e. a lump sum market value for 900 MHz spectrum and a lump sum market value for 1800 MHz spectrum). This requires us to exercise our regulatory judgement, in line with our statutory duties. As set out in paragraph 4.28 above, in using our judgement and in light of our statutory duties, we adopt a conservative approach to interpreting the evidence. We note that, as a result of this conservative approach, ALFs at market value would be lower than they might otherwise have been.
- 4.52 We continue to use the approach to considering lump sum market values proposed in our June 2018 consultation (and summarised in paragraphs 4.27 and 4.28 above).

Impact of technical and commercial developments

- 4.53 In our June 2018 consultation, we considered whether technological and commercial developments since our 2015 Statement could have an impact on forward-looking market values of 900 MHz and 1800 MHz spectrum. On balance, we considered that recent technological or commercial developments did not provide clear evidence as to whether market values are higher or lower than in our 2015 assessment.⁶⁰
- 4.54 All MNOs argued that technical and commercial developments point towards the real value of 900 MHz and 1800 MHz spectrum having declined since 2015.
- 4.55 We have further assessed the impact of technical and commercial developments on real spectrum values in Annex 3. Overall, there are few technological or commercial developments that would cause us to revise our estimate of market value based on the benchmarking analysis. The exception is that there is now greater certainty over the availability of potential substitute mobile spectrum, specifically in the 3.6-3.8 GHz band, compared with 2015. There have also been technological developments (massive MIMO and beamforming) which may have increased the effectiveness of spectrum above 3 GHz. Given this, we consider that this might serve to reduce the forward-looking market value of

⁶⁰ Paragraphs 4.36-4.41, June 2018 consultation.

1800 MHz spectrum relative to our 2015 assessment if taken in isolation (i.e. before considering the changes in market value benchmarks since the 2015 statement). We explain below how we have taken account of this in the context of the other evidence on market value in coming to a view on the most appropriate 1800 MHz estimate.

- 4.56 We consider that the potential impact on 900 MHz spectrum is unlikely to be significant, as 3.6-3.8 GHz spectrum is less likely to be a close substitute for this spectrum than for other mid-frequency bands.
- 4.57 For the reasons explained in Annex 3, we do not consider that other technical or commercial developments provide a firm basis on which to adjust our estimates of the market value of 900 MHz or 1800 MHz spectrum.

Estimate of market value in the UK

900 MHz

- 4.58 Since our June 2018 consultation, we have not revised our view of the forward-looking values of the 900 MHz band or the 800 MHz band in the UK.⁶¹ Nor have we identified any new 900 MHz / 800 MHz ratio benchmarks from European auctions. As set out in paragraphs 4.56 and 4.57 above, we do not consider it appropriate to make an adjustment to the forward-looking value of 900 MHz spectrum on the basis of technical or commercial developments.
- 4.59 Having reviewed the relevant evidence, which is discussed in detail in Annex 3, our view is that the estimate of lump sum value in our 2015 Statement (in real terms) continues to be relevant for the forward-looking value of 900 MHz spectrum.⁶² Therefore, we consider that, subject to cross-checks, **£19m per MHz** would be an appropriate lump-sum value of 900 MHz spectrum (in April 2018 prices).⁶³

1800 MHz

- 4.60 As explained in Annex 2, we now have seven Tier 1 1800 MHz benchmarks: Austria (2013), Czech Republic (2016), Denmark (2016), Germany (2015), Ireland (2012), Italy (2011) and Sweden (2011).

⁶¹ There are some differences in the benchmark values for some countries compared to the figures presented in our June 2018 consultation due to some changes in methodology. See Annex 1 for more detail.

⁶² While some of the precise lump sum values for individual country benchmarks may be slightly different from those in 2015 if adjusting only for inflation (which, as explained in Annex 1 is due to the revised approach to exchange rate conversions and discount rates in some cases), we consider that the evidence taken in the round is as it was in 2015. For example, Figure 4.1 above looks much like Figure 5.1 from the 2015 statement. The average of Tier 1 benchmarks is now £23.5m per MHz (the 2015 average, £21.8m in 2013 prices, is £23.4m in April 2018 prices) and the mid-point between the average and lowest Tier 1 values is £16.9m per MHz (the 2015 value was £15.6m in 2013 prices, £16.8m in April 2018 prices). The Tier 2 benchmarks (Spain and Portugal) remain close to one another and, by coincidence, close to the average of the Tier 1 benchmarks. One of the Tier 3 benchmarks (Denmark) remains well below the Tier 1 and Tier 2 estimates (and is at larger risk of understatement) and the other two Tier 3 benchmarks (Greece and Romania) are above all Tier 1 and 2 benchmarks except for the Austrian benchmark.

⁶³ This is based on taking the estimate of £18m per MHz (in March 2013 prices) in our 2015 Statement, adjusting for inflation to get £19.3m, and then rounding to the nearest £1m.

- 4.61 Among the Tier 1 benchmarks, the highest lump sum value (for Denmark) is more than twice as high as the lowest (for Italy). The Czech Republic, Germany, Ireland and Sweden are somewhat closer to Italy than to Denmark, while Austria is closer to Denmark.
- 4.62 The average of the Tier 1 benchmarks is £18.3m per MHz in April 2018 prices. This is very close to the average of the Tier 1 benchmarks in our June 2018 consultation (which was £18.5m per MHz). The inclusion of the Czech benchmark (which at £14.9m per MHz is below the June 2018 consultation average for Tier 1 benchmarks) and the downward revision to the Italian benchmark⁶⁴ (from £13.8m per MHz to £13.2m per MHz) has been partially offset by an upward revision to the Danish benchmark (from £24.8m per MHz to £27.4m per MHz) as a result of the change in methodology when dealing with auctions taking place in different years.⁶⁵
- 4.63 In light of our view that we should adopt a conservative approach to interpreting the evidence, and the risk of overstatement in three of the seven benchmarks, we consider that in looking at the Tier 1 benchmarks alone an appropriate estimate of UK market value would be between the average (£18.3m per MHz) and the lowest of these seven benchmarks (i.e. Italy at £13.2m per MHz). The midpoint between these two values is £15.7m per MHz.
- 4.64 In our June 2018 consultation, we considered that an estimate between the midpoint (of the average and lowest value) and the lowest value would be appropriate, and we proposed a lump sum estimate of £15m per MHz. We have considered whether, in assessing all the evidence in the round, this remains an appropriate estimate. From that assessment, we consider that it is appropriate to be more conservative in our interpretation of the Tier 1 benchmark evidence than in the June 2018 consultation, in which the inclusion of the Danish (2016) award prompted us to increase in real terms our proposed estimate of 1800 MHz from the 2015 Statement.⁶⁶ In light of (a) the downward revision of the Italian (2011) benchmark (the lowest Tier 1 benchmark);⁶⁷ (b) the re-classification of the risk associated with the Danish (2016) distance method benchmark from a risk of either understatement or overstatement to a risk of overstatement;⁶⁸ and (c) the greater certainty over the availability of potential substitute mobile spectrum in the 3.6-3.8 GHz band and the technological developments (massive MIMO and beamforming) which may have increased the effectiveness of spectrum above 3 GHz,⁶⁹ we consider that an estimate below £15m per MHz is appropriate.
- 4.65 We next consider the single benchmark in Tier 2, which is Germany 2010. The value of this Tier 2 benchmark is £6.0m. However, it is at larger risk of being a larger understatement. On balance, consistent with our view in our June 2018 consultation, we do not consider

⁶⁴ This is due to us previously not accounting for the delayed availability of the 800 MHz spectrum in Italy following the 2011 auction.

⁶⁵ This change was in response to a comment from Telefónica regarding our methodology for making inflation and exchange rate adjustments to auctions in different years. This is explained in Annex 1, paragraphs A1.20 to A1.28.

⁶⁶ See June 2018 consultation, paragraph 4.45, for our explanation of the impact of the Danish (2016) award.

⁶⁷ As explained in Annex 1, paragraph A1.41

⁶⁸ As explained in Annex 2, paragraphs A2.144 to A2.146

⁶⁹ As explained in Annex 3, paragraph A3.26 to A3.30 and A3.84(a)

this benchmark to be informative of the appropriate estimate of the value of 1800 MHz spectrum, particularly as we have a more recent Tier 1 benchmark from Germany.

- 4.66 Seven of the eight Tier 3 benchmarks are below £15m per MHz and the average of Tier 3 benchmarks is £12.4m per MHz. However, consistent with our approach in 2015 and in the consultation, we consider that Tier 3 benchmarks have relatively little informative value and we place considerably less weight on them.
- 4.67 Taking the evidence in the round, including consideration of a fuller set of information on market value benchmarks as well as technical and commercial developments since the 2015 statement, we consider that **£14m per MHz** (in April 2018 prices), is an appropriate estimate of the lump sum value for 1800 MHz spectrum, subject to the cross-checks summarised below and explained in more detail in Annex 4.

Cross-checks

- 4.68 Consistent with our 2015 statement and June 2018 consultation, we consider three sets of cross checks:
- a) Absolute UK-equivalent values of spectrum bands in relevant European auctions. Our view is that we would only modify the lump-sum value estimates derived from the (more reliable) relative values based on the evidence of the (less reliable) absolute values in exceptional circumstances (e.g. if the absolute values were tightly grouped and substantially different to our lump-sum value estimate for that band, having regard to the risk of understatement or overstatement of estimates).
 - b) The ratio of our estimates of 1800 MHz to 900 MHz lump-sum values in the UK to the corresponding ratio for benchmark countries where both bands were awarded.
 - c) The average of Tier 1 countries, and the average of Tier 1 and Tier 2 countries, within each band.
- 4.69 These cross-checks are set out in Annex 4. We do not consider that they provide a basis to revise our estimates of the lump sum value for 900 MHz or 1800 MHz spectrum obtained from the relative value benchmarks and consideration of technical and commercial developments.

Conclusion on lump-sum values

- 4.70 **For 900 MHz**, having considered stakeholders' responses to the June 2018 consultation, we consider that the evidence and analysis in our 2015 Statement remains relevant and we have not identified any reason to change our interpretation of the evidence from the benchmarks or of the appropriate lump-sum value based on our assessment of these benchmarks in-the-round. We do not consider that our cross checks provide a basis to revise this estimate. We therefore consider that the real terms value (i.e. after updating for inflation) for the lump-sum we derived in our 2015 Statement remains the appropriate value for the 900 MHz band at market value. Accordingly, we consider that the lump-sum value for 900 MHz spectrum should, for the purposes of setting ALFs, be **£19m per MHz**.

- 4.71 For 1800 MHz, as set out above, our revised view, based on our assessment of the relative value benchmarks in-the-round and recent technical and commercial developments, is that a value of £14m per MHz is appropriate. We do not consider that our cross checks provide a basis to revise this estimate. Accordingly, we consider that for the purpose of setting ALFs, the lump sum value of 1800 MHz spectrum should be **£14m per MHz**. This is the same value in real terms as we identified in the 2015 Statement.
- 4.72 In the following step in this section we convert these lump-sum values into annual values. In section 5, we consider whether setting ALFs that equate to these values would be appropriate in light of our statutory duties, before reaching our view on the appropriate level of ALFs.

Step 3: Annualisation

Introduction

- 4.73 This section sets out the approach that we have adopted to convert our estimate of the lump-sum value of the spectrum into annual values.
- 4.74 Annex 5 sets out in full our approach to annualisation, the evidential basis for it and how we have taken account of stakeholders' comments to our June 2018 consultation.

The annualisation rate

- 4.75 Consistent with the approach proposed in our June 2018 consultation (and as in the 2015 Statement), we convert the lump-sum values into an equivalent annual rate by spreading the lump-sum value of spectrum over 20 years, using an ALF profile that is flat in real terms (i.e. adjusted for inflation). We apply a post-tax real discount rate and a tax adjustment factor (to reflect the more favourable tax treatment of annual fees compared to a lump-sum payment). In order to allow for inflation, we use the CPI to adjust the base year ALF level each year when the licence fee comes due for payment.
- 4.76 This means the value of ALF in year t is derived from the lump sum value (LSV) in 2018, the annualisation rate and inflation as follows:⁷⁰
- $$ALF_t = LSV * \text{Annualisation rate} * \text{CPI inflation adjustment}$$
- 4.77 The annualisation rate used to convert the lump sum value is itself a function of the post-tax real discount rate and the adjustment for the tax advantages stemming from paying ALFs (as opposed to amortising a lump sum). In spreading the lump sum over a 20-year period, we use a discount rate at which the present value of the resulting payment stream of fees equals the lump-sum value if it had been paid today.
- 4.78 The discount rate depends on, among other things, the uncertainty associated with this future ALF payment stream. One significant uncertainty relates to changes in the market value of the spectrum over time. The discount rate which will leave licensees indifferent

⁷⁰ The formula for calculating this is set out in Annex 5, paragraph A5.3.

between paying ALFs and paying a lump-sum depends on the extent to which they (rather than the Government) are exposed to the effect of such changes in market value of spectrum over time and, therefore, it is an important consideration in determining the appropriate discount rate.

- 4.79 In our June 2018 consultation, consistent with our approach in the 2015 Statement, we considered that the appropriate discount rate would sit somewhere between a lower polar case of the cost of debt (as an approximation of the case where the licensee would bear the risk associated with the variation in the market value of the spectrum) and, as an upper polar case, the weighted average cost of capital (i.e. WACC, which is as an approximation of the case where the government would bear the full risk of variation in the market value of the spectrum).⁷¹ We use a risk-sharing adjustment to determine where between these two polar cases the appropriate discount rate would lie.
- 4.80 In light of stakeholders' responses, and our detailed analysis which is set out in Annex 5, we have decided to adopt the following approach to calculating the discount rate:
- a) As proposed in our June 2018 consultation, we use observed market debt rates on 10-year bonds as the starting point for estimating the discount rate in the lower polar case;
 - b) We then reduce our estimate of the market cost of debt to remove the estimated inflation risk premium in bond yields (as we proposed in our June 2018 consultation);
 - c) In light of further consideration of stakeholder responses (which is discussed in full at Annex 5), we now also reduce the market cost of debt to remove the estimated liquidity risk premium. There is some evidence that corporate bond yields include compensation for factors other than default risk, with liquidity risk often judged to be such a factor;
 - d) We have updated our estimate of the WACC for the upper polar case, based on our latest view of the cost of capital reflective of the operating risk of a UK MNO; and
 - e) We make an adjustment for the degree of risk sharing between licence holders and the government – which arises due to the possibility of future fee reviews that could increase or decrease the ALF payments. To reflect this risk, we allow for a 25% risk sharing adjustment between the lower polar case and the upper polar case to estimate the final discount rate.
- 4.81 As set out in Table 4.1 these changes reduce the annualisation rate compared to the values used in the 2015 Statement and the June 2018 consultation.

⁷¹ The WACC reflects the cost of capital weighted between the cost of debt and the cost of equity, where the weights are a function of, respectively, the proportion of debt to enterprise value and equity to enterprise value.

Table 4.1: Comparison of input values into the formula for calculating the base level of ALF in the 2015 Statement, June 2018 Consultation and 2018 Statement

	2015 Statement	June 2018 Consultation	2018 Statement
Length of period over which we spread the LSV for the purposes of calculating ALF (t*)	20 years	20 years	20 years
Real post-tax discount rate (r)	1.8%	1.5%	1.0%
Adjustment factor that reflects the tax advantages over lump-sum payments (TAF)	1.064	1.055	1.049
Annualisation rate ⁷²	6.27%	6.05%	5.75%

Source: Ofcom

Converting from a lump sum into an annual amount

4.82 As set out above, the annualisation rate is now 5.75%. Multiplying the lump sum values by the annualisation rate gives us the base levels of ALF if set at market value (expressed in April 2018 prices). Consistent with our approach in the 2015 Statement⁷³, and as proposed in the June 2018 consultation, we derive the base levels of ALF rounded to three decimal places in £m per MHz. The base levels of ALF are as follows, each of which would then increase in line with CPI inflation in subsequent years:

- a) 900 MHz: £1.093m per MHz; and
- b) 1800 MHz: £0.805m per MHz.

4.83 In the following section, we consider whether ALFs set at the values set out in paragraph 4.82 above are appropriate in light of our statutory duties.

⁷² The annualisation rate is calculated using the following formula, where r is the real post-tax discount rate and t* is the length of period over which we spread the lump sum value for the purposes of calculating ALF (i.e.20 years), and TAF is the tax adjustment factor. See Annex 5, paragraphs A5.140 to A5.142 for further details.

$$TAF * \left[\frac{r}{1 - (1+r)^{-t^*}} \right] * \left[\frac{1}{(1+r)} \right]$$

⁷³ Paragraph 7.3.

5. Further consideration of ALFs, in light of our statutory duties

Introduction

- 5.1 When we exercise our powers in relation to spectrum, and as explained in Section 2 above, a number of statutory duties are relevant. In particular:
- a) section 3(1) of the Communications Act sets out Ofcom's principal duty to further the interests of citizens and consumers in relevant markets;
 - b) by virtue of Ofcom's principal duty, Ofcom is required by section 3(2) of the Communications Act to secure the optimal use for wireless telegraphy of the electromagnetic spectrum. Section 3(4)(f) also requires Ofcom, in performing its duties, to have regard to the different needs and interests, so far as the use of the electromagnetic spectrum for wireless telegraphy is concerned, of all persons who may wish to make use of it; and
 - c) section 4(2) of the Communications Act provides that Ofcom must have regard to the six Community requirements, which give effect amongst other things to Article 8 of the Framework Directive. We consider the following (summarised) to be particularly relevant to our proposals for ALFs, namely the requirements:
 - i) to promote competition;
 - ii) to promote the interests of all persons who are citizens of the EU; and
 - iii) to take account of the desirability of our carrying out our functions in a way which so far as practicable does not favour one form of electronic communications or one means of making them available.
- 5.2 As described in Section 4 above, and taking account of these statutory duties, we have reached the view that the market value of 900 MHz spectrum is £19m per MHz, and the market value of 1800 MHz spectrum is £14 million. If ALFs were to be set at market value, this would equate to ALFs of £1.093m per MHz per annum for 900 MHz spectrum and £0.805m per MHz per annum for 1800 MHz spectrum.⁷⁴
- 5.3 As well as being consistent with the Direction, ALFs which reflect the market value of the spectrum are consistent with the policy approach to setting spectrum licence fees which we set out in the SRSP, which was itself designed to meet Ofcom's statutory duties when setting such fees.
- 5.4 In this section we consider whether setting ALFs at these rates is appropriate in light of our statutory duties.

⁷⁴ In April 2018 prices.

Structure of assessment

- 5.5 As in our June 2018 consultation, we explain our general policy (as set out in the SRSP) on why spectrum fees should be set by reference to market value. We then consider the specific effects of ALFs being set at market value on:
- a) securing the optimal use of spectrum;
 - b) consumers;
 - c) investment; and
 - d) competition.
- 5.6 Our revised assessments in respect of each of the above take account of stakeholder responses to our June 2018 consultation. We have also separately considered the implications of the 90% geographic voice Coverage Obligation as part of our overall assessment of the impact of ALFs at 900 MHz and 1800 MHz.⁷⁵

Our policy on setting spectrum fees by reference to market value

- 5.7 As explained in Section 3, we published the SRSP in December 2010 in order to give best effect to our statutory duties when setting spectrum licence fees.⁷⁶ This sets out our policy of setting licence fees by reference to the value of the spectrum (known as administered incentive pricing (AIP) fees), for spectrum that is expected to be in excess demand, and charging cost-based fees where AIP is not appropriate. The SRSP provides the policy framework for how we develop AIP fee proposals, as well as how and when we undertake pricing reviews.
- 5.8 In the SRSP we explained that:

“AIP acts as a proxy for market prices for scarce spectrum that has been assigned administratively...rather than auctioned. It promotes optimal use by ensuring that users face a signal of opportunity cost...imposed on society by their use and therefore take it into account in their business and investment decisions, just as they do for other resources that they employ, and so have incentives to use it efficiently in the provision of downstream services.”⁷⁷

“The rationale for AIP may be simply stated. If the price charged for any limited resource, whether it is energy, raw materials, land or spectrum, does not reflect its opportunity cost, there will be less incentive to use it efficiently, it will not be

⁷⁵ The geographic Coverage Obligation is a set of voluntary commitments agreed between the Government and the four MNOs in December 2014, under which each MNO agreed to reach 90% geographic voice coverage in the UK by the end of 2017. This commitment was given effect through a variation by consent of the MNOs' spectrum licences. However, the MNOs were able to meet the obligation using any frequencies or technologies available to them.

⁷⁶ 2010 statement on our Strategic Review of Spectrum Pricing, https://www.ofcom.org.uk/_data/assets/pdf_file/0024/42909/srsp-statement.pdf

⁷⁷ SRSP consultation, paragraph 1.12. https://www.ofcom.org.uk/_data/assets/pdf_file/0021/36804/srsp_condoc.pdf

available for alternative uses or other users that could produce additional value and society will be worse off. For example, faced with a choice between investing in more advanced equipment and using more spectrum businesses will naturally tend to choose the option with lower costs. If the cost of spectrum reflects its true opportunity cost, and the cost of equipment also reflects its true value (as would be expected in a well-functioning market for equipment) then business will make the trade-off between investment in spectrum and equipment in a way that maximises benefits generated from their use.”⁷⁸

5.9 In assessing the AIP principle on spectrum trading,⁷⁹ we further commented that:

“We also note that some commercial and public spectrum users may be less responsive to trading than to AIP... More generally, when strong pressures are put on managers to reduce or contain their operating budgets, but less importance is placed on realising untapped revenue sources such as might arise from selling spectrum, AIP can provide a more powerful incentive for licensees to use spectrum efficiently than the possibility of selling unwanted spectrum.”⁸⁰

5.10 In assessing the AIP principle in relation to wider policy objectives,⁸¹ we commented that:⁸²

“...subsidising one input such as spectrum creates the risk that investment choices will be distorted, such that the users provided with a subsidy will tend, over time, to retain more spectrum than they need, increasing the opportunity cost resulting from excluding other uses and users;

an input subsidy on its own does not guarantee that the input will be used, nor that the desired outputs will be delivered using it. Direct subsidies and/or regulations can be targeted at the desired outputs and so are normally more likely to be effective, and proportionate.”

5.11 As set out in the SRSP,⁸³ the purpose of AIP is to provide users with a sustained long-term signal of the value of the spectrum as indicated by its opportunity cost in the next highest use and, as a result, to give them incentives to use it in a way that maximises benefits for society over time. If the price charged for any limited resource does not reflect its opportunity cost, there will be less incentive to use it efficiently.

⁷⁸ SRSP statement, paragraph 3.34. https://www.ofcom.org.uk/data/assets/pdf_file/0024/42909/srsp-statement.pdf

⁷⁹ This principle was labelled as AIP principle 4 in the Executive Summary, but discussed as AIP principle 5 in the text, for consistency with the SRSP consultation, as explained in paragraph 1.10 of the SRSP statement.

⁸⁰ SRSP statement, paragraph 4.203. We also noted that Arqiva, BT and H3G agreed with this principle, with BT agreeing at least where market mechanisms are not well established and where competition considerations might provide a significant disincentive to trade. O2 and Vodafone disagreed, with O2 arguing that AIP and trading shared the same objective of efficient use of spectrum. SRSP statement, paragraphs 4.192 – 4.197.

⁸¹ AIP principle 5 in the Executive Summary but discussed as AIP principle 6 in the text.

⁸² SRSP statement, paragraph 4.214.

⁸³ SRSP statement, paragraphs 3.33-3.34.

5.12 We considered that in general terms, benefits to society will be maximised over time if spectrum is priced to reflect opportunity cost, and that AIP fees set in this way have an effect similar to the prices that would emerge in a well-functioning spectrum market.⁸⁴

5.13 The SRSP also set out our view⁸⁵ that

“In general, we do not believe that AIP is the appropriate regulatory tool to deal with competition concerns in downstream markets. Similarly, we think it is unlikely that AIP could introduce distortions to competition in downstream markets when it reflects the opportunity cost of spectrum.”

5.14 In considering this general policy in relation to setting ALFs we take the view that ALFs below market value effectively give licence holders a subsidy. This has the potential to distort economic incentives in terms of (among other things) pricing and investment decisions, for instance by causing prices to deviate from the true cost of supply, or by distorting efficient choices between spectrum-related investment and other investments (e.g. alternative network equipment). It also has the potential to distort competition, both between MNOs (because the MNOs’ spectrum holdings differ in scale and mix), as well as between MNOs and providers of competing services which do not hold 900 MHz or 1800 MHz spectrum. These distortionary outcomes would be harmful for consumers.

Approach to setting ALFs in this case in the context of our statutory duties

5.15 Before considering the specific effects of ALFs at market value on: securing the optimal use of spectrum; consumers; investment; and competition, we summarise and respond to the submissions made in response to our June 2018 consultation on our approach to setting ALFs in the context of our statutory duties.

Responses to consultation

5.16 In response to the 2018 Consultation, BT and Vodafone both argued that we failed to carry out an impact assessment sufficient to satisfy the requirements of section 7 of the Communications Act.

5.17 Separately, BT, Vodafone and Telefónica all argued that we had asked ourselves the wrong question when assessing the impact of our proposal.

- a) BT argued that Ofcom had only addressed *“the question of principle of whether ALFs set at such levels (i.e. market value) would breach Ofcom’s regulatory objectives”* and had failed to *“consider how ALFs set at the specific levels which correspond to Ofcom’s estimate of full market value would impact the regulatory objectives by first considering*

⁸⁴ SRSP statement, paragraph 3.41.

⁸⁵ SRSP statement, paragraph 4.68.

*its statutory duties with an open mind and then considering a full range of potential fee levels (including no fees) before making a final decision”.*⁸⁶

- b) Vodafone argued that “Ofcom asks itself the wrong question when applying its duties (e.g. asking whether its approach would have an ‘adverse impact’ on competition, not asking which approach would best achieve them)”.⁸⁷
- c) To similar effect, Telefónica argued based on the principle of proportionality that “(i)t is inadequate to ask whether setting fees at full market value “will have a positive impact in terms of [Ofcom’s] statutory duties’ (§6.1) without considering whether the same or greater impact could be achieved by setting fees at below market value”.⁸⁸

Our assessment

- 5.18 We disagree with Vodafone and BT that we failed to carry out an impact assessment sufficient to satisfy the requirements of section 7 of the Communications Act. Section 5 of the 2018 Consultation contained our detailed reasoning on whether it would be appropriate in the light of our statutory duties to set ALFs at a discount from market value. We consider that the analysis of impacts comprised in the 2018 Consultation was an impact assessment for the purposes of section 7 of the 2003 Act.
- 5.19 We consider each of the submissions summarised at paragraph 5.18 above in turn:
- a) we do not think it would be appropriate or helpful for us to consider a “*full range of potential fee levels*”, as BT has suggested, before making a final decision in this case. We note, in particular, that BT’s suggested approach effectively ignores the existence of the Direction. Given the existence of the 2010 Direction and the SRSP, we think it is appropriate to take as our starting point the market value of the spectrum. Further, we have been able to consider the extent to which fees set below market value would meet our statutory duties without any need to identify specific fee levels below market value. We do not think our consideration of this issue would be improved if we were to seek to identify and consider such, potentially arbitrary, fee levels.
 - b) we disagree with Vodafone’s view that we have asked ourselves the wrong question when asking whether our approach could have an adverse impact on competition. When assessing whether to set ALFs corresponding to market value, we have had regard to the requirement to promote competition and have explained below why we consider that setting ALFs corresponding to market value in this case is consistent with promoting competition. As part of that assessment, we think it is appropriate to reach a view on whether ALFs at that level could have an adverse impact on competition. We note, in this regard, that Article 8 of the Framework Directive refers explicitly to promoting competition by “*inter alia... (b) ensuring that there is no distortion or restriction of competition in the electronic communications sector*”.

⁸⁶ BT response to June 2018 consultation, pp.6-7.

⁸⁷ Vodafone response to June 2018 consultation, page 2.

⁸⁸ Telefónica response to June 2018 consultation, page 9.

- c) we agree with Telefónica that, in addition to asking whether fees corresponding to market value are consistent with our statutory duties, we must also consider whether fees set at below market value would have the same or a greater impact with respect to our statutory duties. However, we are satisfied that fees set below market value in this case would be less likely to achieve our objective of securing the optimal use of 900 and 1800 MHz spectrum. The SRSP explains why, in principle, if the price charged for any limited resource is set below market value, there will be less incentive to use it efficiently, it will not be available for alternative uses or other users that could produce additional value and, as a result, society will be worse off. We discuss this in more detail later in this section. The SRSP acknowledges that there may be circumstances where the efficient use of spectrum may not be optimal, for example, where it is at a significant cost to a particular group of citizens for which we have regard (such as those on low incomes). However, we have not identified any such circumstances in this case. We discuss this further at paragraph 5.86 below and note that no respondent has identified any such circumstances either. We are therefore satisfied that ALFs set at levels corresponding to market value are appropriate in this case to secure the optimal use of spectrum.

Securing the optimal use of spectrum

June 2018 consultation position

- 5.20 We said that setting ALFs at full market value promotes the optimal use of spectrum, in particular by helping to ensure that licence holders have an appropriate incentive to return spectrum licences for which they are not the highest-value potential user.⁸⁹

Stakeholder responses

- 5.21 Stakeholders argued that ALFs at market value would not promote optimal spectrum use, and could actively deter efficient trading. They also said that we have not sufficiently addressed the risk that we might set ALFs above market value. We summarise their arguments in relation to each of these points below.

Efficiency of existing spectrum use and users

- 5.22 BT said setting ALFs at full market value is not necessary to ensure that MNOs make efficient use of their spectrum holdings. It made the following points:⁹⁰
- a) To meet growing demand for coverage, data capacity, and higher quality service, MNOs face a constant trade-off between using existing spectrum more efficiently, investing in new sites, or acquiring new spectrum. As such, they face the implicit price of existing

⁸⁹ Paragraph 5.28, June 2018 consultation.

⁹⁰ BT response to June 2018 consultation, pages 8-9. Also Appendix 1 of BT's response: *Keeping an eye on the prize – investment in mobile networks to deliver coverage, capacity and the 5G strategy: A reappraisal of recurring spectrum fees*, report by Brian Williamson commissioned by BT, May 2018, pages 6-9.

spectrum irrespective of whether there is a fee for this spectrum. The report by Brian Williamson commissioned by BT (Appendix 1 of its June 2018 consultation response) said evidence shows that operators take the implicit price of spectrum into account, for example Verizon declining to bid for AWS spectrum in US auctions;

- b) It is not credible that there is a higher value use for 900/1800 MHz spectrum than mobile, given the harmonised use of the bands concerned and obligations attached to the licences. It is also accepted by Ofcom and Government that spectrum should be reallocated from other uses to mobile use.
 - c) Once operators have acquired spectrum, they make complementary investments in sites and technology which are optimal given their spectrum holdings. Once sunk, these investments tend to imply a higher value for existing holdings by a given operator compared with other operators.
 - d) Further spectrum availability through new awards, acquisitions and trading helps ensure that spectrum is allocated efficiently between operators. Ofcom has recently released 190 MHz of spectrum in the 2.3 GHz and 3.4 GHz bands, with further releases of 700 MHz and higher frequency spectrum planned. Spectrum trades have occurred in the UK for 1.4 GHz and 28 GHz spectrum, while Three acquired 3.4 GHz spectrum with its purchase of UK Broadband.
- 5.23 BT said that an administratively imposed ALF on mobile use is not therefore required or proportionate to promote the optimal use of spectrum when assessed against the costs and risks that high ALFs may ultimately have for consumers.
- 5.24 Three said we have not demonstrated that MNOs may be less responsive to the opportunity cost of holding spectrum than to ALFs at market value. It said the relevant licences have been tradable since 2011, and *“the generally accepted view of economists is that MNOs will be fully responsive to the opportunity cost of holding tradable spectrum”*.⁹¹ Three cited Ofcom’s 2007 review of spectrum fees for broadcasting, where we said trading would create incentives for efficient spectrum use *“if spectrum were a freely and efficiently traded good with sufficient liquidity and transparency that there was good information in the market about prices, and those prices were a good reflection of market value (as in the case for, say, land); and all users of spectrum had to acquire the spectrum that they needed through the market”*.⁹²
- 5.25 Three noted that the SRSP presented two circumstances where trading alone may not provide sufficient incentives to use spectrum efficiently in individual markets: if trading is limited by barriers like transaction costs, coordination problems and/or lack of price information; and if licensees are more responsive to AIP than to trading. The SRSP illustrated the latter circumstance by way of an example where a manager was under

⁹¹ Three response to June 2018 consultation, Section 1.

⁹² Paragraph 3.23, Ofcom, Future Pricing of Spectrum Used For Terrestrial Broadcasting (2007), https://www.ofcom.org.uk/_data/assets/pdf_file/0026/51596/statement.pdf

pressure to reduce operating budgets, but under less pressure to realise untapped revenue sources e.g. by selling under-utilised spectrum.

- 5.26 Against this context, Three said we had relied on flawed evidence to conclude that MNOs are not fully responsive to trading ALF spectrum. It made the following points:⁹³
- a) In Three's view, we made no attempt to determine whether mobile managers face the pressures described above in practice. Three said the only evidence we provided was an inference from a confidential stakeholder submission warning of price rises and delayed investment if ALFs increase above current levels.⁹⁴
 - b) Few conclusions can be drawn about the effectiveness of trading from observed trading volumes. Three said low trading volumes were consistent with a view that the existing spectrum allocation is already efficient. It said that releasing spectrum is very costly and time-consuming as it requires migrating users to alternative frequencies or deploying extra sites or more efficient technology to serve that traffic. It noted that, in the context of liberalising 900 MHz and 1800 MHz licences for 3G use in 2010, Ofcom estimated that releasing 2x5 MHz of 900 MHz would cost around £60-210 million and could cause network disruption in the interim.
 - c) While lack of trading is also consistent with strategic behaviour by MNOs, setting ALFs at full market value is unlikely to deter this kind of behaviour.
 - d) Qualcomm's sale of 1.4 GHz spectrum to Three and Vodafone is a perfectly good example of a firm being responsive to the opportunity cost of holding spectrum.
- 5.27 Three said that we could gather internal documents from MNOs to test the hypothesis that mobile managers face stronger pressure to reduce operating budgets than to realise untapped revenues, or the considerations faced by operators when exploring potential spectrum trades. It also said we could assess the results of recent European awards of expired 900 MHz and 1800 MHz spectrum licences to determine whether existing licence-holders were able to retain their licences at the auction (and therefore whether they have the highest value for 900 and 1800 MHz spectrum).⁹⁵
- 5.28 Three also said our view that MNOs do not already reflect the full opportunity cost of spectrum in retail prices is inconsistent with our position on the opportunity cost of capital, which we include in charge controls (and as an input to the rate used to annualise lump-sum spectrum values to set ALFs).⁹⁶

Impact of ALFs at market value on trading

- 5.29 BT said there is a risk that ALFs could inhibit spectrum trading, since operators may be more wary of inadvertently revealing their true spectrum valuations during trades if these

⁹³ Three response to June 2018 consultation, pages 9-14.

⁹⁴ Three acknowledged that price rises and delayed investment would not be expected if MNOs' pricing and investment decisions reflected opportunity cost.

⁹⁵ Three response to June 2018 consultation, pages 14-15.

⁹⁶ Three response to June 2018 consultation, page 17.

valuations could result in higher ALFs later on.⁹⁷ BT cited a 2009 report by Phillipa Marks and Brian Williamson (on behalf of Plum Consulting) commissioned by T-Mobile, which argued that spectrum fees may reduce spectrum trading if they are adjusted to reflect new information about spectrum values over time.⁹⁸

- 5.30 Telefónica said there is a clearly-recognised link between pricing spectrum at full market value and ensuring optimal use of spectrum, but that this approach may deter efficient trades as it may reduce the potential revenues from any trade to close to zero. Telefónica also said that *“it is widely understood that operators are reluctant to sell spectrum directly to rivals; this disincentive is likely even stronger if the only benefit is savings in annual fees as opposed to a cash windfall that can be reinvested in the network”*.⁹⁹

Risk that Ofcom may set ALFs above market value

- 5.31 All MNOs reiterated that there is an asymmetric risk between setting fees above and below market value, since non-use of spectrum (if set too high) is economically costlier than potentially inefficient use (if set too low).
- 5.32 Telefónica said it remains concerned that we have not been sufficiently conservative to reflect this asymmetric risk, thus failing to ensure the spectrum’s optimal use. It suggested setting ALFs such that we are 90-95% certain that market value is above the ALF.¹⁰⁰ Vodafone and BT also said that our estimates should be more cautious and conservative.¹⁰¹
- 5.33 Three said that MNOs’ winning bids for spectrum won in the 4G auction did not greatly exceed prices paid. It noted that EE’s incremental bid for 2x5 MHz of 800 MHz spectrum of £353 million was 18% higher than our estimated market value of £300 million (in March 2013 prices), while our estimated market value for 2.6 GHz was identical to BT’s incremental bid value for the last 2x5 MHz block of 2.6 GHz spectrum it won. Three said this suggests that, had we been setting ALFs for 800 MHz and 2.6 GHz spectrum without the information provided by the auction, we would have to be very accurate to avoid the risk of fallow spectrum.¹⁰²

Our assessment

Efficiency of existing spectrum use and users

- 5.34 As set out in paragraph 5.11, the purpose of setting spectrum fees by reference to market value is to provide users with a sustained long-term signal of spectrum value, and, as a result, to give them incentives to use it in a way that maximises benefits for society over time.

⁹⁷ BT response to June 2018 consultation, page 9. Williamson report, page 8

⁹⁸ *Is spectrum pricing compatible with spectrum markets?* P. Marks & B. Williamson, Plum Consulting report for T-Mobile, June 2009, <http://plumconsulting.co.uk/spectrum-pricing-compatible-spectrum-markets>. See in particular Section 3.4.1.1.

⁹⁹ Telefónica response to June 2018 consultation, pages 9-10.

¹⁰⁰ Telefónica response to June 2018 consultation, page 7.

¹⁰¹ Vodafone response to June 2018 consultation, page 16. BT response to June 2018 consultation, page 7.

¹⁰² Three response to June 2018 consultation, page 15.

- 5.35 We recognised in our June 2018 consultation that operators may be incentivised to make the *most efficient use* possible of spectrum they currently hold, in the absence of fees set at market value. However, we said this did not necessarily rule out the possibility that they may not be the highest-value users of this spectrum. Even if they are incentivised to maximise the value of their use of that spectrum, they are not necessarily the *most efficient user*.
- 5.36 We also recognised that mobile operators can trade or acquire spectrum licences, and that in principle this creates incentives for operators to only hold licences for which they are the highest-value users. However, we considered there is a risk that MNOs may be less responsive to the opportunity cost of holding spectrum (through forgoing the revenue from trading it) than to ALFs set at market value.¹⁰³ This implies that trading may not in itself be sufficient to ensure that spectrum is allocated most efficiently.
- 5.37 Both the SRSP and our 2007 review of spectrum fees for broadcasting (to which Three referred) identified several market conditions that we considered necessary for spectrum trading to secure optimal spectrum use, including the presence of a liquid and transparent market with good information about prices.¹⁰⁴ Barriers to this (e.g. high transaction costs or lack of price information) may prevent spectrum trading from being sufficiently effective to promote the optimal use of spectrum.
- 5.38 These considerations underpinned our principle on AIP and tradable licences in the SRSP:
- AIP principle 5: Many secondary markets are unlikely to be sufficiently effective to promote the optimal use of the spectrum without the additional signal from AIP. Therefore, AIP will likely continue to be needed to play a role complementary to spectrum trading for most licence sectors.*¹⁰⁵
- 5.39 We said in the SRSP that we would assess the role of spectrum fees on a case-by-case basis. Given the risks to efficiency outlined above, then to depart from setting 900 MHz and 1800 MHz ALFs at market value in this case, we consider we would have to be sufficiently confident that:
- a) these risks to spectrum efficiency are not material for 900 MHz and 1800 MHz spectrum holdings i.e. we can rely on the possibility of trading alone to ensure the allocation of spectrum is efficient; and / or
 - b) setting ALFs at market value will either not help to address the risks to efficiency or will introduce other barriers to efficiency-improving outcomes.
- 5.40 Against this context, we have considered the various points raised by stakeholders.

¹⁰³ See paragraphs 5.47 – 5.61 of the June 2018 consultation.

¹⁰⁴ Paragraph 3.23, Future Pricing of Spectrum Used for Terrestrial Broadcasting. Paragraph 4.31, Ofcom, *SRSP: The revised Framework for Spectrum Pricing*, December 2010, https://www.ofcom.org.uk/data/assets/pdf_file/0024/42909/srsp-statement.pdf

¹⁰⁵ SRSP, paragraph 4.212.

Whether operators are less responsive to the opportunity cost of spectrum

- 5.41 BT and Three's main arguments relate to our view that MNOs may be less responsive to the opportunity cost of holding tradeable spectrum than to ALFs set at levels corresponding with market value.
- 5.42 Firstly, we consider that firms normally pay a market price for the inputs they use. This provides a clear signal as to the opportunity cost of these inputs. However, MNOs have not paid a market price for the 900 and 1800 MHz licences that they currently hold, as the licences were initially awarded by direct assignment.¹⁰⁶ This means that the initial signal to licence-holders is not present in this particular case.
- 5.43 Secondly, we recognise that MNOs are likely to be able to identify potential buyers of their spectrum licences (i.e. among the other MNOs) and could inform themselves about the likely opportunity cost of this spectrum through negotiations. They could also potentially draw on information from spectrum valuation exercises such as those that might be used to inform their auction strategies for other bands at similar frequencies. Nevertheless, there have been no trades for 900 and 1800 MHz spectrum and price information for this spectrum is far more limited than in other markets (e.g. land) where market liquidity is much greater.¹⁰⁷ We consider this makes it harder for licence-holders to evaluate the trade-off between continuing to hold spectrum, against the foregone revenues from trading it.
- 5.44 Thirdly, even if the MNOs' decision-makers have a good awareness of the opportunity cost of their spectrum licences, they might not be so responsive to these opportunity costs. Three said that this position contradicts "the generally accepted view of economists" and that there is no support for this view in the economic literature. However, Three's position takes a narrow view of the economic literature in assuming rational agents will always take full account of opportunity cost in their decisions and so use resources (like spectrum) in the most profitable way. In practice, firms' decision-makers might not always do so, for instance:
- a) decision-makers may not themselves have incentives to fully consider opportunity costs e.g. if strong pressures are put on managers to reduce or contain their operating budgets, but less importance is placed on realising untapped revenue sources such as might arise from selling spectrum (as noted in the SRSP).¹⁰⁸ This is an example of a "principal-agent" situation, in which managers (the agents acting on behalf of the principals, i.e. shareholders) may have different objectives to shareholders;
 - b) decision-makers may not give equal weight to opportunity costs because of the way in which they are "framed". Studies have shown that decisions can be affected by whether outcomes are framed in terms of losses or gains, with losses carrying greater

¹⁰⁶ The only spectrum at these frequencies not obtained by direct assignment is that which H3G acquired (30 MHz of 1800 MHz spectrum) as a result of merger commitments by Orange and T-Mobile given to the European Commission in March 2010. Our understanding based on press reporting (for example, see <https://www.theguardian.com/business/2013/mar/15/three-mobile-phone-network-ee>) is that H3G acquired this spectrum for £0 although we recognise that there may have been a variety of factors behind that transaction.

¹⁰⁷ By that we mean that there have been no commercially unconstrained trades. As set out in footnote 106, the Orange/T-Mobile divestment to H3G was a result of merger commitments given to the European Commission.

¹⁰⁸ SRSP, paragraph 4.203.

weight than equivalent gains. This implies that managers may be more responsive to the direct cost of a licence fee than the foregone revenues from trading spectrum.

- 5.45 Three said that whether MNOs take account of opportunity cost is a matter of fact that we can determine through information gathering. However, we do not consider that it is necessary or appropriate for us to do so in this case. As explained above, we have identified that there is a risk in principle that operators may not be as responsive to opportunity costs as they are to ALFs set to reflect market value. Against this background, we have not received any documentary evidence from MNOs (for example, internal governance papers which demonstrate how managerial decisions are taken, and the extent to which these decisions are driven by operating costs or other considerations such as the opportunity cost of spectrum) to suggest that our view is incorrect. This is despite extensive consultation on fees for these spectrum bands in October 2013, August 2014 and June 2018, and the fact that we would expect the MNOs to have been able and incentivised to provide such evidence.
- 5.46 Furthermore, as previously noted in our August 2014 and June 2018 consultations, we have received MNO submissions that we consider are consistent with our view on opportunity costs. These submissions detailed pressures that mobile managers would face to increase prices or delay investment in response to higher ALFs, which would not arise if the opportunity cost of foregone receipts was already fully reflected by decision-makers. Three said that we made this inference from an unsubstantiated submission. However, the submissions come from more than one MNO,¹⁰⁹ and they have not since explained whether or how they consider we have misinterpreted the implications of these submissions for their internal decision-making.
- 5.47 As such, we still consider there is a risk that MNOs may not fully account for the opportunity cost of their current spectrum holdings. This means that requiring operators to pay an ALF which reflects market value would secure optimal spectrum use by creating appropriate incentives to hold or release spectrum.
- 5.48 We also disagree with Three that we are inconsistent with our approach to the opportunity cost of capital when setting price controls or spectrum fees.
- a) First, the situation of MNOs using spectrum assets is akin to access-seekers purchasing regulated wholesale inputs. If access seekers (such as those purchasing leased lines or local-loop unbundling) did not face a price reflective of the opportunity cost of capital of the firm providing that access, this would represent a subsidy similar to that faced by an MNO using a spectrum asset but not paying a price reflective of the full opportunity cost of spectrum.
 - b) Second, from the perspective of the regulated firm providing access subject to a price control, it will often face a direct financial cost for the financial capital it uses. This will be in the form of interest payments on debt and/or its dividend policy (which will reflect the market price for obtaining such finance). With the regular trading of the financial securities in question (i.e. bonds and/or shares in the company), the regulated

¹⁰⁹ These submissions came from [redacted]. See paragraph A5.17, August 2014 consultation.

company will be in possession of transparent and up to date information on its financing costs.

- 5.49 When setting spectrum fees, we seek to ensure that appropriate compensation for the opportunity cost of this asset (including the time value of money) is reflected in the price paid for its use.

Spectrum trades in other bands

- 5.50 BT and Three said that there have been spectrum trades in the UK which represent good examples of an operator being responsive to the opportunity cost of holding spectrum.
- 5.51 We recognise that there have been instances of spectrum trades, such as Qualcomm's 1.4 GHz licence or trades of 28 GHz licences. There have also been spectrum reallocations via acquisitions (such as H3G's acquisition of UK Broadband which held 3.4 GHz spectrum).¹¹⁰ However, we consider the circumstances surrounding these bands differ from the ALF spectrum bands in important respects:
- a) In respect of the trade of 40 MHz of 1.4 GHz spectrum, our understanding is that Qualcomm initially purchased this spectrum for a different technology (mobile television) that did not transpire as commercially successful.¹¹¹ This created a strong incentive for Qualcomm to relinquish this spectrum, which is less likely to apply in the case of MNOs with profitable mobile businesses.
 - b) In respect of 3.4 GHz spectrum, 40 MHz of this was indirectly purchased by H3G as part of its acquisition of UK Broadband along with all UK Broadband's assets, including significant spectrum holdings at 3.6 GHz (84 MHz) and in higher frequency bands. Acquiring an entire operator and all its holdings in a given band would be a very costly way of reallocating 900 MHz or 1800 MHz spectrum to another user with a higher value for that spectrum. We therefore do not consider that this example indicates that efficient trades would necessarily be realised – which are likely to be for increments of spectrum, not the existing licensee's entire holding of 900 MHz or 1800 MHz spectrum.
 - c) 28 GHz licences are regional licences that were auctioned for Broadband Fixed Wireless Access (rather than spectrum which was directly assigned for use in mobile access networks).¹¹² Some of the initial licence holders (e.g. Energis) ceased operations shortly after trading the licences, indicating that they held a particularly low value for the licence at that time, while other licences have changed hands due to company acquisitions (e.g. the licences bought by Vodafone from Cable and Wireless, who bought them from Thus PLC). We do not consider that these instances are particularly relevant to the likelihood of trades occurring for 900 and 1800 MHz spectrum.

¹¹⁰ We do not consider the example of AWS spectrum in the US to be relevant in this context as it demonstrates that Verizon was prepared to forego winning new spectrum, for which it would have paid an auction price, rather than relinquishing spectrum that it already owned and for which it was not paying a market price.

¹¹¹ See: <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2008/ofcom-awards-spectrum-licence-to-qualcomm-uk-spectrum-ltd>. Qualcomm's press release said it intended to use this spectrum to explore emerging business models and advanced mobile technologies. See: <https://www.qualcomm.com/news/releases/2008/05/16/qualcomm-wins-40-mhz-l-band-spectrum-uk-auction>.

¹¹² See paragraph 3.10, Ofcom, *Variation of 28 GHz Broadband Fixed Wireless Access Licences*, Consultation, December 2012, https://www.ofcom.org.uk/data/assets/pdf_file/0022/63922/28_ghz_consultation.pdf

5.52 In any case, these relatively limited examples from other spectrum bands do not suggest the presence of a liquid spectrum market, and particularly not for 900 MHz and 1800 MHz spectrum. Our view is not that operators necessarily ignore the opportunity cost of their spectrum holdings, but that they may be less responsive to foregone revenue from trading spectrum than to ALFs set at market value. This view is not contradicted by the existence of limited trades at other frequencies.

Relevance of lack of trades for ALF spectrum

5.53 As stated in our June 2018 consultation, we recognise that one possible explanation for a lack of spectrum trades of 900 MHz and 1800 MHz spectrum is that existing licence-holders are the highest value users of that spectrum.¹¹³ The tailoring of networks to spectrum holdings means existing licensees may be particularly high-value users of their spectrum. However, this does not rule out the possibility that alternative users may have higher values at the margin for 900 MHz and 1800 MHz spectrum, particularly as spectrum holdings in these bands are asymmetric, and we would expect marginal values to decline with each increment of spectrum.¹¹⁴

5.54 Three referenced our estimated cost of releasing 2x5 MHz of 900 MHz spectrum as part of our 2010 advice to Government on liberalising 900 and 1800 MHz spectrum for 3G use (between £60 million and £210 million), and compared this with our assessment of the value of 900 MHz of £190m for 10MHz.¹¹⁵ However, this estimate undertaken in 2010 was designed to measure the full avoided network cost (in terms of building extra sites) from releasing a block of spectrum, which would also be relevant to alternative users of that spectrum (if using the same technology) and therefore an important aspect of market value.¹¹⁶ Moreover, the analysis undertaken was based on the avoided network costs from using the spectrum for GSM (i.e. 2G services). Even if incumbent users continue to use 900 MHz spectrum for 2G services, a potential buyer of that spectrum is at least as likely to value it for 4G (which provides much faster data services compared to 2G).

5.55 Three also suggested that we look at the results of recent European awards of expired 900 MHz and 1800 MHz spectrum licences. Again, we do not consider that incumbent European MNOs retaining spectrum licences rules out the possibility that there may be higher value users for 900 MHz and 1800 MHz spectrum in the UK. To the extent that this

¹¹³ We also noted possible strategic reasons for holding spectrum and recognised that ALFs set at market value would not necessarily address this inefficiency (as also argued by Three in its response).

¹¹⁴ Vodafone and Telefónica account for all available 900 MHz spectrum, and a large majority of current sub-1 GHz mobile spectrum (109.6 MHz, out of a total of 129.6 MHz – i.e. over 80%), while EE holds a large majority of 1800 MHz spectrum (90 MHz, out of 143.2 MHz – i.e. over 60%). EE's overall share of mid-frequency spectrum (i.e. frequencies between 1800 MHz and 6 GHz) is around 38%.

¹¹⁵ Ofcom, Advice to Government on the consumer and competition issues relating to liberalisation of 900MHz and 1800MHz spectrum for UMTS, October 2010, https://www.ofcom.org.uk/data/assets/pdf_file/0024/55068/government-advice.pdf

¹¹⁶ Three also noted the time and network disruption associated with releasing spectrum. We recognised in our Advice to Government there would be some disruption to the seller of such spectrum, which would not be relevant to potential alternative users, but we said it is unclear if this would have a material impact in terms of costs as operators should be able to minimise this. We estimated that, as a worst case, the costs of network disruption would be moderate (around £2 million to £21 million for one block). See paragraphs A16.20-A16.21 and Table 5 of our Advice to Government, https://www.ofcom.org.uk/data/assets/pdf_file/0025/41677/annex16.pdf.

is relevant, though, we note that there have been instances of spectrum licences changing hands at auction.¹¹⁷ These examples are consistent with private values and marginal opportunity costs changing over time.

- 5.56 Furthermore, as set out in the SRSP, setting ALFs at levels corresponding with market value is intended to provide operators with long-term price signals, even if there are barriers to releasing or trading spectrum in the short-term. As the time horizon increases, there is likely to be greater scope for developments in technology and mobile market conditions to bring about changes in marginal valuations for additional spectrum. It also increases the likelihood that network equipment will need to be replaced and / or upgraded, which makes it less likely that networks costs should be regarded as sunk investments (as argued by Three and BT). In this respect, we note that MNOs have held their 900 MHz and 1800 MHz spectrum for many years and these holdings are highly asymmetric; Vodafone and Telefónica hold 100% of the 900 MHz spectrum and EE hold over 60% of the 1800 MHz spectrum.¹¹⁸ This increases the possibility that existing licence-holders may not necessarily be the highest-value users of the entirety of those holdings.
- 5.57 While we recognise that it is possible for efficient outcomes to arise without trading, we do not consider in light of the above that it would be appropriate to rely solely on the existence of trading opportunities (and an absence of actual trades in the bands of interest to date) to conclude that existing allocations are efficient.

Other points raised by BT

- 5.58 BT made other arguments to which our responses are as follows:
- a) We agree with BT that mobile use is likely to be the highest value use of 900 MHz and 1800 MHz spectrum (paragraph 5.22(b) above). We also agree that operators may be incentivised to use their spectrum holdings as efficiently as possible. However, for the reasons set out above, neither of these points precludes the possibility that at least a portion of an MNO's spectrum holdings could be valued more highly by *another MNO*. Accordingly, we remain of the view that there may still be scope for efficiency improvements from transferring spectrum to another operator, which would not be realised absent ALFs set at market value. An alternative approach to securing an efficient allocation of licences over time would be to make them time limited and re-auction them when the licence period expires. This is the approach adopted by other regulatory authorities in Europe.¹¹⁹ However, as the licences in question currently have an indefinite term (subject to revocation on 5 years' notice for spectrum management reasons), we prefer to maintain the current position and set ALFs at market value

¹¹⁷ See the 2013 Austrian auction – illustrated in Figure A8.1.5 of our 2015 Statement. More recently, the 2016 Swedish auction of 1800 MHz was won by someone other than the licence-holder.

¹¹⁸ Vodafone and O2 have held their existing 900 MHz licences since 1992 (and held spectrum in this band since the 1980s), while the 1800 MHz licences were awarded between 1993 and 1996. H3G acquired 1800 MHz spectrum in 2012, but because of merger commitments by Orange and T-Mobile. Three noted that the European Commission gave the parties 3.5 to 5.5 years to release this spectrum.

¹¹⁹ For example, the German NRA re-auctioned licences in 900 MHz and 1800 MHz spectrum in 2015; in 2017, the Greek NRA re-auctioned 1800 MHz licences that were going to expire in 2018 and 2020; and the Swedish NRA re-auctioned an 1800 MHz licence in 2016 due to expire in 2017.

(consistent with the 2010 Direction), rather than re-auction them at the end of a finite licence term.

- b) We recognise the scope for spectrum auctions to provide some correction to inefficiencies in spectrum holdings over time (paragraph 5.22 above). However, as explained in the June 2018 consultation, we still consider that this is limited by the infrequent nature of spectrum auctions, and the fact that specific spectrum bands tend to be more suitable for some purposes than others.¹²⁰

Overall view

- 5.59 We remain of the view that setting ALFs at levels corresponding with market value secures optimal spectrum use and therefore gives effect to our statutory duty at section 3(2) of the Communications Act. Although licence-holders may be high-value users of their existing 900 and 1800 MHz spectrum, and new spectrum awards may play some role in addressing the demand from other operators, there may still be efficiency gains from reallocating 900 MHz and 1800 MHz spectrum across mobile users. Furthermore, while we also recognise that mobile operators can trade spectrum licences, we consider there is a risk that operators are less responsive to the opportunity cost of spectrum than to fees set at market value.

Impact on trading of ALFs at levels corresponding with market value

- 5.60 BT and Telefónica said setting ALFs at market value could *deter* efficient spectrum trades, for instance by reducing the scope to overcome transaction costs. We considered this issue in our October 2013 consultation:¹²¹

“...our perspective is that, whilst a higher ALF would reduce the buyer’s willingness to pay for spectrum, it would also reduce the price at which the seller was willing to sell by the same amount; accordingly, it would not alter the potential gain from trade”.

- 5.61 We remain of the view that this is the most appropriate characterisation of the present situation, as we are setting ALFs for 900 and 1800 MHz spectrum without reference to any UK trades at these frequencies.
- 5.62 The 2009 paper by Marks and Williamson, to which BT referred, presents examples where spectrum fees are automatically adjusted to reflect new information over time i.e. the level of fees is endogenous to the value revealed by trading. In such circumstances, they illustrate that gains from trade, and hence trading opportunities, are affected by the level of fees.
- 5.63 We previously considered this risk in the context of the SRSP. We recognised that a spectrum trade could reveal new information about the opportunity cost of spectrum, which, if fully reflected in future ALFs, could in theory deter the trade from occurring or

¹²⁰ Paragraph 5.41 – 5.46, June 2018 consultation

¹²¹ Paragraph A9.16, October 2013 consultation. This point is recognised by Marks and Williamson in their 2009 report “Is spectrum pricing compatible with spectrum markets?”, <http://plumconsulting.co.uk/spectrum-pricing-compatible-spectrum-markets/>. See page 15.

create a risk of circularity.¹²² We reflected this risk in our SRSP principles, in particular by making clear that we will interpret such market valuations with care and not apply them mechanically to set reference rates and AIP fees (see AIP Principle 7).¹²³ We consider that there is benefit to licensees in having some certainty over what fees will be over the longer-term and revisions up or down to ALFs in response to individual market events would not be conducive to providing such predictability to licensees.

- 5.64 Consistent with this, in the specific context of 900 MHz and 1800 MHz ALFs, we have previously stated that we were not minded to review ALFs within the next five years (i.e. five years after implementing revised ALFs), and thereafter we would only consider reviewing the level of ALFs if evidence suggested that a material misalignment had arisen.
- 5.65 As explained in paragraph 6.20, we again envisage such a period of stability in the real level of ALFs for 900 and 1800 MHz bands going forward. We would therefore be unlikely to review ALFs in the next five years save in very exceptional circumstances and would also propose to retain them beyond that date unless there were grounds to believe that a material misalignment had arisen between the level of these fees and the value of the spectrum, in keeping with our general policy on fee reviews. Moreover, to date, we have only reviewed and adjusted AIP-based fees in other spectrum bands in limited circumstances.¹²⁴
- 5.66 In the present context, we are not using any information from secondary market trades to inform ALFs for 900 and 1800 MHz spectrum. As explained above, we also do not envisage revising ALFs for some time – and then only in the event of material misalignment.
- 5.67 For these reasons, we do not consider that there is a risk to future efficient trades from setting 900 MHz and 1800 MHz ALFs on the basis of the information on market value relied on in this review.
- 5.68 Finally, we disagree with Telefónica that the disincentive to trade spectrum could be stronger if the only benefit to the licence holder is savings in annual fees, as opposed to a cash windfall that can be reinvested in the network. First, a saving in ALF payments could be used to reinvest in the network and if ALFs are set at market value, the avoided payments would be expected to be the same (or similar) to the likely proceeds from a sale of the same amount of spectrum.¹²⁵ Second, as we have explained above, we expect that direct costs such as licence fees are likely to place stronger pressures upon managers than the foregone receipts that could be obtained by trading spectrum.

¹²² See paragraph 4.264 of the SRSP.

¹²³ "AIP Principle 7 (use of market valuations): We will take account of observed market valuations from auctions and trading alongside other evidence where available when setting reference rates and AIP fee levels. However, such market valuations will be interpreted with care and not applied mechanically to set reference rates and AIP fees." See page 4 of the SRSP statement.

¹²⁴ For instance, in 2016 we suspended a review of spectrum fees for fixed links and satellite services until we had more certainty on the future of these bands. See: <https://www.ofcom.org.uk/consultations-and-statements/category-1/review-spectrum-fees-fixed-links-satellite>.

¹²⁵ We recognise that where the ALFs are set with a conservative interpretation of the evidence on market value, it is possible that the avoided ALF payments could be less than the proceeds from a sale. However, where the trade was between only one seller and one buyer, the seller may generate lower proceeds from a sale than if selling to a large number of buyers (and we note that a large number of buyers is unlikely in the context of a trade at these frequencies).

Risk that Ofcom sets ALFs above market value

- 5.69 We agree with the MNOs that setting ALFs above market value would not secure the optimal use of spectrum, and that there is a greater risk to optimal use of spectrum from setting fees above market value than below. However, we remain of the view that we have adequately addressed this risk by taking a conservative approach to interpreting the evidence on market value. This process necessarily involves us exercising regulatory judgement when considering the evidence.
- 5.70 While stakeholders have argued again that our analysis is not sufficiently conservative, we disagree. In particular, we disagree with Telefónica and Vodafone that market value should be determined using statistical confidence intervals. This would require us to exercise judgement around the correct distribution of market values and on the appropriate confidence interval to use, particularly as this may itself entail a wide range of values. As such, we consider that this exercise would create a false impression of precision, compared with our existing approach to conservatively interpreting the evidence on market value. We explain in section 4 how we have taken a conservative approach in practice to interpreting evidence on lump sum market values for 900 MHz and 1800 MHz spectrum.
- 5.71 Regarding Three's point that winning bids did not greatly exceed the prices paid in the 4G auction, we recognise that private values for spectrum can in some circumstances be close to market clearing prices. However, we do not consider that this requires us to change our approach, as we already take a conservative approach to interpreting market value from UK and overseas auctions. In any case, in the specific 800 MHz example highlighted by Three, we disagree that an 18% premium of EE's incremental bid value for the 800 MHz block it won over our estimate of marginal opportunity cost (i.e. roughly £50 million for a 2x5 MHz block) constitutes a "narrow margin". On a per MHz basis, this represents £5 million per MHz in March 2013 prices (closer to £5.4m per MHz in April 2018 prices). We also note that the winning bids for spectrum in the 4G auction totalled £5.2 billion i.e. 124% more than total auction revenue of £2.3 billion,¹²⁶ which implies a significant amount of overall surplus generated by the MNOs from these spectrum holdings.
- 5.72 Furthermore, as Three noted, we have estimated market values for 800 MHz and 2.6 GHz using the bidding information available to us, including EE and BT (Niche's) bids.¹²⁷ EE was the marginal bidder for 800 MHz and its losing bid informed our conclusion on market value. Similarly, in coming to a decision on the market value for 2.6 GHz, we noted that BT's incremental bid value for the last 2x5 MHz in the 2x15 MHz block it won in the auction was only £5.5m per MHz (in March 2013 prices), and that this means any price above £5.5m per MHz would lead to reduced demand by BT of 2x5 MHz. However, in selecting this as our estimate of market value, we recognised that any price below £6.4m per MHz would still imply excess demand in the band overall, because it would be more than offset by the extra demand for 2x10 MHz by Telefónica. Hence there would be no fallow spectrum at a price of £5.5m per MHz. As we explained in the 2015 Statement, we

¹²⁶ See Figure 4 of the following LSE discussion paper on the 4G auction:

<http://www.lse.ac.uk/accounting/Assets/CARR/documents/D-P/Disspaper74.pdf>.

¹²⁷ Three referred to BT's 2.6 GHz spectrum bids as Niche, which is a subsidiary of BT Group.

preferred the estimate of £5.5m per MHz because we adopted a conservative approach when interpreting the evidence.¹²⁸

Impact on consumers

June 2018 consultation position

5.73 We said it is possible that setting ALFs at levels corresponding with market value would lead to higher consumer prices than would prevail if ALFs were set at a discount to market value. However, we considered that retail prices should reflect the input cost of spectrum, and this does not reflect a market failure, or markets failing to work in the interests of consumers.¹²⁹

Stakeholder responses

5.74 Telefónica said there is a growing body of theoretical and empirical work linking excessive pricing of key inputs (e.g. spectrum) to high prices and lower competition in downstream markets. It cited three reports by NERA for the GSMA which linked excessive spectrum prices to lower-quality networks and higher consumer prices.¹³⁰ Telefónica said this provides a strong case for not pricing spectrum above market value and reinforces the argument that spectrum fees should be set conservatively.¹³¹

5.75 Vodafone said that we have failed to consider the impact of our proposals on consumers. It argued that our assessment of consumer impacts is in fact an assessment of the impact on efficiency, and that we have made no effort to understand the consequences of our proposals in terms of choice, quality of service or prices. Vodafone argued that our lack of regard to the social consequences of higher consumer prices “is wrong in law”. Vodafone also said we have not considered the potential impacts on vulnerable consumers.¹³²

5.76 Three said that we have blindly followed the cost-based pricing axiom and ignored the fact that aligning retail prices with costs may not be socially optimal, for instance if the price of a substitute for mobile services is below cost (e.g. due to an externality).¹³³

Our assessment

5.77 In general, and consistent with our wider policy on spectrum fees, we consider that retail prices should reflect the input cost of spectrum, and this does not reflect a market failure, or markets failing to work in the interests of consumers. As such, it would not be appropriate to maintain the price of ALF spectrum below its market value in order to artificially suppress consumer prices through a mobile spectrum subsidy.

¹²⁸ See paragraphs 2.227 and 2.228 of the September 2015 Statement.

¹²⁹ Paragraph 5.68, June 2018 consultation.

¹³⁰ The GSM Association (GSMA) is an association of mobile operators, handset and device makers and other related companies.

¹³¹ Telefónica response to June 2018 consultation, page 12.

¹³² Vodafone response to June 2018 consultation, pages 13-14

¹³³ Three response to June 2018 consultation, pages 18-19.

- 5.78 In this context, we disagree with Vodafone that we have failed to consider consumer impacts. We remain of the view that it is appropriate to assess these impacts by considering how consumer prices would be set in well-functioning markets, as this is likely to promote consumers' long-term interests.
- 5.79 As such, we consider that setting ALFs in accordance with market value will provide efficient price signals for the use of scarce spectrum by operators. This will benefit consumers by ensuring that spectrum is used in the most efficient way for the provision of downstream services for which there is greatest value. If setting ALFs at these levels led to an increase in prices for mobile services (which is not certain), we would expect consumers to adjust their purchasing decisions towards other substitute goods and services which can be supplied at lower cost (with inputs appropriately reflecting the cost of supply), or for which they derive greater value. We would expect this to improve overall consumer outcomes.
- 5.80 Alternatively, if setting ALFs at market value encourages spectrum release which facilitates expansion by rival operators or even entry by another operator, it could also result in greater competition and lower retail prices for mobile services for consumers.
- 5.81 In contrast, if the price of 900 MHz and 1800 MHz spectrum is below opportunity cost, there is a risk that it will continue to be held by operators who are not the highest value user of that asset. This is harmful to consumers and society more widely, particularly in recognition of the scarcity of this spectrum, its asymmetric allocation between MNOs and the scope for demand and technology to change through time. We consider this harm to the prospects for long-term efficiency and consumer welfare to be enough to set ALFs at levels reflecting market value even if consumer prices for today's mobile services might be lower with subsidised use of 900 MHz and 1800 MHz spectrum.
- 5.82 We have also considered the impact of our proposals on vulnerable consumers, including those with protected characteristics under the Equality Act 2010. As noted above (and explained below), retail prices might fall for all consumers if there is a pro-competitive impact in markets for wireless and mobile services. However, even if ALFs that reflect full market value do lead to higher consumer prices (which is not certain):
- a) Firstly, as explained above, we do not consider that this would represent markets failing to work in the interests of consumers, including vulnerable consumers.
 - b) Secondly, in terms of the magnitude of any impact, this would represent an increase in average mobile subscriptions of less than 15 pence per month (around 1%).¹³⁴ We do not consider this would likely create or worsen affordability issues for vulnerable customers currently using mobile services.¹³⁵ We also have no reason to believe the

¹³⁴ The increase in ALFs is around £127 million per year which is around 1% of total retail spend on mobile services in 2017 (£15.6 billion, as shown in Annex 3 Figure A3.3). The per subscription calculation is based on 92 million active mobile subscriptions. See Figure 4.1 of Ofcom's 2018 Communications Market Report, https://www.ofcom.org.uk/data/assets/pdf_file/0022/117256/CMR-2018-narrative-report.pdf. This assumes that ALFs would be passed through in full, which may overstate the true impact.

¹³⁵ We note that our latest affordability tracker research shows mobile services are generally affordable; around 3% of people had difficulties paying for a mobile service (including smartphone) in the last year, rising to 5% among those with a long-term disability or illness. This research was published on 1 October on our website. See: <https://www.ofcom.org.uk/research-and-data/data/statistics/stats18#october>, Table 7, page 61.

impact would be concentrated on one form of tariff or another (i.e. it would not disproportionately fall on tariffs taken by vulnerable consumers).

c) Thirdly, if otherwise efficient markets are not serving vulnerable consumers effectively, we prefer to intervene with targeted measures to address such concerns.

- 5.83 We disagree with Three that we have “blindly followed” cost-based pricing as an axiom. Rather, we have sought to apply a policy based on efficient price signals which, in general, should lead to better welfare outcomes. In doing so we have considered where there are potential adverse implications on consumer welfare that would cause us to depart from our policy based on efficient pricing of spectrum. As explained in this section and in accordance with our primary duty to further the interests of citizens and consumers, we have not identified or seen any reasons which we consider would justify departing from setting ALFs at market value.
- 5.84 Three refers to a situation where a mobile substitute is priced below cost, but it did not provide a specific example of this. We are not aware of any subsidies in relevant input markets (i.e. labour or telecoms equipment) or potential substitute outputs (such as non-mobile forms of communication like fixed voice and broadband services) that would create such a distortion. In practice, it seems more likely that services related to mobile in production or consumption are priced above marginal cost (or long-run incremental cost) – for example, due to the need to recover common costs.
- 5.85 Furthermore, to the extent that a substitute output or input were not priced on a cost-reflective basis, we consider that the appropriate policy response would be to address the source of that distortion directly. In our view, subsidising an input such as spectrum is unlikely to be the most appropriate policy response.
- 5.86 Finally, we agree with Telefónica that setting ALFs above market value could lead to worse outcomes for consumers than setting ALFs below market value. As discussed above, we have addressed this risk from potentially setting ALFs at a level above market value by taking a conservative approach to interpreting the evidence on the market value of 900 MHz and 1800 MHz spectrum.

Impact on investment

June 2018 consultation position

- 5.87 We said that setting ALFs at market value can be expected to promote efficient investment, and that, while it is theoretically possible that some investments would be deterred by ALFs at those levels, rather than at some discount, we do not have evidence that efficient investment would be deterred.¹³⁶

Stakeholder responses

- 5.88 BT said we have not sufficiently considered the impact that ALFs have on operators’ ability to finance network investments, by reducing their free cash flows. BT said that its capital

¹³⁶ Paragraph 5.73, June 2018 consultation.

expenditure is at a ten-year high and any reduction in free cash flows will threaten BT's ability to deliver its long-term programme of network investment. BT referred to several academic papers which it said demonstrated the positive relationship between cash flows and investment for both capital constrained and unconstrained firms, albeit less strongly for capital-unconstrained firms.¹³⁷

- 5.89 Vodafone said Ofcom accepted there is empirical evidence that budget constraints have an impact on operators' behaviour in auctions, and there is no reason to believe that similar budget constraints will apply [*sic*¹³⁸] in the case of investment when operators face annual fees. Vodafone said our approach means that operators will face an ever-increasing burden of spectrum costs while revenue growth has flat-lined (or even decreased in real terms), and that it will not be sustainable for operators to increase network investment while at the same time paying an increasing proportion of revenues on spectrum costs.¹³⁹
- 5.90 Three said that investment decisions will be fully efficient without the need for ALFs if MNOs fully consider the opportunity cost of holding spectrum, in which case ALFs are at best redundant and at worst (i.e. if ALFs are set above market value) will lead to inefficient investment in more costly alternatives.¹⁴⁰
- 5.91 Telefónica agreed that setting ALFs at market value does not lead to a reduction in the efficient level of investment *per se*, but it said Ofcom's failure to compensate operators for the Coverage Obligation will likely have a negative impact on future investments.¹⁴¹

Our assessment

Efficient investment

- 5.92 Our view, as set out in our August 2014 and June 2018 consultations, is that investment decisions should reflect the true costs of inputs. This is achieved by setting ALFs at levels corresponding with market value, as this requires operators to pay the opportunity cost of their spectrum holdings.¹⁴²
- 5.93 We recognise that this could, in some cases, disincentivise existing licence-holders from making investments which they would otherwise have made. However, we consider that outcome is likely to be efficient because the licence-holder will either pursue alternative, more efficient solutions (taking account of the true cost of all inputs) or will choose not to invest (thereby avoiding over-investment in spectrum-based solutions). This position is explained in the SRSP¹⁴³ and summarised in paragraph 5.10 above.
- 5.94 Stakeholder responses to the June 2018 consultation generally did not distinguish between efficient and inefficient investment in the way described in the SRSP. Rather, they focused

¹³⁷ BT response to June 2018 consultation, page 9. Williamson report, pages 4-5.

¹³⁸ We take this to mean "will not apply".

¹³⁹ Vodafone response to June 2018 consultation, page 17-18.

¹⁴⁰ Three response to June 2018 consultation, page 20.

¹⁴¹ Telefónica response to June 2018 consultation, pages 13-14.

¹⁴² See in particular paragraphs 5.75 to 5.77 of the June 2018 consultation.

¹⁴³ Paragraph 4.213-4.214 and 4.239, SRSP.

on the extent to which overall investment levels would be affected by our proposals. We consider that the appropriate way to consider investment impacts is the impact on efficient investment. In this respect, we consider that capital markets impose an important discipline on investment decisions by firms, and where investments are made in the absence of this discipline there is a risk that managers will make inefficient investments as a result, for example, of optimism bias, escalation of commitment, or moral hazard.¹⁴⁴

- 5.95 We have considered below stakeholders' specific arguments on the impact of higher ALFs on internal funding opportunities.
- 5.96 We separately consider Telefónica's arguments on the impact of the Coverage Obligation on investment in paragraphs 5.125-5.127 below. In relation to Three's arguments, we have set out our view on the opportunity cost of holding spectrum in paragraphs 5.34-5.59 above. We recognise that setting ALFs above market value could lead to inefficient investment outcomes, and we have addressed this risk by taking a conservative approach to interpreting the evidence on market values of 900 MHz and 1800 MHz spectrum.

Internal funds vs. external finance

- 5.97 BT referred to academic studies which identified a positive relationship between free cashflows and capital expenditure, across a range of industries and countries. The main paper to which BT refers (Lewellen and Lewellen (2016)) is a US study which finds that additional cash flow is likely to be associated with additional investment, although less than one-for-one.¹⁴⁵ We note the following:
- a) Firstly, Lewellen and Lewellen said that "empirically, investment and cash flow are indeed related, although both the strength of the relation and its cause are the subject of much debate". They also noted that "much of the recent literature suggests that cash flow has, at most, a small impact on investment". Their study seeks to improve on the methodology for estimating this relationship, which they say dramatically strengthens the apparent impact of cash flow on investment.
 - b) Secondly, commenting on their findings, Lewellen and Lewellen say "*the key open question is whether the remaining cash flow effect for unconstrained firms reflects lingering financing constraints for a subset of those firms or a violation of q theory, for example, because managers tend to overinvest internal funds*". In other words, the study does not conclude as to whether lower cashflows prevent *efficient* investment from taking place.
- 5.98 Moreover, the findings from this and other papers are based on cross-industry data from different countries. As such, they do not necessarily reflect the relevant impacts under consideration i.e. the specific impact on UK mobile investment of setting ALFs on the basis

¹⁴⁴ Optimism bias is the tendency for managers to be overly optimistic in their assessment of an investment; escalation of commitment is the tendency to continue with a particular investment rather than change course even when faced with negative outcomes; and moral hazard is the risk that managers make risky investment decisions because it will be shareholders rather than the manager that bears the risk.

¹⁴⁵ Lewellen, J. and K. Lewellen. "Investment and Cash Flow: New Evidence", *Journal of Financial and Quantitative Analysis* (August 2016). The paper estimated that \$1 of additional cash flow is associated with \$0.32 of additional investment for firms that are least likely to be financially constrained.

of market value. In the June 2018 consultation, we outlined the circumstances which would need to prevail in practice for ALFs set on the basis of market value to prevent prospective mobile investments from going ahead, namely:

- a) An investment opportunity exists where the expected return exceeds the internal cost of capital but is below the external cost of capital; and
- b) Setting ALFs at market value would reduce the internal funds available to mobile operators to the extent that such investments would not be made.¹⁴⁶

5.99 In considering the likelihood of such an outcome, we note that the proposed increase in ALF payments represents around 5% of average annual EBITDA minus capital expenditure for the 4 MNOs between 2009 and 2017, and around 5% of average annual capex.¹⁴⁷ This implies that the risk to overall investment levels from setting ALFs at market value is likely to be low – before considering the efficiency of investments made.

5.100 In Figure 5.1 below we show EBITDA and capex over the period 2009 to 2017. This shows that there have been significant fluctuations in EBITDA over the period shown, with total EBITDA changing by more than the change in ALFs arising from this statement (i.e. £127 million) year-on-year on several occasions. Despite this, aggregate capex remained more stable across the period, increasing in real terms up to 2014 before falling slightly in 2015 and again in 2017 to levels comparable with 2012. The fall in industry capex in 2017 followed a fall in EBITDA of around £900 million in 2016, which was primarily due to lower reported EBITDA by EE¹⁴⁸ and Vodafone. However, the fall in capex was mainly attributable to a different MNO (H3G), as EE and Vodafone's capex remained broadly constant between 2016 and 2017.

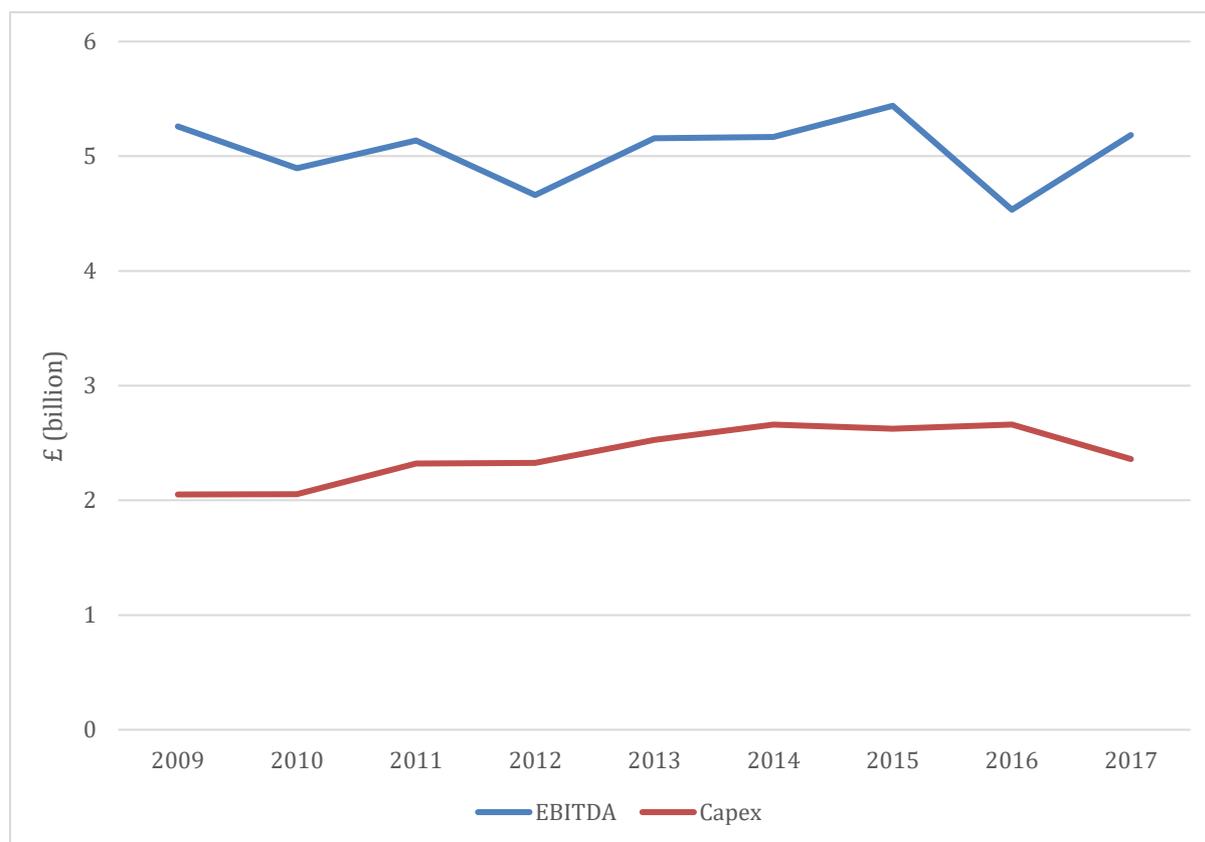
5.101 Overall, we do not consider that the available data provides compelling evidence that ALFs at market value are likely to distort efficient capex or investment decisions by UK MNOs.

¹⁴⁶ Paragraph 5.82 of the June 2018 consultation.

¹⁴⁷ We use EBITDA minus capex as a proxy for cash flow, although we note it assumes no change in working capital. EBITDA minus capex averaged around £2.6 billion per year over this period (when stated in April 2018 prices i.e. on a consistent basis with the increase in ALF payments), while capex averaged £2.4 billion.

¹⁴⁸ Following the acquisition of EE by BT in January 2016, BT reorganised EE's business divisions into several of its own divisions (i.e. EE, Business and Public Sector and Wholesale and Ventures). Hence the drop in EBITDA from 2015 to 2016 can be partially explained by this reorganisation. EE's EBITDA for 2016 and 2017 only relate to mobile services, broadband and TV.

Figure 5.1: Aggregate capex and EBIDTA for the 4 MNOs, 2009 to 2017 (April 2018 prices)



Source: Ofcom, based on Company financial reports, excluding expenditure on spectrum fees. Note: Vodafone figures relate to the year ending March 31st following the year shown. O2 figures have been converted from euros to pounds using average in-year exchange rates. EE figures up to 2015 are as per its own financial statements for the years ending 31 December. From 2016 onwards, (post acquisition of EE by BT), EE's figures are as per the EE segment in BT's consolidated financial statements for the years ending 31 March. Post-acquisition, EE's business division and MVNO business has been absorbed into BT's "Business and Public Sector" and "Wholesale and Ventures" business lines respectively.

5.102 In response to BT's other points:

- a) Our position does not "implicitly assume that the cost of internal financing is the same as external financing". We have summarised in paragraph 5.98 above the circumstances in which these costs may differ, and the implications for our impact assessment.¹⁴⁹
- b) We disagree that setting ALFs at market value is analogous to a direct tax such as higher corporate tax rates. Corporate tax rates are a marginal tax on profits and would therefore be expected to affect firms' investment incentives differently to a fixed licence fee (or at least one which is not subject to regular review).¹⁵⁰ In any case, we have explained above our view that efficient investment decisions should reflect the true resource cost of inputs, of which spectrum is one, whereas direct taxes are not an

¹⁴⁹ See also paragraphs 5.82 to 5.86 of the June 2018 consultation.

¹⁵⁰ Corporate tax rates are based on a proportion of profits and so the tax burden increases directly with profitability. In contrast, ALFs are fixed in real terms (i.e. invariant to MNO profits) for a sustained period of time.

input to the provision of mobile services (i.e. they are not a cost related to a factor of production, even if they are a cost of doing business).

- c) We do not consider that Moody's downgrading BT's credit rating necessarily supports a view that higher ALFs will negatively impact investment. The ratings downgrade, while reflecting lower cashflow expectations, was prompted by specific concerns over weaker operational performance owing to underlying structural pressures in its business segment, as well as slowing consumer revenue growth and an expected increase in BT's pension deficit. Moody's also notes that BT's cash flow generation is exposed to the risk of *increased* fibre capital investment.¹⁵¹

Overall view on investment impacts

- 5.103 In summary, we consider that efficient investment will be promoted when operators face a market price (reflective of the relevant resource costs) for the inputs they use. We disagree with stakeholders that ALFs set at market value will lead to lower efficient investment levels. The alternative, of setting ALFs below market value, would effectively be an unconditional subsidy for operators holding such spectrum.

Impact on competition

June 2018 consultation position

- 5.104 In our June 2018 Consultation, we did not consider that ALFs set at market value would be likely to have an adverse impact on competition. We said there is some risk that setting ALFs below market value would have an adverse competition impact, as subsidising 900 MHz or 1800 MHz spectrum in this way would have differential financial effects on MNOs. We also considered that ALFs set at levels corresponding with market values would tend to be pro-competitive as they could help to relieve spectrum scarcity and enable market entry or expansion by smaller providers. Overall, we considered that setting ALFs at market value is consistent with promoting competition.¹⁵²

Stakeholder responses

- 5.105 Telefónica broadly agreed with our assessment that setting ALFs at market value is consistent with competition objectives. It said that our approach ensures all operators face the same cost for the spectrum they hold, regardless of their spectrum mix. By acting conservatively, it avoids the risk of over-pricing spectrum which might unduly constrain less profitable operators.¹⁵³
- 5.106 Vodafone said we should consider how to set ALFs in a manner which best promotes competition, rather than considering whether setting ALFs at market value would result in adverse competition effects. Vodafone also said our assessment of competition impacts is

¹⁵¹ See: https://www.moodys.com/research/Moodys-downgrades-BTs-and-EEs-ratings-to-Baa2-stable-outlook--PR_380805. 23 March 2018.

¹⁵² Paragraphs 5.104 - 5.109, June 2018 consultation.

¹⁵³ Telefónica response to June 2018 consultation, page 12.

not specific to the circumstances of this case, and that “Ofcom needs to prepare a proper, up-to-date analysis of the competitive situation that exists today, as envisaged by the SRSP”.¹⁵⁴

- 5.107 Vodafone referred to one potential adverse competition impact of an operator not being able to compete effectively for a particular segment of customers or “use case” due to relinquishing spectrum required to deliver a specialised service.¹⁵⁵

Our assessment

- 5.108 Our view on spectrum fees and competition, as set out in the SRSP, is that fees are unlikely to introduce distortions to competition in downstream markets when they reflect the opportunity cost of spectrum.¹⁵⁶ However we said in the SRSP that we would consider the potential effect of spectrum fees on competition on a case-by-case basis.
- 5.109 In this context, we disagree with Vodafone that we have not sufficiently considered competition impacts specifically from setting 900 and 1800 MHz ALFs at market value.
- 5.110 We also consider that the approach we have taken is consistent with promoting competition. As we are setting all ALFs on the same basis i.e. to reflect the market value (or forward-looking opportunity cost) of that spectrum, we do not consider that any operator will be disadvantaged by this approach, relative to other mobile operators. We recognise that this implies different operators paying different fees, but this reflects differences in the market value of different spectrum bands. We do not consider that it constitutes a windfall gain (or loss) for any operator; on the contrary, it is placing MNOs with different mixes of (auctioned and non-auctioned) spectrum on a more level footing. Furthermore, if ALFs set at market value revealed differences in value for different MNOs, they can buy or release spectrum to enhance their competitive position.
- 5.111 We have also considered the risk that setting 900 MHz and 1800 MHz ALFs at market value could affect competition by leading operators to relinquish spectrum which they need to be credible. We remain of the view that this is not a likely response. First, this is because of the divisibility of a given holder’s spectrum and our expectation of diminishing marginal value for additional blocks at a given frequency. Even if ALFs at market value were set above the marginal private value to an operator of some of its spectrum blocks at a particular frequency, it is unlikely that the ALF will be above the private value of the spectrum blocks which it requires to be credible (as any operator who needs a particular block of spectrum in order to be credible is likely to place a high valuation on it). Second, in taking a conservative approach to interpreting the evidence on market value, we consider that this risk is unlikely to arise in any case.
- 5.112 We consider that this is equally applicable to spectrum which is required to deliver specialised services or to serve particular customers. Vodafone has not provided any evidence to suggest otherwise, nor provided any examples of what specialised services or

¹⁵⁴ Vodafone response to June 2018 consultation, page 12. Vodafone said (page 15) that the SRSP “commits to giving consideration of competition impacts on a case-by-case basis”.

¹⁵⁵ Vodafone response to June 2018 consultation, pages 15-16.

¹⁵⁶ SRSP, paragraph 4.68.

use cases rely on the full amount of its (or another MNO's) 900MHz and/or 1800 MHz spectrum.

- 5.113 Furthermore, we consider that setting ALFs for 900 MHz and 1800 MHz at market value would be expected to have a pro-competitive impact if it triggers spectrum release by giving licence holders an incentive to relinquish spectrum for which they are not the highest-value users. This could help to relieve spectrum scarcity and enable market entry or expansion by other operators who place a greater value on the spectrum being released.
- 5.114 Set against this, there is a risk that setting ALFs below market value could have an adverse competition impact, by effectively giving MNOs a discount or "subsidy" that is contingent on their existing 900 MHz or 1800 MHz spectrum holdings. This means an MNO with a greater amount of this ALF spectrum would receive a higher absolute subsidy.
- 5.115 Finally, we have not identified any reasons why it might be appropriate to selectively discount certain 900 MHz or 1800 MHz ALFs below market value to promote downstream competition. We have recently assessed competition in the UK mobile services sector as part of our 2017 statement on the award of 2.3 GHz and 3.4 GHz spectrum, and we consider that the current provision of mobile services is generally working well, with the four MNOs competing strongly and prices remaining relatively low compared to other countries.¹⁵⁷ Even if this were not the case, changing competitors' relative input costs via a reduction in ALFs is unlikely to be the most effective approach to promoting competition.
- 5.116 Overall, therefore, we consider that setting ALFs for 900 MHz and 1800 MHz at market value is consistent with promoting competition.
- 5.117 We recognise that the competition impacts considered above from setting fees at market value are also potentially applicable to AIP in other spectrum bands, as Vodafone suggests. However, we do not consider that this changes our assessment here.
- 5.118 We next discuss the implications of the Coverage Obligation.

Geographic coverage obligation

- 5.119 The geographic Coverage Obligation is a set of voluntary commitments agreed between the Government and the four MNOs in December 2014, under which each MNO agreed to reach 90% geographic voice coverage in the UK by the end of 2017. This commitment was given effect through a variation by consent of the MNOs' spectrum licences. However, the MNOs were able to meet the obligation using any frequencies or technologies available to them.

¹⁵⁷ See paragraph 1.14, Ofcom, Award of the 2.3 GHz and 3.4 GHz spectrum bands, Competition issues and Auction Regulations, Statement, July 2017, https://www.ofcom.org.uk/data/assets/pdf_file/0022/103819/Statement-Award-of-the-2.3-and-3.4-GHz-spectrum-bands-Competition-issues-and-auction-regulations.pdf. We will update this assessment as part of our preparation for the design of the award of 700 MHz and 3.6-3.8 GHz spectrum.

June 2018 consultation position

5.120 In the June 2018 consultation, we did not consider it appropriate to reduce ALFs to reflect the incremental cost of the Coverage Obligation. We said that we did not consider it had an impact on the market value of 900 MHz and 1800 MHz spectrum. We also did not consider it constitutes a reason for setting ALFs below market value.

Stakeholder responses

5.121 Respondents argued that we had not taken sufficient account of the geographic coverage obligation in our impact assessment. They made the following points:

- a) **Impact on market value:** BT said the market value of spectrum with a coverage obligation will be lower than without such an obligation.¹⁵⁸ Similarly, Telefónica said that we should at the very least acknowledge that the Coverage Obligation reduces the overall value of spectrum, and address this by being more conservative in our methodology.¹⁵⁹
- b) **Expectations at the time of the Coverage Obligation:** BT said the MNOs had an expectation of a *quid pro quo* with respect to ALFs when agreeing to the Coverage Obligation, and that this is clear from the fact that other benefits to MNOs were agreed at the same time. BT said the fact that the commitment was given voluntarily simply reflects that it could not be imposed without EE's consent, not that it was given gratuitously, just as the fact that a contract is entered into voluntarily does not mean that there are no obligations under it or that it is not reciprocal. It argued that "it is wholly wrong and unfair of Ofcom now to refuse properly to do that which was promised...at the time of acceptance of the Coverage Obligation, which is that Ofcom would consider adjusting ALFs to take account of the costs of implementing the Coverage Obligation".¹⁶⁰ Similarly, Telefónica said the MNOs had reasonable expectations that they would be compensated for the Coverage Obligation commitments through a reduction in ALFs.¹⁶¹ It said our decision not to do so was unexpected, which is contrary to our objective of regulatory predictability. Telefónica also said this removes incentives for future cooperation with Government.
- c) **Impact on investment:** BT said that the costs of meeting the Coverage Obligation have damaged its ability to commit internal funds to network investments.¹⁶² Telefónica said that "Ofcom's failure to compensate operators for the Coverage Obligation in the form of a discount on ALF will likely have a negative impact on future investments", as it reduces the returns that operators will generate on their sunk investments. Telefónica said that, if this happens repeatedly, it will also lead to operators reducing their

¹⁵⁸ BT response to June 2018 consultation, pages 10-11.

¹⁵⁹ Telefónica response to June 2018 consultation, page 13

¹⁶⁰ BT response to June 2018 consultation, page 11.

¹⁶¹ Telefónica response to June 2018 consultation, page 12

¹⁶² BT response to June 2018 consultation, page 12.

expected returns on future investments, which leads to lower investment in the long term (Telefónica refers to this as the “hold-up” problem).¹⁶³

- d) **Differential impacts on operators:** Three said the decision not to adjust ALFs for the Coverage Obligation imposes a disproportionate burden on Three as the MNO with the smallest geographic coverage.¹⁶⁴ BT said that Ofcom has not considered equal treatment of the MNOs, as operators with less sub-1 GHz spectrum (BT/EE, H3G) incur greater costs in meeting the Coverage Obligation.¹⁶⁵ BT said that ignoring these costs would be discriminatory. It also said it is wrong to consider the point solely *ex post facto* as though the Coverage Obligation had been agreed irrespective of ALFs, because the Coverage Obligation was only agreed on the basis that Ofcom would consider adjusting ALFs to take account of the costs of meeting the Coverage Obligation.

5.122 Separately, BT, Vodafone and Three all said that ALFs could be used as a way of further improving mobile coverage beyond the levels set by the existing Coverage Obligation, for instance by establishing a mechanism whereby ALFs are rebated to operators that deploy coverage in hard-to-reach rural areas.

Our assessment

5.123 We have explained in previous consultations (and in the September 2015 Statement) why we consider that the Coverage Obligation does not affect market values.¹⁶⁶ In summary:

- a) The market value of spectrum for the purpose of setting 900 MHz and 1800 MHz ALFs depends on the value to the marginal operator. Each of the four MNOs is subject to the Coverage Obligation whether or not it acquires additional spectrum in the 900 MHz or 1800 MHz bands. So, if the marginal operator for additional 900 or 1800 MHz spectrum is one of the four existing MNOs, it is already subject to the Coverage Obligation whether or not it acquires the additional spectrum in question.
- b) This implies that the impact of the Coverage Obligation on market values for 900 or 1800 MHz would be:
- i) Neutral, if the marginal operator can already meet the Coverage Obligation with its existing holdings such that additional 900 or 1800 MHz spectrum would not increase or decrease its costs of meeting that obligation.
- ii) Positive, if the marginal operator could use an increment of this spectrum to *reduce* its cost of meeting the Coverage Obligation. However, we said this was unlikely. In the case of 900 MHz, for which BT/EE or H3G may be the marginal bidder, we said their 800 MHz spectrum holdings may be adequate to deliver sufficiently wide coverage to assist in meeting the obligation for voice services (as voice over LTE became a viable option). In the case of 1800 MHz, we said all operators’ existing

¹⁶³ Telefónica response to June 2018 consultation, page 12.

¹⁶⁴ Three response to June 2018 consultation, page 20.

¹⁶⁵ BT response to June 2018 consultation, page 12.

¹⁶⁶ See in particular Section 4 of our 2015 Statement.

holdings suggest that the cost of meeting the Coverage Obligation would not be materially affected by acquiring additional 1800 MHz spectrum.¹⁶⁷

- iii) Negative, if it negated any voice coverage advantages that acquiring more of this spectrum would confer if operators were otherwise commercially unconstrained in their choice of voice coverage. However, as set out above, we consider it is unlikely that additional 900 MHz spectrum would confer on the marginal operator a material relevant capability that it could not obtain using its existing 800 MHz spectrum holding. Likewise, extension of voice coverage is unlikely to be a source of value from additional 1800 MHz spectrum, given each MNO's existing spectrum holdings.¹⁶⁸
- c) While it is possible that the marginal user of a spectrum licence could be an operator other than one of the MNOs, this possibility is unlikely to increase the market value of the 900 MHz or 1800 MHz band, because, for instance:
- i) it is not clear that the Coverage Obligation would be imposed on an operator who acquired a spectrum licence but was not one of the four MNOs;
 - ii) valuations of operators other than the existing MNOs had a limited effect on our assessment of the value of the 900 MHz and 1800 MHz licences. Our market value estimates are largely based on marginal valuations by existing MNOs, both in the UK 4G auction and in our international benchmarks;¹⁶⁹
 - iii) to the extent that there may now be a new entrant with a higher value for spectrum than the marginal bidders used in our analysis (both before and after the Coverage Obligation), this would imply that our existing methodology is actually *understating* true market value because our estimates of value are based on the value to a marginal MNO (which in this scenario would be lower than the value to a new entrant).
- 5.124 No stakeholder challenged the specific arguments summarised above in their June 2018 consultation responses and we note that this was not challenged as part of EE's appeal of the 2015 statement.¹⁷⁰ We therefore remain of the view that the Coverage Obligation is unlikely to affect the market value of the 900 MHz band or the 1800 MHz band for the purpose of setting ALFs.
- 5.125 Separately, we understand at least some of the MNOs' responses to our June 2018 consultation to be suggesting that they had a legitimate expectation that fees for the 900 MHz and 1800 MHz bands would be reduced as compensation for the Coverage Obligation.
- 5.126 However, we explained in the June 2018 consultation that the Coverage Obligation was a voluntary commitment and no direct compensation was offered for it by Ofcom or the

¹⁶⁷ See paragraphs 4.29 and 4.34-4.35 of the 2015 Statement.

¹⁶⁸ See paragraphs 4.30-4.31 and 4.36 of the 2015 Statement.

¹⁶⁹ This is also the case for our more recent international benchmarks since 2015, as all the bidders in these auctions were existing national MNOs.

¹⁷⁰ See paragraph 88 of the judgment of the High Court [2016] EWHC 2134 (Admin).

Government, at the time it was agreed.¹⁷¹ We said, in a letter to the Secretary of State of 17 December 2014¹⁷² and in a letter to EE of 27 January 2015, that we would consider whether the Coverage Obligation should impact future ALFs, taking account of the associated incremental costs incurred by the MNOs. This is what we did, and we set out our conclusions in our September 2015 Statement. We do not consider that anything since, including EE's litigation, has changed the position.

- 5.127 We do not accept that in light of the Coverage Obligation, setting ALFs at market value will reduce MNOs' expectations of the returns they can earn on future investments. We do not consider that there has been an exploitation of sunk investments in this case and, in general, we seek to provide an environment of regulatory consistency and stability – which we expect to be conducive to fostering future investment. In the mobile sector that includes the approach to licence terms awarded at auction and the period of stability envisaged for ALFs.¹⁷³ Therefore, we disagree with Telefónica that our approach to ALFs (and our consideration of the Coverage Obligation in that context) constitutes a hold-up problem.^{174 175}
- 5.128 We also remain of the view that ALFs should not be adjusted to take account of the costs of meeting the Coverage Obligation. Insofar as the costs of meeting the Coverage Obligation are different for different operators, this does not on its own present a competition concern. All the operators concerned agreed to the commitment voluntarily and made the investments required to meet the obligation. We have taken into account that the impact of the Coverage Obligation was different for different operators, but this is the case in relation to many operational costs. As such, we remain of the view that setting ALFs at market value would not have a deleterious effect on competition. More generally, we do not consider that providing a subsidy to MNOs by setting ALFs below market value – whether across the board or at different levels for different MNOs – would be an appropriate tool for promoting competition.
- 5.129 Finally, we do not consider that 900 MHz and 1800 MHz ALFs should be adjusted to further improve mobile coverage (i.e. beyond the Coverage Obligation). We do not consider that setting ALFs in this way would be the most effective way to promote other objectives e.g. in respect of optimal spectrum use, investment and competition, which we consider are particularly relevant to our decision on ALFs. We consider that there are superior ways of achieving the objective of improved mobile coverage, including the release of spectrum suitable for improving mobile coverage (such as the upcoming award of 700 MHz

¹⁷¹ Paragraph 5.96, June 2018 consultation

¹⁷² https://www.ofcom.org.uk/_data/assets/pdf_file/0016/130507/78.-Letter-from-Sajid-Javid.pdf This was in response to the letter of the Secretary of State of the same date – see

https://www.ofcom.org.uk/_data/assets/pdf_file/0015/130506/79.-Letter-from-Ed-Richards.pdf

¹⁷³ Specifically, we generally award spectrum licences for 20-year minimum terms with a five-year notice period for revocation. In circumstances where ALFs are applicable, we have said we would be unlikely to review them in the next five years save in very exceptional circumstances (as explained in paragraph 6.20).

¹⁷⁴ As Telefónica explains, hold-up occurs when the return on one party's sunk investments can be expropriated *ex post* by another party.

¹⁷⁵ Regarding BT's argument that the Coverage Obligation has damaged its ability to commit internal funds to network investment, we have set out our view on this point in paragraphs 5.92 to 5.103 above.

spectrum) and we will continue to work to promote mobile coverage in such ways.¹⁷⁶ We have also recently published advice to government on further options for improving mobile coverage.¹⁷⁷

Overall view on setting ALFs at full market value

- 5.130 For the reasons set out in this section, we consider that setting ALFs at market value, while taking a conservative approach to interpreting the evidence:
- a) will secure the optimal use of spectrum which we consider to be in the interests of UK citizens and consumers;
 - b) benefits consumers by ensuring that spectrum is used in the most efficient way for the provision of downstream services for which there is greatest value. We recognise that it could lead to higher consumer prices than if ALFs were set at a discount to market value. However, we consider that retail prices should reflect the resource costs of spectrum, and this does not represent a market failure, or markets failing to work in the interests of consumers;
 - c) can be expected to promote efficient investment, and we do not have evidence that efficient investment would be deterred by ALFs at market value; and
 - d) is consistent with promoting competition.
- 5.131 Therefore, we consider that, as well as being consistent with the Direction, setting ALFs at market value will best meet our statutory duties relevant to the setting of spectrum licence fees.

¹⁷⁶ See: <https://www.ofcom.org.uk/consultations-and-statements/category-2/700-mhz-coverage-obligations>.

¹⁷⁷ See: https://www.ofcom.org.uk/data/assets/pdf_file/0017/120455/advice-government-improving-mobile-coverage.pdf

6. Conclusions and implementation

Levels of ALFs for 900 MHz and 1800 MHz frequency bands

- 6.1 As set out in Section 5 (see paragraphs [x] and [x]), we consider that setting ALFs at market value will meet our statutory duties relevant to the setting of spectrum licence fees.
- 6.2 From the analysis summarised in Section 4 (supported by Annex 1 to 5), the base levels of annual licence fees, expressed in April 2018 prices (i.e. before adjustment for CPI inflation), are:
- a) £437,200 per each 2 x 200 kHz national channel in the 900 MHz band, which is equal to £1.093 million for 1 MHz within the same band; and
 - b) £322,000 per each 2 x 200 kHz national channel in the 1800 MHz band, which is equal to £0.805 million for 1 MHz within the same band.

Implementation

- 6.3 This section sets out how we have implemented the revised fees, including:
- a) common effective date;
 - b) phasing in; and
 - c) inflation indexation.

Common effective date

- 6.4 No consultation respondent disagreed with our view that it is appropriate to introduce the revised ALFs so that all licensees pay a rate that reflects the market value of the corresponding spectrum from the same point in time, with ALFs payable on each following anniversary.
- 6.5 Accordingly, we have maintained 31 October as the common actual payment date, with a common effective date for the new fee regulations of 31 January 2019.
- 6.6 We are pro-rating the revised ALF payable for the period between 31 January 2019 and 30 October 2019. Where licensees have elected to pay the existing ALF in instalments over the year, we will adjust their current instalment plans by adding on a sum to reflect the new fee levels.
- 6.7 Since consulting, we have simplified the drafting of the regulations which effects this.

Phasing in

- 6.8 In the June 2018 consultation we proposed not to introduce a phase in period for the new fees. Instead, we proposed that the full fees should be due from the common effective date.

- 6.9 BT said that Ofcom should take an approach on phase-in consistent with the 2015 regulations, i.e. to phase in the increase with 50% of the increase (relative to the current fees paid under the 2011 regulations) due in the first year following commencement of the new regulations and the full amount starting from the second year. It thought it was unclear why Ofcom considered that phasing in was appropriate in 2015 but not in 2018. Other respondents did not comment on this issue.
- 6.10 BT did not accept Ofcom's reasoning that the proposed fee levels are similar to those that licensees were paying under the now quashed 2015 Regulations. It said that this reason was *"not valid if MNOs considered the 2015 fees to be illegal (as was proven to be the case) and expected, and continue to expect, overpaid fees to be refunded and may have had legitimate expectations that the new proposed fees would be lower as a result of Ofcom taking proper account of its full set of statutory duties."*¹⁷⁸
- 6.11 It added that phase-in would both *"reduce risks of harm from the increase in ALFs, such as MNOs' ability to invest in networks for capacity growth, expansion of coverage and introduction of 5G"* and *"reduce the potential impact on consumers and competition"*, while having *"no adverse impact on securing optimal and efficient use of the spectrum"*.
- 6.12 We do not agree with BT's submissions that a phase-in is necessary or appropriate.
- 6.13 In our September 2015 statement, we decided to introduce a two-step phase-in for the fees set out in the 2015 Regulations and explained that, in taking this approach, we were balancing *"a) On one hand the fact that a significant period of time has passed since the Government Direction was made in December 2010, and since the conclusion of the 4G auction in March 2013"* and *"b) On the other hand, recognising that the revised ALFs are significantly higher than the current level of fees."*
- 6.14 We consider that the circumstances are now different and do not justify a phase-in. In particular, we note that:
- a) the Direction has been in force for almost eight years, and that the 4G auction concluded over five years ago; and
 - b) the MNOs paid fees set at similar levels to those which we are setting now from 2015 until the Court of Appeal's judgment in November 2017. Although Ofcom's 2015 fees regulations were quashed, the Direction (which directs us to revise fees for these spectrum bands to reflect full market value) remains in force. As the prior fee levels (to which payments have reverted since the Court of Appeal's judgment) are clearly significantly below full market value, it has been clear since the end of 2017 that Ofcom would be reviewing the level of fees for the 900 MHz and 1800 MHz bands in accordance with the Direction and the Court of Appeal's judgment.
- 6.15 In connection with the risks and potential impacts to investment and on consumers and competition, we respond to these points in detail in section 5 of this document. For the reasons explained there, we do not agree with stakeholders that these potential risks and

¹⁷⁸ BT's response to the June 2018 consultation, pp.34-35.

impacts provide us with sufficient reason to set ALFs below market value. As such, we do not consider that these risks give us reason to phase in ALFs for the 900 and 1800 MHz bands.

Inflation indexation

6.16 As proposed in our June 2018 consultation we consider that it is appropriate to take account of inflation in setting ALFs.¹⁷⁹

6.17 Specifically, we use a formula for calculating each year's ALF (ALF_t) that incorporates an annual adjustment to the ALF in line with inflation, as measured by the CPI. In particular, the nominal value of ALF would change by the ratio:

$$\left[\frac{CPI_t}{CPI_0} \right]$$

where:

- a) CPI_t is the latest available figure for the same index published in the Consumers Price Inflation Reference Tables by the Statistics Board (Office for National Statistics) ("ONS"); and
- b) CPI_0 is the level of the CPI (all items) index in April 2018 (which is currently 105.4).

6.18 We have made a revision to the fee regulations proposed in our June 2018 consultation by replacing the absolute value of 105.4 (which is the CPI value for April 2018) with a formula reference to " CPI_0 " which we define as the "CPI value for April 2018". This change does not affect the ALFs that will be paid in any year compared to the draft fee regulations. However, the change future-proofs the fee regulations such that if the ONS changes the reference year (in which $CPI = 100$) used to calculate the all items consumer price index then it will not be necessary to revise the fee regulations.¹⁸⁰

Application of the revised fees

6.19 A copy of the revised fee regulations is provided in Annex 6.¹⁸¹ The fees set in these regulations will remain applicable until we amend or revoke them.

6.20 This means that, in effect, ALFs are set for an indefinite period and are not time limited. We consider that there is benefit in a period of relative certainty for licensees. We would therefore be unlikely to review ALFs in the next five years save in very exceptional circumstances and would also propose to retain them beyond that date unless there were

¹⁷⁹ June 2018 consultation, paragraph 6.8.

¹⁸⁰ The ONS last changed the reference year in 2016, and as a result we had to issue an amendment to the fee regulation that was in force at that time. See https://www.ofcom.org.uk/_data/assets/pdf_file/0029/77069/cpi_statement.pdf. In response to that consultation Vodafone suggested that we should move to a 'formula reference' as we have now done.

¹⁸¹ The draft of the regulations on which we consulted did not extend them to Jersey, Guernsey and the Isle of Man. Upon reflection, we consider it is appropriate for these regulations to extend there because they amend the 2011 regulations which do extend there. We have made some small amendments to the definitions to make it clear that the new fees do not relate to the licences held by the operators in those jurisdictions using the 900 MHz and 1800 MHz frequencies.

grounds to believe that a material misalignment had arisen between the level of these fees and the value of the spectrum, in keeping with our general policy on fee reviews.