
Annual Licence Fees for 900 MHz and 1800 MHz frequency bands

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CONSULTATION:

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About this document

This document consults on the level of annual licence fees we should set for 900 MHz and 1800 MHz spectrum, and on draft regulations to achieve that.

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1. Executive summary

- 1.1 This document consults on levels of annual licence fees (**ALFs**) for 900 MHz and 1800 MHz spectrum, to be paid by mobile network operators (MNOs) from the date we make new regulations. 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 proposed ALF levels, we have had regard to our statutory duties as well as 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.
- 1.3 Consistently with both the Direction and our existing general policy on spectrum pricing (which was itself established having regard to our statutory duties), 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 in determining this. The analysis requires us to exercise our regulatory judgment in several respects, in light of our duties.
- 1.4 We have then converted these lump-sum values into an equivalent annual rate by applying an annualisation rate. This is derived from a post-tax discount rate (taking into account the nature 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).
- 1.5 We have then assessed, applying our statutory duties, whether these annual figures which have initially been derived at market value should be modified.
- 1.6 Our provisional conclusion, following this consideration of our duties, is that it is appropriate for us to revise fees to the level of full market value, and that the appropriate ALFs for these bands (expressed in April 2018 prices) are:
 - a) 900 MHz: £1.150m per MHz per annum
 - b) 1800 MHz: £0.908m per MHz per annum
- 1.7 We wish to consult on these conclusions including specifically the issue of how our duties impact upon the correct level of fees, and the notice of the proposal is set out at Annex 5.

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. There is an annual fee for holding a licence.

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

2.3 In December 2010, the Government directed Ofcom to award 4G licences in the 800 MHz and 2600 MHz 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 4G licences in 2013. In September 2015, Ofcom set new annual licence fees (**ALFs**) for the 900 MHz and 1800 MHz spectrum bands.¹ In November 2017, the Court of Appeal quashed that 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 2003.² Specifically, the Court stated that whilst the Secretary of State has powers to issue directions to Ofcom under section 5 WTA in relation to Ofcom's exercise of its radio spectrum functions, section 5 WTA 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.

¹ The Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) (Amendment and Further Provisions) Regulations 2015¹ (the **2015 Regulations**).

² [2017] EWCA Civ 1873.

- 2.4 As a result of the Court of Appeal’s order quashing the 2015 Regulations, we therefore now consider what the appropriate level of ALFs is, having regard as appropriate to the Direction read together with our statutory duties.
- 2.5 The legal framework for the setting of ALFs derives from our duties under both European and domestic legislation, specifically from:
- the Common Regulatory Framework³ for electronic communications networks and services, in particular the Framework Directive and the Authorisation Directive;
 - the Communications Act 2003 (the “Communications Act”) and the Wireless Telegraphy Act 2006 (the “Wireless Telegraphy Act”) which transpose the provisions of those directives into national law; and
 - in the case of licences for frequencies in the 900 MHz and 1800 MHz bands, The Wireless Telegraphy Act 2006 (Directions to OFCOM) Order 2010 (the Direction defined in paragraph 2.3 above).

Common regulatory framework

- 2.6 Article 8 of the Framework Directive sets out the objectives which national regulatory authorities must take all reasonable steps to achieve. These include:
- 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
 - 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.
- 2.7 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):
- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services; and
 - promoting efficient investment and innovation in new and enhanced infrastructures.
- 2.8 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.
- 2.9 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

³ 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).

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.

- 2.10 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.
- 2.11 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.
- 2.12 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

- 2.13 Section 3 of the Communications Act sets out Ofcom's general duties including its principal duty:
- to further the interests of citizens in relation to communications matters; and
 - to further the interests of consumers in relevant markets, where appropriate by promoting competition.
- 2.14 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.
- 2.15 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.
- 2.16 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.

- 2.17 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.
- 2.18 Section 4 of the Communications Act requires Ofcom 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 2006.

The duties imposed by the Wireless Telegraphy Act 2006

- 2.19 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.
- 2.20 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.

Ofcom's power to set fees

- 2.21 Under section 12 of the Wireless Telegraphy Act Ofcom has 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.
- 2.22 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 Communications Act.
- 2.23 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.

The Direction

- 2.24 Under section 5 WTA, the Secretary of State may 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.

- 2.25 In December 2010, the Government issued the Direction as part of a package of reforms of spectrum management, including making licence terms indefinite and liberalising spectrum in the hands of the incumbent operators. The Direction required Ofcom to revise the fees payable for licences to use radio spectrum in the 900 MHz and 1800 MHz bands so that they reflect the full market value of the 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).
- 2.26 Both the validity and the correct interpretation of the Direction were considered in EE's litigation, as was the underlying section 5 WTA power. The Court of Appeal held that although section 5 WTA allows the Secretary of State to give directions to Ofcom "about the carrying out by them of their radio spectrum functions" – including the power in section 12 WTA to set licence fees – it does not transfer to the Secretary of State the function of exercising the section 12 power. The Court of Appeal further held that in making the Direction, the Secretary of State did not purport to give himself that power, and that the Article 8 Framework Directive considerations (set out above) were not excluded from Ofcom's determination of the licence fees.
- 2.27 The legality of the Direction was however not put in issue and it therefore remains valid, as interpreted by the Court of Appeal.

3. Proposed approach to determining ALFs

- 3.1 Ofcom's general policy position in light of our statutory duties has been and remains that there are good regulatory reasons to set fees by reference to market value even where there is spectrum trading.⁴
- 3.2 The Direction is consistent with this in requiring Ofcom to revise the relevant fees so that they reflect the full market value of the frequencies.⁵
- 3.3 Therefore, we start by identifying the level of ALFs if they were set at an appropriate estimate of market value.
- 3.4 In 2015, we considered that because of the terms of the Direction we had no discretion to assess whether fees at full market value would be appropriate having regard to our duties more generally. In this document, once we have considered the market value of the spectrum, we go on to consider whether in light of our statutory duties there is any reason for us to set ALFs at a level which is not full market value.
- 3.5 In light of that assessment, we then reach a view of the appropriate level of ALFs.

Market value

- 3.6 We consider that the general approach we used in 2015 to assess market value continues to be appropriate.⁶ We note that EE appealed Ofcom's 2015 decision (the **2015 Statement**), supported by the other MNOs, on two grounds: first, that Ofcom erred in law in failing to take account of its statutory duties and second, Ofcom failed to consider evidence from avoided cost modelling in determining the market value. The High Court dismissed the appeal on both grounds⁷ and EE's appeal to the Court of Appeal was on the first ground only. It was refused permission to appeal by the High Court on the second ground and did not renew that application.
- 3.7 Neither the 900 MHz nor the 1800 MHz spectrum has been auctioned in the UK. Rather, we have evidence of the market value of other bands which have been auctioned in the UK, and of the 900 MHz, 1800 MHz and other bands in other countries where they have been auctioned.
- 3.8 Our approach to deriving ALFs at market value in our 2015 Statement can be summarised as follows:
 - a) We first 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 4G auction.

⁴ 2010 consultation and statement on our Strategic Review of Spectrum Pricing ("the **SRSP**")

⁵ 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.

⁶ Our analysis of market value in 2015 was not successfully challenged. See [2016] EWHC 2134 (Admin), paragraphs 105 to 113.

⁷ [2016] EWHC 2134 (Admin).

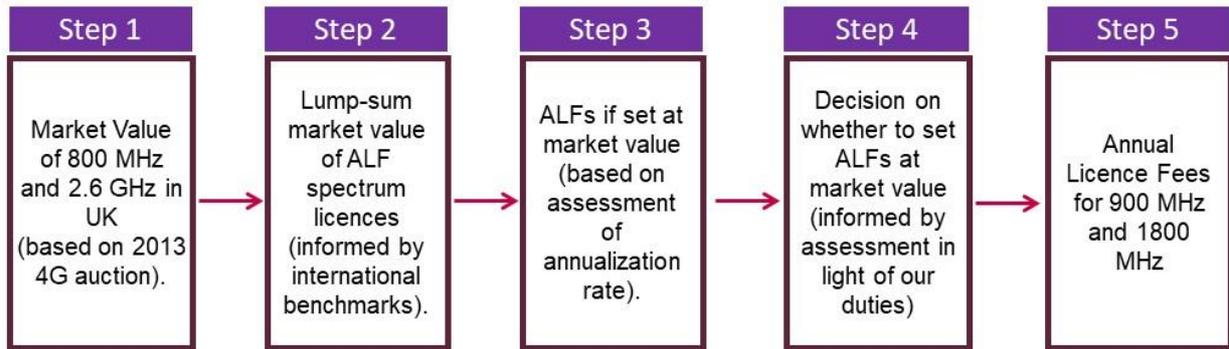
- b) We considered auction prices for 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz spectrum in European countries from 2010 onward from which we derived the relative values of the 900 MHz and 1800 MHz bands (the 'ALF bands') to 800 MHz and 2.6 GHz spectrum in these benchmark countries. We used these relative 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 (GCO) agreed between the licensees and the Government in December 2014. We concluded that the GCO was unlikely to have a material effect on 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 GCO.
- d) We derived lump-sum values of the ALF 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 adopting a conservative interpretation of this evidence.
- e) To convert the lump-sum values into an equivalent annual rate, we applied an annualisation rate, derived from a post-tax discount rate (which took into the nature or 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).

3.9 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 appropriate discount rate and tax adjustment factor.

3.10 The framework we propose for deriving an appropriate level of ALF is illustrated in Figure 3.1. This framework broadly follows that in our 2015 Statement, except that

- a) It includes a further assessment of our duties in Step 4.
- b) As we have previously reached a view that the GCO does not have an impact on the market value of ALF spectrum, we have not presented this as a separate step in Figure 3.1. We consider further arguments relating to the GCO in the assessment in Section 5 below.

Figure 3.1: Framework of steps



Source: Ofcom

- 3.11 Section 4 below sets out our assessment of market value and ALFs if set at market value. Section 5 sets out our assessment of that level of ALFs in light of our statutory duties. Section 6 sets out our proposals for ALFs.

4. Derivation of ALFs if set at market value

Introduction

- 4.1 In this section we set out our proposed approach to establishing the market values of ALF licences and the equivalent annual licence fees if set at market value (steps 1 to 3 of our framework of steps set out in Figure 3.1 above).
- 4.2 We define full market value for the purpose of ALF 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.

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

High-level overview of methods

- 4.3 As in the 2015 Statement, we derive the market value of each of the 800 MHz and 2.6 GHz bands for the purposes of ALF through analysis of a range of methods to assess the evidence from the UK 4G auction:⁸
- a) Prices in the 4G auction, which were determined as the higher of (i) reserve prices and (ii) the incremental bid value⁹ 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
 - 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

⁸ For the detail underlying the analysis summarised here, see our 2015 Statement, section 2 and annex 6.

⁹ i.e. the bidder’s difference in bid value between two different packages for a specified increment of spectrum.

for the 2.6 GHz band of most of the complicating factors that arise in the analysis of the 800 MHz band.¹⁰

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. We concluded¹¹ that:
- 4.6 “Taking account of the evidence and analysis... and applying our regulatory judgment, our conclusion is that an appropriate market value of the 800 MHz band for the purpose of ALF is £30m per MHz. In our view, this is more likely to understate market value than to overstate it¹²...”
- 4.7 This market value figure for the 800 MHz spectrum in March 2013 prices 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.¹³
- 4.8 The equivalent April 2018 prices, updated for CPI¹⁴ 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

- 4.9 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.
 - d) Our conservative estimate based on marginal bidder analysis was £5.5m per MHz.

¹⁰ 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 ALF bands; the relevant marginal increment of spectrum; and the (at that time) proposed mergers between participants in the 4G auctions.

¹¹ 2015 Statement, paragraph 2.58.

¹² The reasons why we considered it more likely to understate market value than overstate it were set out in paragraph 2.205 of our 2015 Statement.

¹³ The analytical steps to deriving these estimates are set out in detail in paragraphs 2.59-2.201 of our 2015 Statement.

¹⁴ Consumer Price Index.

- 4.10 In our 2015 Statement (paragraph 2.207(e)) we concluded that:
- 4.11 “Taking account of the evidence and analysis... we conclude that an appropriate market value of the 2.6 GHz band for the purpose of ALF is **£5.5m per MHz**.”¹⁵
- 4.12 We also noted that (paragraph 2.228):
- 4.13 “...[I]n our view, there is a risk that £5.5m per MHz may understate market value. Nevertheless, we prefer this estimate because we consider that we should adopt a conservative approach when interpreting the evidence.”
- 4.14 The equivalent April 2018 price is £5.9m per MHz.

Ofcom’s view

- 4.15 The UK 4G auction concluded in March 2013. Based on a conservative interpretation of bids in this auction, we reached a conclusion on forward-looking market values in September 2015.
- 4.16 In our view, market developments do not provide clear evidence that the value of either the 800 MHz or the 2.6 GHz band have changed since 2013. On the one hand, developments such as enhanced MIMO (multiple input multiple output) may offer routes to increasing capacity without additional spectrum, and the prospects of deploying such technologies may be clearer than was the case in 2013. On the other hand, mobile data demand has continued to grow, and is expected to rise sharply over the next decade (see paragraph 4.39 below).
- 4.17 Annex 4 discusses mobile spectrum awards in Europe since our 2015 Statement. We have identified two awards of 800 MHz and 2.6 GHz spectrum, in Cyprus and Poland. In Cyprus, band-specific prices were not obtainable as prices were for packages including spectrum from both bands. In Poland, the price of 800 MHz spectrum was £125m per MHz in UK equivalent terms, several times higher than our UK estimate, while the 2.6 GHz price was £3.2m per MHz. We do not consider that these results provide a reason to revise our estimates of the UK values of 800 MHz or 2.6 GHz.
- 4.18 As set out in Annex 4, we completed the public sector spectrum release (**PSSR**) auction of the 2.3 and 3.4 GHz bands on 13 April 2018, and we note that the auction price of the 2.3 GHz band was broadly similar to the market value for 2.6 GHz spectrum in our 2015 Statement (£5.5m per MHz).
- 4.19 Our view is that 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** are the appropriate estimates of the lump-sum market value of these bands based on the sums bid in the auction.

¹⁵ The analytical steps to deriving this estimate are set out in more detail in paragraphs 2.207-2.231 of our 2015 Statement.

Step 2: Benchmarks for 900 MHz and 1800 MHz

Proposed approach

- 4.20 We have 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 band¹⁶ 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 ALF spectrum in the UK.
- 4.21 A number of country-specific factors have the potential to affect auction prices in comparator countries relative to the UK. Licence holders have 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 income levels and willingness to pay for mobile services, will be reflected in the PPP 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 expect that relative values are less likely to be affected by country-specific factors than absolute values.¹⁷
- 4.22 For the 900 MHz band, we focus on the relative value of 900 MHz to 800 MHz licences in countries where both bands have been auctioned. We consider 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.¹⁸
- 4.23 For the 1800 MHz band, we adopt 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 MHz generated by the distance method reflect the UK auction values of both 800 MHz and 2.6 GHz spectrum in the UK auction. We consider that, in principle, this is an advantage over the paired ratios of 1800 MHz to 800 MHz and 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.¹⁹

¹⁶ 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.

¹⁷ See August 2014 consultation, paragraph A7.37 to A7.41.

¹⁸ See August 2014 consultation, paragraph 3.23.

¹⁹ We set out details of these calculations in Annex 7 of our 2015 Statement (paragraphs A7.81-A7.84).

- 4.24 We focus on these 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.
- 4.25 We categorise the available relative value benchmarks into three tiers, which reflect how informative of UK market values we considered them to be (placing more weight on benchmarks in higher tiers). Our criteria for placing a benchmark in Tier 1 (highest quality) are that:
- a) The auction prices appear likely to have been primarily determined by a market-driven process of bidding in the auctions (generally this means the prices were not set by reserve prices);
 - b) Based on the evidence available to us, the relative prices in the auction are at least as likely to be based on bidders' intrinsic valuations of spectrum as on strategic bidding; and
 - c) The outcome appears likely to be informative of forward-looking relative spectrum values in the UK, having regard to country-specific circumstances and auction dates.
- 4.26 Our criteria for placing a benchmark in Tier 2 are that one or more of the criteria for Tier 1 are not met; but (a) there is some evidence that the relative auction prices reflect bidders' relative intrinsic valuations of different bands, and (b) while there is a clear, evidence-based reason for considering that the outcome is less informative of forward-looking relative spectrum values in the UK, the outcome is not obviously uninformative of forward-looking relative spectrum values in the UK. Our criterion for placing a benchmark in Tier 3 is that it does not meet the criteria for Tier 1 or Tier 2.
- 4.27 In addition to our assessment of which tier a benchmark is in, we have assessed whether there is a risk that each benchmark is an understated or overstated estimate of the UK value of the relevant band.
- 4.28 In response to consultations prior to our 2015 statement, stakeholders generally agreed with our focus on relative value benchmarks rather than absolute value benchmarks, and with the specific relative value benchmark measures we used (i.e. the 900 MHz / 800 MHz ratio benchmark, and the 1800 MHz distance method benchmark). Our view is that we should continue to focus on relative value benchmarks derived using these methods in assessing lump-sum values.

Relative value benchmarks

- 4.29 In our 2015 Statement we derived the following specific relative value benchmarks for:
- a) 900 MHz:
 - i) three Tier 1 benchmarks (Austria, Germany (2015 auction) and Ireland);
 - ii) two Tier 2 benchmarks (Portugal and Spain); and
 - iii) three Tier 3 benchmarks (Denmark, Greece and Romania).

- b) 1800 MHz:
 - i) five Tier 1 benchmarks (Austria, Germany (2015 auction), Ireland, Italy and Sweden);
 - ii) one Tier 2 benchmark (Germany, 2010 auction); and
 - iii) five Tier 3 benchmarks (the Czech Republic, Greece, Portugal, Romania and the Slovak Republic).

4.30 In addition to the auctions considered in our 2015 Statement, in Annex 4 we have considered relevant European auctions that have 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.

900 MHz

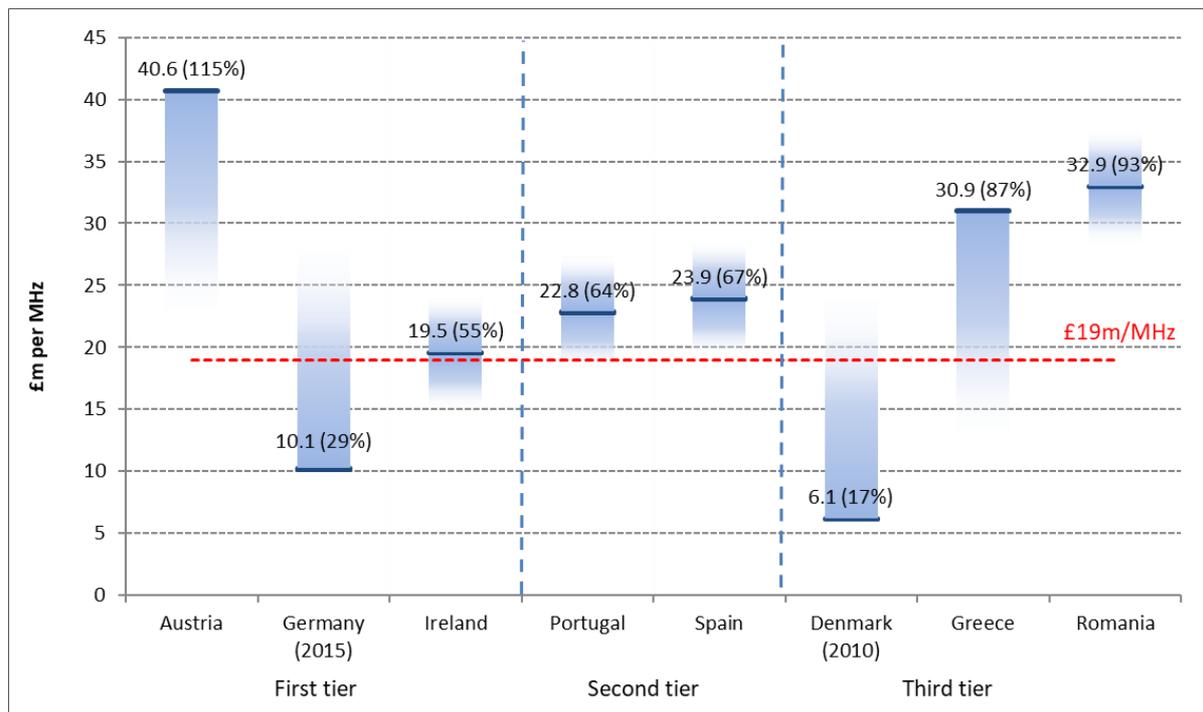
4.31 As set out in Annex 4, we are unable to derive any suitable 900 MHz / 800 MHz benchmarks from European auctions that have taken place since the publication of our 2015 Statement. However, as discussed below, we have considered evidence from these auctions as cross-checks on our estimate of the market value of 900 MHz.

4.32 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.²⁰ Percentages in brackets represent the 900 MHz / 800 MHz ratio.²¹ The values shown are equivalent to those in Figure 5.1 of our 2015 Statement, updated to April 2018 prices. The figure also shows our estimate of the lump-sum value of 900 MHz spectrum in the UK, discussed below.

²⁰ 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 conclusions on the risk of potential understatement or overstatement in the 2015 Statement which we still consider to be relevant.

²¹ 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, the ratio shown in Figures 4.1 and 4.2 are different from the ratio used to generate the relative value benchmark.

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



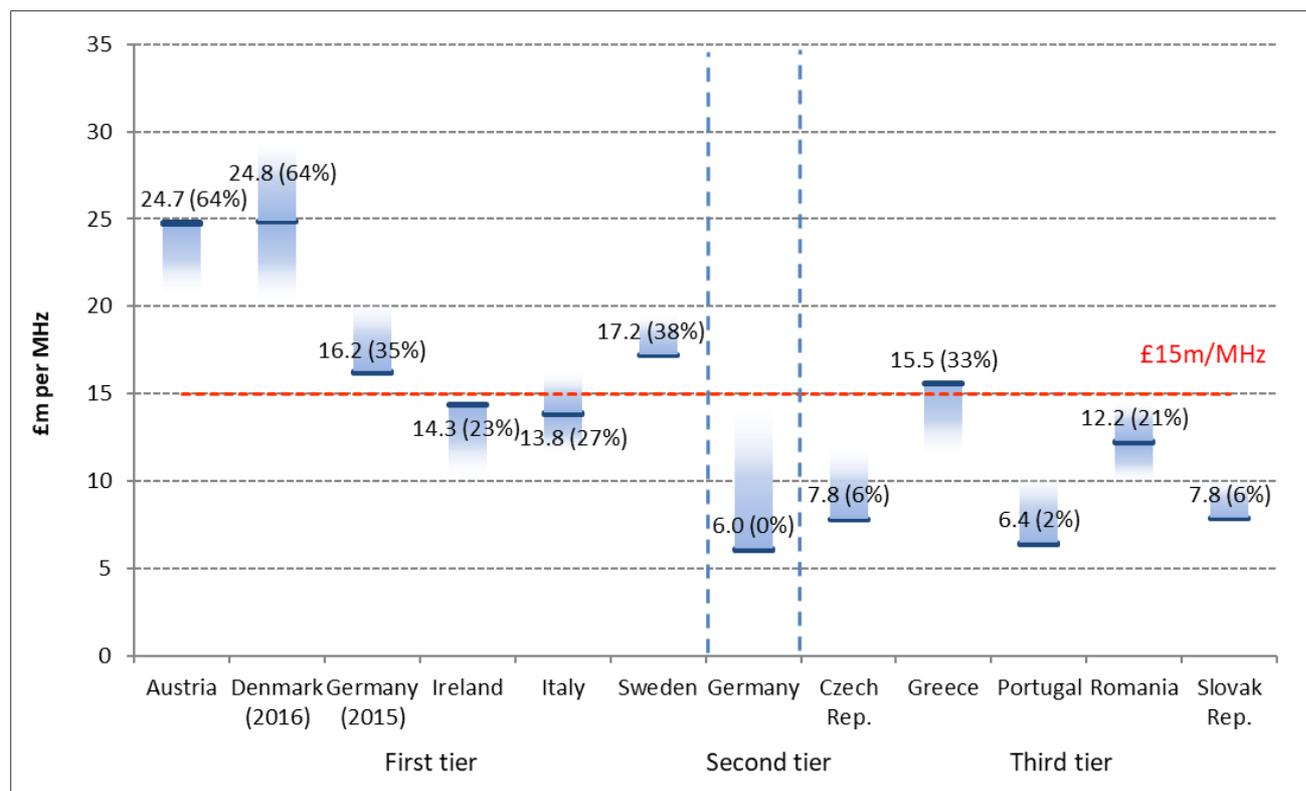
Source: Ofcom

1800 MHz

4.33 As set out in Annex 4, paragraphs A4.47 to A4.56, we have derived a distance method benchmark of the value of 1800 MHz spectrum from auctions in Denmark, and our view is that this is a Tier 1 benchmark, with a risk of either understatement or overstatement. The 1800 MHz distance method benchmarks are shown in Figure 4.2, grouped by tier. Percentages in brackets represent the Y/X ratio.²² With the exception of Denmark, the values shown are equivalent to those in Figure 5.2 of our 2015 Statement, updated to April 2018 prices. The figure also shows our estimate of the lump-sum value of 1800 MHz spectrum in the UK, discussed below.

²² See footnote 21.

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



Source: Ofcom

Assessment of lump-sum values of ALF if set at market value

Proposed approach

4.34 We consider that the general approach to deriving ALFs if set at market value that we used in the 2015 Statement remains appropriate. In Section 5 of our 2015 Statement we set out the estimates of the lump-sum values of 900 MHz and 1800 MHz which we used as a basis for setting ALFs. 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 cross-checks, such as:
 - 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.

4.35 The first of these steps involved using our judgment as to how most appropriately to assess the available benchmarks, rather than relying on summary statistics such as weighted averages. In using our judgment, we adopted a conservative approach to interpreting the evidence, as set out in paragraphs 1.38 to 1.43 of our 2015 Statement.

Developments in technology, mobile data demand, and spectrum availability

- 4.36 In our 2015 Statement²³ we recognised the possibility that the market value of ALF spectrum might have changed since the 4G auction. In particular, we considered that there might be greater certainty over the availability of potential substitute bands for mobile spectrum use (700 MHz, 2.3 GHz, 3.4 GHz and 1452- 1492 MHz), and that this might serve to reduce the forward-looking market value of current mobile bands such as 900 MHz and 1800 MHz. This was one of the reasons why we considered we should adopt a conservative approach when interpreting the available evidence on market values.
- 4.37 We also considered that technological developments could have an impact on forward-looking market values. For example, we considered that there was a risk of understatement of relevant 900 MHz benchmarks from an increase in the attractiveness of the LTE900 ecosystem²⁴, and that there was a risk that 1800 MHz awards which took place before 2012 may have understated the more recent (i.e. 2015) market value of 1800 MHz relative to 800 MHz and 2.6 GHz given that the increased interest in Europe in 1800 MHz for LTE can be reasonably dated between late 2011 and early 2012.²⁵ In light of this, we took account of the date of award in our interpretation of the relevant 1800 MHz benchmarks.²⁶
- 4.38 We have 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.
- 4.39 Over the last five years, demand for mobile capacity has grown at a cumulative annual rate of more than 50%, and we expect this sort of increase in demand to continue. Although projections of future growth are uncertain, there is a broad consensus that mobile data consumption will increase sharply over the next decade – potentially by a factor of 10 to 100. Such a rapid growth in demand places pressure on MNOs to increase their capacity in order to meet growing consumer expectations.²⁷ In our 2016 Mobile Data Strategy update²⁸ we noted that mobile data traffic had grown faster than we had forecast in our 2014 Mobile Data Strategy statement.²⁹
- 4.40 Increasing demand could increase the forward-looking value of ALF spectrum. On the other hand we are now intending to auction 3.6 GHz – 3.8 GHz spectrum in 2019 alongside the 700 MHz band. This will provide additional capacity compared to that which was expected

²³ See Annex 9, paragraph A9.5.

²⁴ See 2015 Statement, Annex 9, paragraph A9.78.

²⁵ See 2015 Statement, Annex 9, paragraph A9.80.

²⁶ See 2015 Statement, Annex 9, paragraph A9.83. The way in which we did this was explained in paragraphs A7.143- A7.145 of the February 2015 consultation.

²⁷ See *Ofcom, Award of the 2.3 and 3.4 GHz spectrum bands: Competition issues and Auction Regulations, paragraphs 1.5-1.6*. 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

²⁸ *Ofcom, Mobile Data Strategy - Update on our strategy for mobile spectrum*, June 2016, paragraph 3.7, https://www.ofcom.org.uk/data/assets/pdf_file/0033/79584/update-strategy-mobile-spectrum.pdf

²⁹ *Ofcom, Mobile Data Strategy Statement*, May 2014, paragraph 1.2.

https://www.ofcom.org.uk/data/assets/pdf_file/0027/58347/Mobile-Data-Strategy-statement.pdf

to be made available for mobile use at the time of our 2015 Statement. In addition, as noted in paragraph 4.16 above, developments such as enhanced MIMO (multiple input multiple output) may offer routes to increasing capacity without additional spectrum. Our understanding is that this technology is likely to be less well-suited for low frequency spectrum such as 900 MHz.

- 4.41 On balance, we do not consider that recent technological or commercial developments provide clear evidence as to whether the forward-looking value of 900 MHz or 1800 MHz spectrum is higher or lower than in our 2015 assessment.

Estimates of market value in the UK

900 MHz

- 4.42 We have not revised our view of the forward-looking value of the 900 MHz band or the 800 MHz band in the UK. Nor have we identified any new or revised 900 MHz / 800 MHz ratio benchmarks. Having reviewed the relevant evidence, our view is that our assessment for our 2015 Statement continues to be relevant for a forward-looking assessment. We consider that, subject to cross-checks, **£19m per MHz** is an appropriate lump-sum value of 900 MHz spectrum (in April 2018 prices). This is based on taking the estimate of £18m (in March 2013 prices) in our 2015 Statement, adjusting for inflation to get £19.3m, and then rounding to the nearest £1m, consistent with our approach in our 2015 Statement.

1800 MHz

- 4.43 We have six benchmarks in Tier 1: Austria, Denmark, Germany 2015, Ireland, Italy and Sweden. The highest, Denmark, is around 80% higher than the lowest, Italy, while Germany, Ireland and Sweden are somewhat closer to Italy than to Denmark, and Austria is closer to Denmark. There is a larger risk that the Austria and Ireland benchmarks overstate the UK market value, although in both cases we cannot be sure of the scale of potential overstatement. There is a risk that the Sweden benchmark understates UK market value, and a larger risk that the Germany 2015 benchmark understates it, although, again, we cannot be sure of the scale in either case. The average of the Tier 1 benchmarks is £18.5m per MHz.
- 4.44 In light of our view that we should take a conservative approach to interpreting the evidence, and the risk of overstatement in two of the benchmarks, we consider that in looking at the Tier 1 benchmarks alone an appropriate estimate of UK market value would be between the average (£18.5m per MHz) and the lowest of these five benchmarks (i.e. Italy at £13.8m per MHz). The midpoint between these two values is £16.1m per MHz.
- 4.45 In our 2015 Statement, we considered that, viewing the evidence in the round, an estimate below this midpoint would be more appropriate than one at the midpoint, because the Ireland benchmark was at larger risk of overstatement, and if this benchmark were overstated by more than 4% the true value of the lowest benchmark in Tier 1 might be

lower than we have taken it to be.³⁰ The additional benchmark from Denmark increases the average of Tier 1 benchmarks compared to 2015, and hence increases the value of the midpoint. We have also considered whether, in light of the addition of this benchmark, which is somewhat higher than all of the other benchmarks, and for which we have identified a risk of either understatement or overstatement, there may be a case for an estimate based on the midpoint, rather than between the midpoint and the lowest value. However, on balance we consider that an estimate of **£15m per MHz** (between the midpoint and the lowest value) would be an appropriate estimate from the Tier 1 benchmarks.

- 4.46 We next consider the single benchmark in Tier 2, which is Germany 2010. The average of Tier 2 benchmarks alone would be £6.0m (i.e. the value of the Germany 2010 benchmark). However, the Germany 2010 benchmark is at larger risk of being a larger understatement. On balance, we do not consider 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.
- 4.47 Although four of the Tier 3 benchmarks are below £15m per MHz, we consider that Tier 3 benchmarks have relatively little informative value and we place considerably less weight on them. In view of the fact that we have four Tier 1 benchmarks with a value above our estimate of £15m per MHz, we do not consider our Tier 3 benchmarks provide a sufficient basis for making an adjustment to the lump-sum estimate derived from Tier 1 benchmarks

Cross-checks

- 4.48 We consider three sets of cross checks:³¹
- 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).³²
 - b) The ratio of our estimates of 1800 MHz to 900 MHz lump-sum values in the UK to the corresponding ratio within 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.
- 4.49 In the 2015 Statement we did not consider that a revision to either of our lump-sum value estimates was appropriate in light of cross checks.³³

³⁰ 2015 Statement, paragraph 5.56.

³¹ 2015 Statement, paragraph 5.69.

³² 2015 Statement, paragraph 5.74.

³³ 2015 Statement, paragraphs 5.87, 5.91, and 5.94.

4.50 We have reviewed these cross checks in light of evidence from recent auctions in Denmark in Norway. We have also considered ratios of 1800 MHz to 800 MHz and to 2.6 GHz in Denmark as an additional cross-check. We have not identified a tier for Norway for 900 MHz or 1800 MHz, as we do not have relative value benchmarks from Norway for either band. However, we consider that the 900 MHz and 1800 MHz prices appear likely to have been primarily determined by a market-driven process of bidding in the auctions based on intrinsic valuations, and to be informative of forward-looking relative spectrum values in the UK – i.e. these evidence points from Norway are consistent with our criteria for Tier 1 benchmarks, and we consider we should give them similar weight in our cross checks as evidence points on absolute values and the ratio of 1800 MHz to 900 MHz from Tier 1 countries.

Absolute values

4.51 We have considered the following evidence from recent auctions as cross-checks to our estimates.

900 MHz

4.52 For 900 MHz, we have considered the evidence in the 2015 Statement, and an additional evidence point of the absolute value in Norway for this band of £28.3m per MHz (in UK equivalent terms). We consider this price to be at risk of understatement.³⁴ This figure is materially higher than our estimate of £19m per MHz.

4.53 The absolute values of 900 MHz spectrum in our benchmarks countries are included in Table 4.1 below and they are also shown in Figure 4.3 below. The values shown are equivalent to those in Table 5.3 and Figure 5.3 of our 2015 Statement, updated to April 2018 prices. The absolute value from Norway is materially higher than our estimate. However, consistent with our approach in our 2015 Statement, we do not consider that a revision to our estimates is appropriate in light of this cross check.

Table 4.1: Absolute values for 900 MHz spectrum (UK-equivalent £m per MHz)

	Absolute value	Tier ³⁵	Known risk of under / overstatement
Denmark (2010)	£3.1m	3	Larger risk of larger under-statement
Germany (2015)	£17.3m	1	Larger risk of under-statement
Norway	£28.3m	N/A	Risk of under-statement
Portugal	£32.0m	2	Larger risk of larger over-statement
Greece	£35.0m	3	Larger risk of larger over-statement

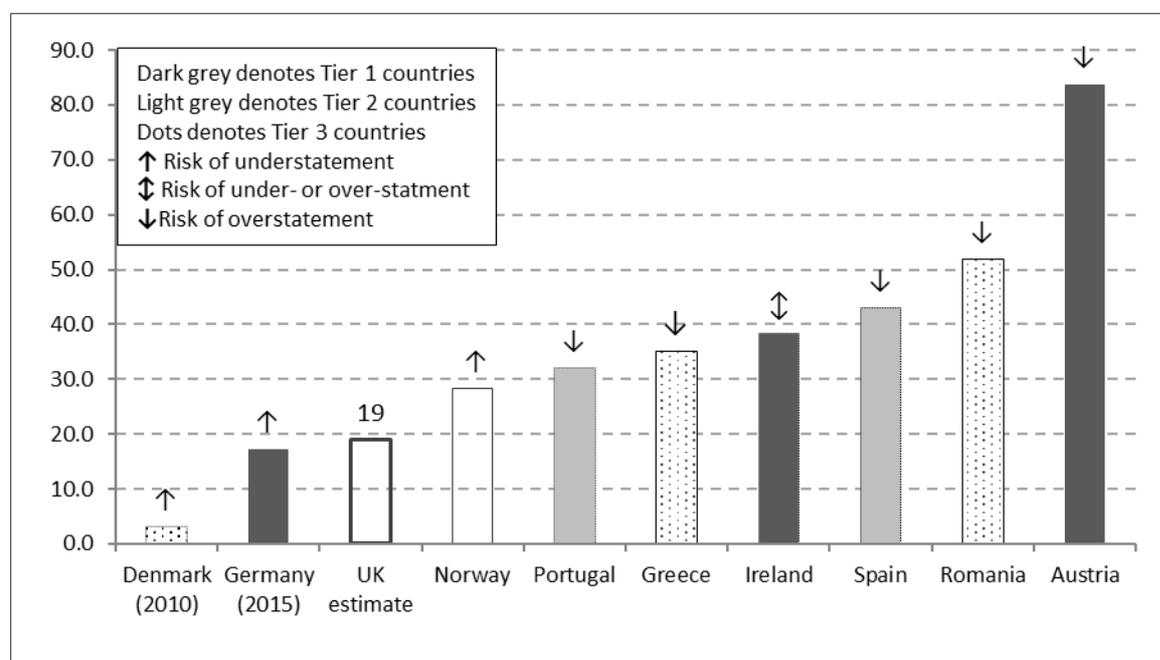
³⁴ See paragraph A4.68.

³⁵ The tiers shown relate to the tiers for the associated relative value benchmark in that country.

	Absolute value	Tier ³⁵	Known risk of under / overstatement
Ireland	£38.3m	1	Risk of under- or over-statement
Spain	£42.9m	2	Larger risk of larger over-statement
Romania	£51.8m	3	Risk of over-statement
Austria	£83.8m	1	Larger risk of larger over-statement

Source: Ofcom

Figure 4.3: Absolute values for 900 MHz spectrum (UK-equivalent £m per MHz)



Source: Ofcom

1800 MHz

4.54 For 1800 MHz, we have considered our revised estimate of market value against the evidence in the 2015 Statement as well as new evidence: the absolute value in Denmark of £16.4m per MHz which we consider to be at risk of overstatement; and in Norway of £38.3m per MHz, for which we have not identified a risk of understatement or overstatement. While the first of these is just above our estimate of £15m per MHz, the second is more than twice as high as this estimate.

4.55 The absolute values of 1800 MHz spectrum in our benchmark countries are set out in Table 4.2 and Figure 4.4 below. With the exception of Denmark and Norway, the values shown are equivalent to those in Table 5.4 and Figure 5.4 of our 2015 Statement, updated to April

2018 prices. Consistent with our approach in our 2015 Statement, we do not consider a revision to our estimates is appropriate in light of this cross check.

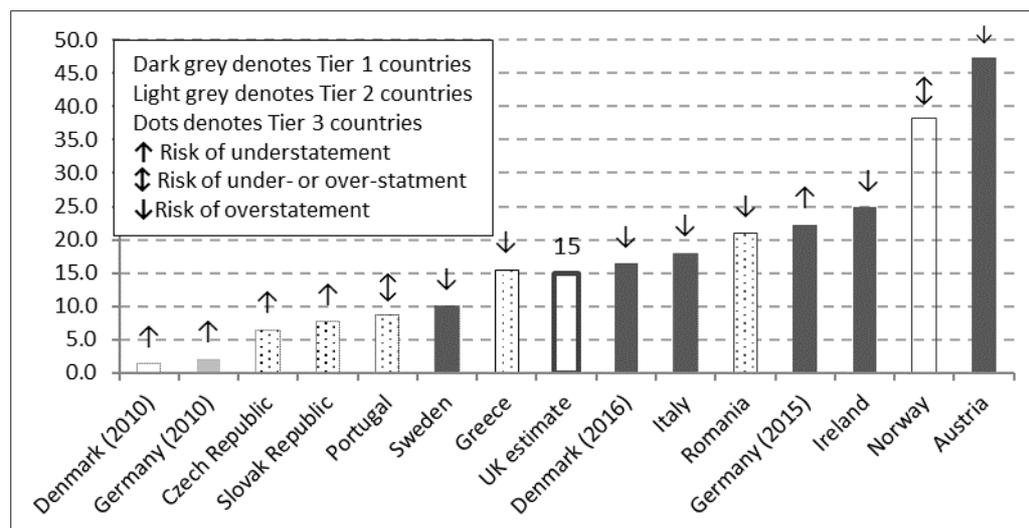
Table 4.2: Absolute values for 1800 MHz spectrum (UK-equivalent £m per MHz)

	Absolute value	Tier ³⁶	Known risk of under / overstatement
Denmark (2010)	£1.3m	Excluded	Larger risk of larger under-statement
Germany (2010)	£2.0m	2	Larger risk of under-statement
Czech Republic	£6.4m	3	Larger risk of under-statement
Slovak Republic	£7.8m	3	Larger risk of larger under-statement
Portugal	£8.7m	3	Risk of under- or over-statement
Sweden	£10.0m	1	Risk of over-statement
Greece	£15.5m	3	Larger risk of over-statement
Denmark (2016)	£16.4m	1	Risk of over-statement
Italy	£18.0m	1	Larger risk of over-statement
Romania	£20.9m	3	Larger risk of over-statement
Germany (2015)	£22.3m	1	Larger risk of under-statement
Ireland	£24.8m	1	Larger risk of over-statement
Norway	£38.3m	N/A	No risk identified
Austria	£47.3m	1	Larger risk of over-statement

Source: Ofcom

³⁶ The tiers shown relate to the tiers for the associated relative value benchmark in that country.

Figure 4.4: Absolute values for 1800 MHz spectrum (UK-equivalent £m per MHz)



Source: Ofcom

Ratios of 1800 MHz to 900 MHz

- 4.56 In our previous assessment of ratios of 1800 MHz to 900 MHz³⁷ we focused on the three countries – Austria, Germany and Ireland – from which we were able to derive Tier 1 benchmarks in both bands. We note that:
- In Denmark, the ratio of the 2016 award price of 1800 MHz to the 2010 award price of 900 MHz is 488%. However, as discussed in Annex 4, we consider that the Danish 900 MHz auction provides less important evidence for the value of 900 MHz spectrum in the UK,³⁸ and the 900 MHz price is at a larger risk of larger understatement.
 - In Norway, the ratio of 1800 MHz to 900 MHz prices is 131%. This is similar to the highest ratio we considered in our 2015 Statement (129% in Germany).
- 4.57 The fact that prices for 1800 MHz have been higher than for 900 MHz in recent awards in two countries (Germany in 2015, and Norway in 2016 and 2017) may indicate that the values of the two bands are moving closer together. We do not consider the evidence from these two countries to be definitive. However, to the extent it is relevant, as we do not have clear evidence that the value of 900 MHz has decreased, on balance we consider it more likely that the value of 1800 MHz has increased.

Averages across tiers

- 4.58 For 900 MHz, our estimate is 81% of the average across the Tier 1 relative benchmarks, and 81% of the average across Tiers 1 and 2. For 1800 MHz, our estimate of £15m per MHz is 81% of the average of Tier 1 countries and 90% of the average across Tier 1 and Tier 2 countries. However, we do not consider the latter proportion to be informative, as there is

³⁷ 2015 Statement, paragraph 5.90.

³⁸ For this reason the 900 MHz to 800 MHz ratio benchmark for Denmark is in Tier 3.

only one Tier 2 benchmark for 1800 MHz, which we consider to be at larger risk of larger understatement.

Conclusion on lump-sum values at market value

- 4.59 **For 900 MHz**, the evidence and analysis in our 2015 Statement remains relevant and we have not identified any reason to change our view of our benchmarks³⁹ or of the appropriate lump-sum values based on an in-the-round assessment of these benchmarks. We do not consider that our cross checks provide a basis to revise this estimate. We therefore consider that the lump-sum value we derived in our 2015 Statement remains the appropriate lump-sum value for the ALF bands at market value (after updating for inflation since 2015). Accordingly, we consider that an appropriate lump-sum value for 900 MHz spectrum if set at market value for the purpose of ALF is **£19m per MHz**.
- 4.60 **For 1800 MHz**, as set out above our revised view is that from relative value benchmarks a value of £15m per MHz is appropriate. We do not consider that our cross checks provide a basis to revise this estimate. Accordingly we consider that an appropriate lump-sum value for 1800 MHz spectrum if set at market value for the purpose of ALF is **£15m per MHz**.
- 4.61 In the following step we identify annual fees if based on these lump-sum market values. In the next section, we assess our statutory duties if we were to set ALFs on this basis, before reaching our view of the appropriate level of ALFs.

Step 3: Annualisation

Proposed approach

- 4.62 In this section we set out the approach we propose to adopt to annualise our estimates of the lump-sum value of the spectrum.
- 4.63 In our 2015 Statement, we converted 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, that is a 20-year annuity. We applied a post-tax discount rate of 1.8% and a tax adjustment factor of 1.064 (to reflect the more favourable tax treatment of annual fees compared to a lump-sum payment). We used the CPI index to adjust the base year ALF level each year when the licence fee comes due for payment.⁴⁰ We propose to adopt the same approach to annualisation for the purposes of this consultation.⁴¹
- 4.64 Accordingly, as in the 2015 Statement, we propose to use the following formula for calculating the base level of ALF.⁴² This formula assumes the ALF represents an annuity payment with the payments made at the beginning of the year.

³⁹ I.e. their appropriate tier, and risk of understatement or overstatement.

⁴⁰ Our full reasoning was set out in Section 6 of our 2015 Statement.

⁴¹ [2016] EWHC 2134 (Admin), paragraphs 105 to 113.

⁴² See 2015 Statement, paragraphs 6.133 and 6.134.

$$ALF_t = LSV * TAF * \underbrace{\left[\frac{r}{1 - (1 + r)^{-t^*}} \right] * \left[\frac{1}{(1 + r)} \right] * \left[\frac{CPI_t}{CPI_{t0}} \right]}_{\text{Annualisation rate}}$$

4.65 Where:

- ALF_t is the value of ALF in year t ;
- LSV is the lump-sum value of spectrum;
- TAF is an adjustment factor that reflects the tax advantages of ALF over lump-sum payments;
- r is the real post-tax discount rate;
- t^* is the length of period over which we spread the LSV for the purposes of calculating ALF, which is equal to the initial term of the licences obtained in the 4G auction, i.e. 20 years;
- CPI_{t0} is the level of the CPI (all items) index in April 2018 and CPI_t is the latest available figure for the same index published in the Consumer Price Inflation Reference Tables by the UK Statistics Authority.⁴³
- We refer to the expression on the right hand side of the formula which is multiplied by the LSV to derive the base level of ALF (i.e. before updating for inflation) as the “annualisation rate”.

The annualisation rate

4.66 Where appropriate, we have updated the figures used to inform the annualisation rate to reflect changes since 2015. Table 4.3 compares the values used in the 2015 Statement to the values proposed in this consultation. We discuss each of these below.

Table 4.3: Comparison of input values into formula for calculating base level of ALF in 2015 Statement and 2018 Consultation

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

⁴³ In our 2015 Statement we calculated values in March 2013 prices and therefore CPI_{t0} was the level of CPI (all items) index in March 2013.

Source: Ofcom

Length of period

4.67 We consider that a reasonable approach to converting our lump sum values into annual licence fees is to spread the lump-sum value over 20 years using a constant real profile. This is consistent with our approach in the 2015 Statement.⁴⁴ We chose a 20 year period because this was consistent with the initial term of the spectrum licences awarded in the UK 4G auction.

Discount rate for annualisation

4.68 As set out in our 2015 Statement⁴⁵, in spreading a lump sum over a 20-year period, we use a discount rate at which the present value of the resulting payment stream equals the lump-sum value paid today. An appropriate 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 MNOs indifferent between paying ALF and paying a lump-sum amount depends on the extent to which they (rather than the Government) are exposed to the effect of such changes in market value over time and, therefore, it is an important consideration in determining an appropriate discount rate.⁴⁶

4.69 In our 2015 Statement we considered that the appropriate discount rate would sit somewhere between 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 the WACC (as an approximation of the case where the government would bear the risk of variation in market value of the spectrum).⁴⁷ We considered that a risk sharing adjustment of 25% would be a sensible and conservative reflection of the risk that the Government is likely to bear over and above that of a 'normal' creditor.⁴⁸

4.70 As a result, in our 2015 Statement⁴⁹ we considered that an appropriate starting point for the discount rate was the cost of debt based on observed yield to maturity (YTM) data on comparator bonds. We then adjusted this for an inflation risk premium, to account for the fact that the Government would not bear any inflation risk due to the indexation of the ALFs.

⁴⁴ See 2015 Statement, paragraph 6.8.

⁴⁵ Paragraph 6.20.

⁴⁶ This analysis is not dependent on the fact that it is the Government that is the recipient of the ALF payments. Our task is to assess "market value" in a context where payments for spectrum take the form of a stream of annual payments as opposed to a one-off lump-sum payment. This concept of market value needs to apply equally in a situation where one company decides to trade (or lease) its spectrum usage rights to another company in return for annual payments, with the opportunity for these payments to be adjusted in light of changes in market value over time (rather than being traded outright for a one-off payment).

⁴⁷ See 2015 Statement, paragraph 6.21-6.25.

⁴⁸ See 2015 Statement, paragraphs 6.61-6.117 for a fuller discussion on risk sharing.

⁴⁹ See paragraphs 6.20-6.120 and Annex 10.

- 4.71 We then uplifted this by 25% of the difference between the lower polar case (the cost of debt) and the upper polar case (the WACC) to reflect the additional risk the Government bears.
- 4.72 We propose to adopt the same approach for this consultation and have estimated updated values for the cost of debt and the WACC as set out below.

Cost of debt

- 4.73 In Annex 10 of our 2015 Statement we considered which bonds should inform our cost of debt estimate. We considered that yields on bonds of a maturity of around 10 years would give an estimate of the cost of debt appropriate to use in the annualisation rate.⁵⁰ We therefore considered a sample of the sterling denominated debt of each MNO parent company⁵¹ with a maturity date around 10 years in the future, and BBB rated bonds with a 10 year maturity more generally (since each MNO parent company had a BBB rating).
- 4.74 In this consultation we again focus on bonds with a maturity date of around 10 years. Table 4.4 below summarises the YTM on debt we have considered and Figure 4.5 illustrates the YTM on these bonds over the past three years.

Table 4.4: YTM on sterling debt with maturities of around 10 years, May 2018

	Credit rating	Debt maturity	Years to maturity	12 month average yield	12 month minimum yield	12 month maximum yield	Average May 2018 ⁵²
Vodafone	BBB+	2025	7	2.3%	2.0%	2.7%	2.5%
		2032	15	3.3%	3.1%	3.5%	3.3%
Telefónica	BBB-	2026	8	2.6%	2.2%	2.9%	2.7%
		2029	11	2.9%	2.5%	3.2%	3.0%
BT	BBB	2028	11	2.7%	2.2%	3.2%	3.0%
		2031	14	3.1%	2.9%	3.5%	3.3%
10 year BBB rated bonds ⁵³		2028	10	2.6%	2.3%	2.9%	2.7%

Source: Bloomberg, Ofcom analysis as at 17 May 2018. Credit ratings are the Bloomberg Composite rating.

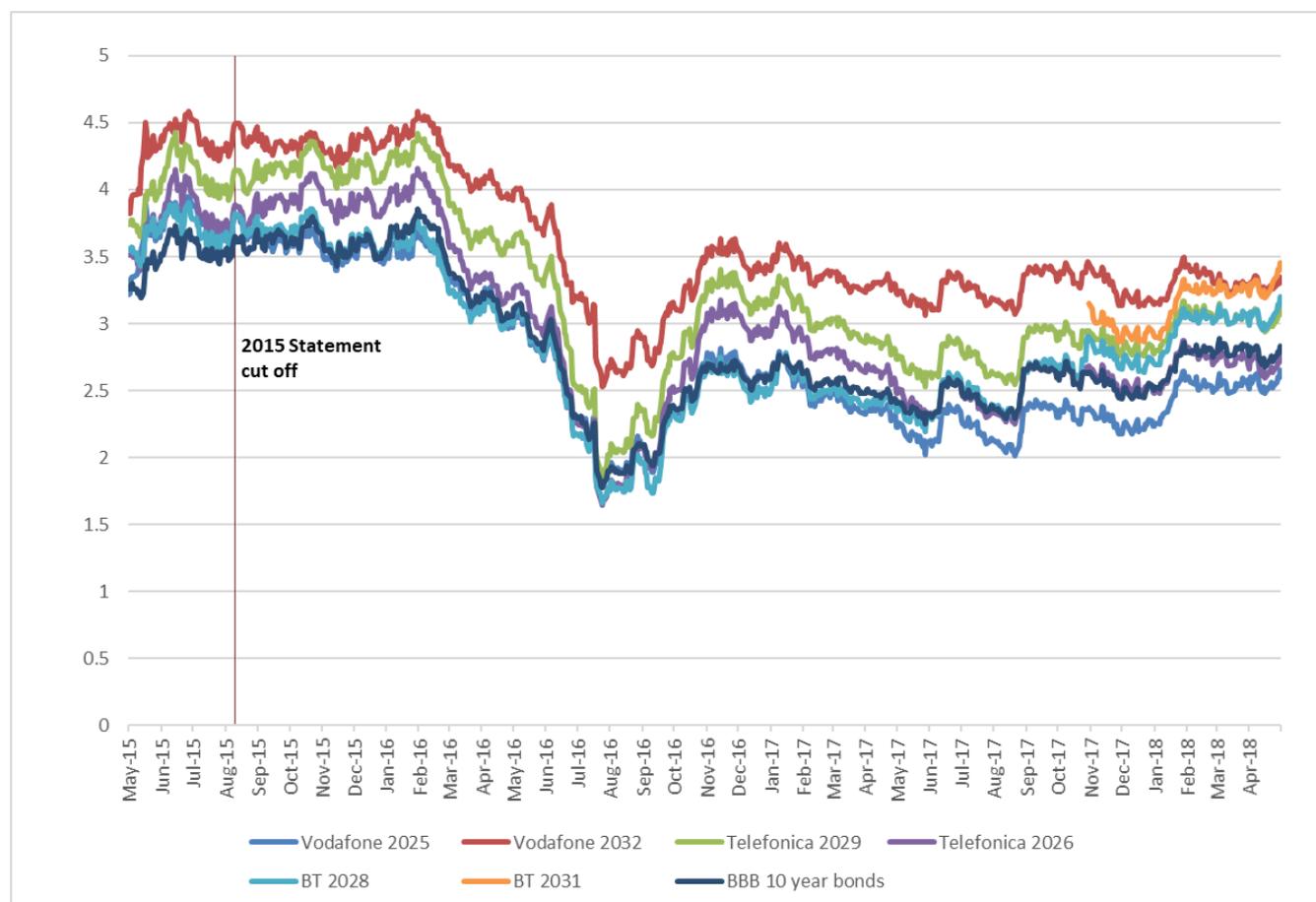
⁵⁰ A constant stream of payments (i.e. an annuity like ALF) has a lower duration than the same maturity bond with a bullet payment at the end. Hence, yields on bonds with a maturity of around 10 years have a similar duration to a 20 year ALF. See paragraphs A10.22-A10.26 of 2015 Statement.

⁵¹ At that time the MNO parent companies we used were Vodafone, Telefónica, Orange and Deutsche Telekom. We noted that Hutchison Whampoa, the owner of H3G, is a diversified conglomerate operating across a number of sectors including retail, ports and telecoms. We considered that estimates for Hutchison Whampoa were therefore unlikely to convey useful information about a UK MNO.

⁵² The average for May 2018 is based on 12 working days' worth of data from 1 May 2018 to 17 May 2018 (inclusive).

⁵³ Source: Bloomberg's BVCSGU10 Index 18 May 2017 to 17 May 2018.

Figure 4.5: YTM on sterling debt with maturities of around 10 years



Source: Bloomberg, Ofcom analysis as at 17 May 2018

- 4.75 The chart shows that yields have fallen since our 2015 Statement data cut off point (August 2015) with the decline particularly marked over the 6 months to August 2016. Yields have increased since then, though they have been relatively stable in 2018.
- 4.76 Given that we are interested in the yields on bonds with a maturity of around 10 years and each of the UK MNOs have BBB credit ratings, we have placed most weight on the yields on an index of 10 year BBB-rated bonds.⁵⁴ For the 12 months to May 2018 yields on the BBB 10-year index have ranged from 2.3% to 2.9% and averaged 2.6%, with more recent observations towards the top end of this range. We consider that this evidence would broadly support a YTM range of 2.5% to 3.0%.
- 4.77 A range of 2.5% to 3.0% would also broadly capture the lowest and highest yields on the BT and Telefonica bonds with 11 year maturities (i.e. the bonds with maturities closest to 10 years) including the average yield on these bonds over the 12 months to May 2018 as well

⁵⁴ Specifically Bloomberg's BVCSGU10 Index which includes sterling bonds rated BBB-, BBB and BBB+

as the current yields on these bonds. The range would also capture the average yield over the last year on all UK MNO bonds shown in Table 4.4 of 2.8%.

- 4.78 Within this range, we consider it would be appropriate to use a value below the UK MNO average of 2.8% since most UK MNO bonds shown in Table 4.4 have maturities greater than 10 years (so would be expected to have higher yields than bonds of a 10 year maturity). Further, given that the credit ratings on UK MNOs range from BBB- to BBB+ (i.e. they cover the range of credit ratings reflected in the BBB index), we consider it would be appropriate to use a nominal YTM towards the midpoint of this range. On this basis, we propose to use a pre-tax nominal cost of debt of 2.7%, which is around the midpoint of the range and below the 2.8% UK MNO average yield over the last year.
- 4.79 Allowing for a reduction of 10 bps to remove any inflation risk premium gives a pre-tax nominal rate of 2.6%.⁵⁵
- 4.80 We estimate a post-tax nominal cost of debt by allowing for our estimate of the average corporate tax rate which will prevail over the 20 year period.⁵⁶ This gives a post-tax nominal rate of 2.2%.⁵⁷ The equivalent post-tax real rate is 0.2% (using our CPI inflation assumption of 2%).
- 4.81 We propose to update these figures for the statement to take account of more recent evidence on debt yields.

WACC

- 4.82 In our 2015 Statement⁵⁸ we concluded that the WACC used in the 2015 MCT Statement was a reasonable proxy for the WACC applicable to the upper polar case. We propose to adopt a similar approach for this consultation and use the WACC determined in the 2018 MCT Statement. The pre-tax nominal WACC in the 2018 MCT Statement was 9.1%.⁵⁹ This was the same as that used in the 2015 MCT Statement. The corresponding post-tax real WACC we propose to use in this consultation is 5.5%.⁶⁰

⁵⁵ This is consistent with the adjustment for inflation risk that we made in our 2015 Statement, see paragraphs A10.42-A10.49 of that Statement.

⁵⁶ See paragraph 4.86 below.

⁵⁷ Based on the range for the pre-tax nominal YTM of 2.5% to 3.0% set out in paragraph 4.76, this would lead to (after adjusting for inflation risk) a post-tax nominal range of 2.0% to 2.4% and a post-tax real range of 0.0% to 0.4%.

⁵⁸ Paragraph 6.45.

⁵⁹ See Ofcom, Mobile Call Termination final statement, March 2018, paragraph 5.40, page 83, https://www.ofcom.org.uk/data/assets/pdf_file/0021/112458/Final-Statement-Mobile-Call-Termination-Market-Review-2018-2021.pdf

⁶⁰ The post-tax nominal WACC is calculated by multiplying the pre-tax nominal WACC by (1-tax rate). As set out in paragraph 4.86 the tax rate we use in this instance is 17.1%. The post-tax real WACC is then calculated as (1+post tax nominal WACC)/(1+CPI assumption) -1, where we assume CPI is 2%. In our 2015 Statement the post-tax real WACC used was 5.2%. The difference is due to the lower tax rate.

Discount rate for annualisation

4.83 Applying the same approach as in our 2015 Statement with these updated figures gives us a cost of debt figure of 0.2% which we uplift by 25% of the difference between the lower polar case (the cost of debt) and the upper polar case (the WACC). This gives an uplift of $25\% * (5.5\% - 0.2\%)$ or 1.3%. For the purposes of annualising the lump-sum value, we therefore propose to apply a discount rate of 1.5% (rounding to one decimal place).⁶¹

Tax adjustment

4.84 In our 2015 Statement we calculated a tax adjustment from the difference in tax benefits from ALF payments compared to the amortisation of tax deductions available through a lump-sum payment, converted to present values using the after-tax discount rate (as discussed above).⁶² The TAF is thus calculated as:

$$TAF = 1 + \left[\frac{(PV \text{ of tax benefits of ALF} - PV \text{ of tax benefits of the amortisation of LSV})}{LSV} \right]$$

4.85 In our 2015 Statement⁶³ we calculated the tax adjustment of 1.064 based on the time varying corporate tax rates as set out in the 2015 Summer Budget⁶⁴, taking into account the time value of money. This TAF equated to an average tax rate of 18.3% over the 20 year period.

4.86 At Budget 2016 the government announced a further reduction to the corporate tax rate for the year starting 1 April 2020, setting the rate at 17%.⁶⁵ We have re-calculated the TAF to take account of this. This leads to an updated tax adjustment figure of 1.055. This TAF equates to an average tax rate of 17.1% over the 20 year period.⁶⁶

Annualisation rate

4.87 As set out in paragraph 4.64 above, the annualisation rate is calculated as follows:

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

4.88 Where:

- TAF is an adjustment factor that reflects the tax advantages of ALF over lump-sum payments;
- r is the real post-tax discount rate;

⁶¹ In our 2015 Statement we considered that we should apply a discount rate of 1.8 % (see 2015 Statement paragraph 6.120).

⁶² See 2015 Statement, paragraphs 6.121-6.131.

⁶³ See 2015 Statement, paragraph 6.129.

⁶⁴ The 2015 Summer Budget announced that the corporate tax rate would be reduced from 20% to 19% from April 2017 and 18% from April 2020.

⁶⁵ See <https://www.gov.uk/government/publications/rates-and-allowances-corporation-tax/rates-and-allowances-corporation-tax>

⁶⁶ See TAF Calculation spreadsheet published alongside this consultation.

- t^* is the length of period over which we spread the LSV for the purposes of calculating ALF, which is equal to the initial term of the licences obtained in the 4G auction, i.e. 20 years;

4.89 With a TAF of 1.055, a real discount rate of 1.5% and a 20 year period, the annualisation rate is 6.05%.

Inflation adjustment

4.90 We continue to use CPI as the measure of inflation in calculating ALFs as in our 2015 Statement. In this consultation we state prices in April 2018 prices while in our 2015 Statement we stated prices in March 2013 prices.

Implied annualised values of ALFs if set at market value

4.91 As set out above, the annualisation rate is 6.05%. Using the formula set out in paragraph 4.64 above, multiplying the annualisation rate by the lump sum values gives us the base levels of ALF if set at market value (expressed in April 2018 prices). These are as follows:

- 900 MHz: £1.150m per MHz; and
- 1800 MHz: £0.908m per MHz.

4.92 Consistent with our approach in our 2015 Statement⁶⁷, we derive the base levels of ALF rounded to three decimal places in £m per MHz. We consider that, given the nature of the annualisation calculation, rounding to three decimal places is a reasonable approach without introducing an undue risk of spurious precision.

4.93 In the following section, we assess setting ALFs at the market values set out in paragraph 4.91 above in light of our statutory duties.

⁶⁷ Paragraph 7.3.

5. Step 4: Assessment of ALFs in light of our statutory duties

Introduction

- 5.1 As described in paragraphs 4.59 and 4.60 above, we consider that appropriate lump-sum market values are £19m per MHz for 900 MHz spectrum, and £15m per MHz for 1800 MHz spectrum, corresponding to ALFs, if set at market value, of £1.150m per MHz per annum for 900 MHz spectrum and £0.908m per MHz per annum for 1800 MHz spectrum.⁶⁸ We adopted a conservative approach when interpreting the evidence, given the uncertainty about the correct estimates for market value (see paragraph 4.35 above).
- 5.2 When we exercise our powers in relation to spectrum, section 4(2) of the Communications Act 2003 applies. This 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: the requirements,
- a) to promote competition;
 - b) to promote the interests of all persons who are citizens of the EU; and
 - c) 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.
- 5.3 In this section we present our assessment, in light of all our statutory duties, of setting ALFs at the full market value of the spectrum.
- 5.4 Our assessment takes account of a number of sources, including:
- a) Our 2010 consultation and statement on our Strategic Review of Spectrum Pricing (“**the SRSP**”).
 - b) Our April 2014 spectrum management strategy statement⁶⁹.
 - c) Our assessment, in our October 2013 consultation, our August 2014 consultation, and our 2015 Statement⁷⁰, of the risks of setting ALFs too low or too high, and stakeholder comments on these issues.
 - d) Relevant material submitted as part of the High Court appeal, and particularly the expert report by Professor Maarten Janssen on behalf of EE (“**the Expert Report**”).

⁶⁸ In April 2018 prices.

⁶⁹ https://www.ofcom.org.uk/data/assets/pdf_file/0021/71436/statement.pdf

⁷⁰ [October 2013 Consultation, August 2014 Consultation, 2015 Statement.](#)

Ofcom's policy on setting spectrum fees by reference to spectrum value

- 5.5 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. 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 PSSR auction earlier this year of the 2.3 GHz and 3.4 GHz bands. In the UK, each MNO has a portfolio of spectrum licences which includes some spectrum acquired at auction and some licences in the ALF bands.⁷¹
- 5.6 As we discuss below, 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 implications for the mobile sector, other spectrum users, and the UK economy.⁷² 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.
- 5.7 In December 2010, we published our Strategic Review of Spectrum Pricing – *SRSP: The revised Framework for Spectrum Pricing statement (SRSP)*.⁷³ 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 commented 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.”⁷⁴

“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 available for alternative uses or other users that could produce additional value and

⁷¹ As we discuss below, H3G also has spectrum which it acquired from Qualcomm and EE, and Vodafone has spectrum which it acquired from Qualcomm. BT, following its acquisition of EE, holds licences which were previously acquired by EE, Orange and T-Mobile.

⁷² Paragraph 5.26.

⁷³ https://www.ofcom.org.uk/data/assets/pdf_file/0024/42909/srsp-statement.pdf

⁷⁴ SRSP consultation, paragraph 1.12. https://www.ofcom.org.uk/data/assets/pdf_file/0021/36804/srsp_condoc.pdf

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.”⁷⁵

5.9 In assessing the AIP principle on spectrum trading,⁷⁶ 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.”^{77 78}

5.10 In assessing the AIP principle in relation to wider policy objectives,⁷⁹ we commented that:⁸⁰

“...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 In the SRSP⁸¹ we set out how we interpret our duty to secure the optimal use of spectrum. We considered that the optimal use is more likely to be secured for society if spectrum is used efficiently, that is to produce the maximum benefits for society⁸². We considered that efficient use of spectrum means that:

⁷⁵ SRSP statement, paragraph 3.34. https://www.ofcom.org.uk/data/assets/pdf_file/0024/42909/srsp-statement.pdf

⁷⁶ 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.

⁷⁷ SRSP statement, paragraph 4.203.

⁷⁸ We 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.

⁷⁹ AIP principle 5 in the Executive Summary, but discussed as AIP principle 6 in the text.

⁸⁰ SRSP statement, paragraph 4.214.

⁸¹ SRSP statement, paragraphs 3.13-320.

⁸² See also section 4 of our spectrum management strategy, published on 30 April 2014.

- spectrum is allocated and assigned to those uses and users that will provide the greatest benefits to society as a whole;
- individual spectrum users economise on their use of spectrum so there is no ‘wasteful’ use or underutilisation of spectrum; and
- spectrum becomes available over time for new and innovative services, where these are of sufficient value to society, and more generally to accommodate changes in technologies and consumer demand for services that rely on spectrum.

5.12 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.

5.13 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

5.14 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.”

5.15 In considering this general policy in relation to setting ALFs for the 900 MHz and 1800 MHz bands in particular, we take the view that ALFs below market value effectively give mobile operators a subsidy. Subsidies have the potential to distort economic incentives, and they are potentially discriminatory, to the extent that the size of any such subsidy is determined by each operator’s ALF licence holdings. If a subsidy is provided in pursuit of a policy goal (e.g. investment in mobile coverage), it would generally be good practice for it to be conditional on the recipient undertaking the desired activity, which would not be the case for a general discount on ALFs. For us to conclude that ALFs should be at a discount below market value for ALF spectrum (which was not acquired at auction), we would need to expect that such a discount would deliver benefits in terms of our duties, and that these benefits would exceed the costs associated with any distortionary or discriminatory effect.

Summary of our assessment

5.16 In summary, and for the reasons set out in greater detail below, our assessment is that:

⁸³ SRSP statement, paragraphs 3.33-3.34.

⁸⁴ SRSP statement, paragraph 3.41.

⁸⁵ SRSP statement, paragraph 4.68.

- a) ALFs at full market value promote the **optimal use of spectrum** which we consider to be in the interests of UK citizens and consumers (see paragraph 5.28 below). In addition:
- i) We recognise that there is scope for spectrum auctions to provide some correction to inefficiencies in spectrum holdings over time. However, we consider that this is limited by the infrequent nature of spectrum auctions, and the fact that specific auction bands tend to be more suitable for some purposes than others (paragraph 5.41).
 - ii) We also recognise that mobile operators are able to trade spectrum licences. However, we consider there is a risk that they may be less responsive to the opportunity cost of holding spectrum (through forgoing the revenue from trading it) than to fees at market value (paragraph 5.47).
 - iii) While there is a risk of inefficiency from spectrum lying fallow if ALFs were too high, there are a number of reasons why this risk may be limited. However, on balance this risk may be greater than the risk that efficiency-improving changes would not occur if ALFs were too low. We have addressed this risk to the optimal use of spectrum by taking a conservative approach when interpreting the evidence, given the uncertainty about the correct estimates for market value in the 2015 Statement (paragraphs 5.63 and 5.65).
- b) It is possible that ALFs at market value would lead to higher **consumer prices** than would prevail than if ALFs were set at a discount to market value. However, we consider that retail prices should reflect the input cost of spectrum, and this does not represent a market failure, or markets failing to work in the interests of consumers (paragraph 5.68).
- c) ALFs at market value can be expected to promote efficient **investment**, and we do not consider that we have evidence that efficient investments would be deterred by ALFs at market value (paragraph 5.73).
- d) We have considered arguments about both positive and negative impacts on **competition**. We do not consider that ALFs at market value would be likely to have an adverse impact on competition, and there is some risk that setting ALF below market value would have such an adverse impact. Overall, we consider that setting ALFs at market value would be consistent with promoting competition (paragraph 5.104).

5.17 Our view is that setting ALFs at full market value of the spectrum will have either a positive impact or no material impact with regard to each of our statutory duties. Specifically and considering matters in the round, we consider that setting ALFs at market value is likely to have a positive impact in terms of fulfilling our statutory duties.

Our previous analysis of asymmetry of risk

- 5.18 As part of our 2015 Statement we considered whether there was an asymmetric risk to setting ALFs above or below market value.⁸⁶ In that analysis we considered the possible implications of the level of ALFs for optimal use of spectrum, consumer welfare, investment, and competition. We took account of detailed comments from stakeholders on these issues. The purpose of the analysis was to establish whether we should be conservative when interpreting the evidence, given the uncertainty about the correct estimates for market value.⁸⁷
- 5.19 On the basis of our analysis, we decided on balance that there was a greater risk to optimal use of spectrum from setting fees too high than too low⁸⁸, while the risks of the other impacts we considered were symmetric.⁸⁹ In light of this, when setting ALFs we were conservative when interpreting the evidence, but we did not seek to set ALFs at the lowest possible level consistent with market value.⁹⁰
- 5.20 In our assessment below, we are considering whether we should set ALFs at, or below, market value. This is different from the question we were considering in our 2015 Statement (i.e. whether or not, when setting ALFs at market value, we should adopt a conservative approach when interpreting the evidence about market value). The assessment in this document considers the options of setting ALFs at market value or *intentionally* setting them below market value. The issues considered in the 2015 Statement were about *inadvertently* setting ALFs above or below market value, due to uncertainty about the level of ALFs at market value. However, the issues we need to consider now - the implications of the level of ALF for optimal use of spectrum, consumer welfare, investment, and competition – are similar to those we considered in the 2015 Statement.
- 5.21 Accordingly, our assessment below considers many of the same underlying issues as were relevant to our assessment of asymmetric risk in the 2015 Statement (and in preceding consultation documents). We take account of further arguments, particularly from the Expert Report, of relevance to these issues.
- 5.22 EE claimed, in its appeal against our 2015 Statement, that “[Ofcom has not] in substance taken into account the impact on consumers, investment and innovation, distortion of

⁸⁶ Annex 5 of our August 2014 consultation. This was part of our assessment of the issues where we considered at that time that we had discretion under the Government’s Direction.

⁸⁷ In light of the Direction, our view at that time was that it was not open to us to set ALFs below market value.

⁸⁸ August 2014 consultation, paragraph A5.30 (c).

⁸⁹ i.e. to investment, consumer welfare, and competition. By “symmetric” we meant that the risks of an adverse effect from setting ALFs too high or too low (relative to market value) were broadly similar, while “asymmetric” meant that the risk was greater in one direction than the other.

⁹⁰ In the 2015 Statement we adopted a conservative approach when interpreting the evidence in various parts of our analysis, such as UK market values of auctioned spectrum, interpretation of the international benchmark evidence and the annualisation rate. For example, when deciding on lump sum values based on benchmark evidence, we considered values between the midpoint and the bottom of the range.

competition or ensuring efficient or optimal use of spectrum resources”. EE added that “Ofcom did discuss stakeholders’ arguments on some economic issues in Annex 9 to its October 2013 Consultation and Annex 5 to its August 2014 Consultation in the specific context of considering whether there was an asymmetry of risk to efficiency if it were “inadvertently” to make an error in its determination of market value.” However, EE sought to argue that because this material was not reproduced or updated in our Provisional Decision and Statement, “Ofcom clearly has not properly considered and responded to the arguments made by stakeholders in response to the October 2013 and August 2014 Consultation or the Provisional Decision nor has it reached a concluded view on these issues.”⁹¹

- 5.23 In fact, we did reach a concluded view on these issues – indeed they were a reason for our adopting a conservative approach to interpreting evidence of market value. In our 2015 Statement we considered that stakeholders had not made any new substantive arguments on these issues, additional to points we had already taken into account.⁹²

Structure of our assessment

- 5.24 We consider below the effects of ALFs being set at or below market value on:
- a) The optimal use of spectrum;
 - b) Consumer welfare;
 - c) Investment; and
 - d) Competition.
- 5.25 We consider the scenario of ALFs at full market value (£1.150m per MHz per annum for 900 MHz spectrum and £0.908m per MHz per annum for 1800 MHz spectrum, in April 2018 prices), compared to an alternative scenario of ALFs below full market value. In view of our conclusion we have not considered it necessary to specify the precise extent of discount to market value (which might depend on the specific reasons for setting ALFs below market value).

Promoting the optimal use of spectrum

- 5.26 Because radio spectrum is a scarce and finite resource, its allocation has important implications for users of mobile communications services and the UK economy. A 2013 study by Analysys Mason for DCMS estimated the value of spectrum use in the UK at over £50 billion per annum, of which the value of spectrum use for mobile communications accounted for £30 billion.⁹³ Mobile data consumption is widely expected to increase

⁹¹ EE Claim Form, Statement of Facts and Grounds, paragraph 40 and footnote 40.

⁹² 2015 Statement, paragraphs 1.38 -1.43.

⁹³ <http://www.analysismason.com/About-Us/News/Insight/Economic-value-of-spectrum-Jan2013>

sharply over the next decade, and deploying additional spectrum is an important means for mobile operators to meet this demand.⁹⁴

- 5.27 In light of the importance of spectrum to the mobile sector and the economy, any effect of ALFs at or below market value on the efficient allocation of spectrum could have a material impact, whether positive or negative.
- 5.28 In our view, ALFs at full market value promote 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.
- 5.29 In our August 2014 consultation (Annex 5) we set out our view that there were risks to the optimal use of spectrum from either setting ALFs too low or too high. However, on balance we considered that the risk of inefficiency if ALFs were set too high might be greater than the risk of inefficiency if ALFs were set too low.⁹⁵ Based on this assessment, in our 2015 Statement, we adopted a conservative approach to interpreting the evidence when estimating the market value of ALF spectrum.⁹⁶
- 5.30 Below we consider the following arguments, which have been raised by stakeholders before or after our 2015 Statement:
- a) Licence holders already have an incentive to use their spectrum holdings efficiently.
 - b) Current licence holders are likely to be the highest-value users of spectrum.
 - c) As new mobile spectrum licences become available in auctions, operators with a high value for incremental spectrum will tend to bid aggressively in those auctions. This will tend to correct imbalances between spectrum holdings and valuations.
 - d) Mobile operators are able to trade the spectrum licences they hold, and in principle should have the incentive to do so if there is another higher-value user.
 - e) The risk of setting ALFs above market value has not been addressed.
- 5.31 Prior to September 2015, ALFs were not at market value, so there was no direct evidence available at that time that MNOs would respond to ALFs being at market value such as by trading or returning spectrum to Ofcom (potentially leading to improvements in spectrum efficiency by transferring licences to a higher-value user, or to inefficiencies arising from spectrum lying fallow, or both). ALFs were at market value for a period following our 2015 Statement and until the November 2017 Court of Appeal judgment. No licence holder responded to ALFs at market value over this period by trading or relinquishing spectrum rights. However, we do not consider the lack of response to ALFs is informative, either in relation to the potential for improvements in spectrum efficiency by transferring licences to a higher-value user, or to inefficiencies arising from spectrum lying fallow. In particular,

⁹⁴ Ofcom, Award of the 2.3 and 3.4 GHz spectrum bands, July 2017, paragraphs 1.6 and 1.7.

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

⁹⁵ Paragraph A5.24.

⁹⁶ As noted above, the purpose of this analysis was to inform our approach to estimating market value, but the issues raised are also relevant to assessing ALFs being at or below market value.

we note that our 2015 Statement was subject to appeal proceedings throughout this period.

Incentives to use own spectrum holdings efficiently

- 5.32 As in our previous analysis, we draw a distinction between the efficient (highest-value) *user* of the spectrum and, leaving aside this question of efficient user, efficient *use* of their own spectrum holdings by the current licence-holders.
- 5.33 Stakeholders argued⁹⁷ that they have an incentive to use their spectrum holdings as efficiently as possible, because they have a fixed amount of spectrum, and acquiring additional spectrum in auctions is expensive. Stakeholders also argued⁹⁸ that the fact that spectrum holdings were fixed, at least in the short term, and that additional licences were expensive to acquire, gave them an incentive to make efficient use of their existing spectrum.
- 5.34 We recognised there were arguments as to why operators may be incentivised to make the most efficient use possible of spectrum they currently hold. However, we said this did not necessarily rule out the possibility that they may not be the highest-value users of this spectrum (i.e. even if they are incentivised to maximise the value of their spectrum use).⁹⁹
- 5.35 Our view remains that, even if all licence-holders are using their spectrum holdings as efficiently as they can, there may be scope for efficiency improvements from transferring spectrum to another licence-holder.

Highest-value users

- 5.36 Stakeholders argued¹⁰⁰ that they are likely to be the highest-value users of the spectrum they hold, because they have optimised their networks based on their spectrum holdings.
- 5.37 In response, we noted that some spectrum may be held by operators who are not the highest-value users of at least a proportion of their holdings in the 900 MHz or 1800 MHz bands, and that valuations of different operators can change over time. In particular we commented¹⁰¹ that:
- 5.38 “The value of a spectrum licence to an operator depends on a range of factors, including the portfolio of licences held by that operator, its network configuration (e.g. the relative density of high-power and small cells in urban, suburban and rural locations) and the ecosystem available for the spectrum licences it holds (such as the number of new devices that are LTE900 compatible). We recognise that operators will generally seek to configure their networks to exploit the spectrum licences they hold, and to bid for new licences which are more complementary to their networks and portfolios of licences. However, as

⁹⁷ August 2014 consultation, paragraphs A5.10 to A5.12.

⁹⁸ August 2014 consultation, paragraphs A5.11 to A5.12.

⁹⁹ August 2014 consultation, paragraph A5.14.

¹⁰⁰ August 2014 consultation, paragraph A5.10.

¹⁰¹ August 2014 consultation, Annex 5, footnote 2.

the market, technology and regulatory environment evolves, it is possible that the current holder of a licence, even if incentivised to use that licence as efficiently as it can, will not be the most efficient user of the spectrum.”

- 5.39 Large disparities of holdings in spectrum bands could potentially increase the risk that spectrum is not held by the highest-value user (on the basis that the incremental value to a user of additional spectrum in a band will generally tend to decline, all else equal). In this context, we note that Vodafone and Telefónica account for all of the available 900 MHz spectrum, and a large majority of sub-1 GHz spectrum (109.6 MHz, out of a total of 129.6 MHz), while EE holds a large majority of 1800 MHz spectrum (90 MHz, out of 143.2 MHz).
- 5.40 Our view is that, while tailoring of networks to spectrum holdings is a possible reason why licence holders may be particularly high-value users of their spectrum holdings, it does not mean that they are necessarily the highest-value users of the entirety of those holdings.

Spectrum awards

- 5.41 We recognise that there is scope for spectrum auctions to provide some correction to inefficiencies in spectrum holdings over time.¹⁰² However, we consider that this is limited by the infrequent nature of spectrum auctions, and the fact that specific auction bands tend to be more suitable for some purposes than others. In our August 2014 consultation, we noted that the prospect of more spectrum being made available to mobile operators (beyond the 2.3 GHz, 3.4 GHz and 700 MHz bands) was subject to some uncertainty, as it depended both on ongoing growth in demand for mobile data¹⁰³ and the supply of new beneficial spectrum for mobile use, which can take years of preparation, for example in securing international agreements or clearing incumbent users.
- 5.42 We noted¹⁰⁴ that newly-released spectrum bands might not necessarily be close substitutes for the ALF bands. We said that:
- a) The 4G auction will already have tended to mitigate any inefficiencies in spectrum holdings, to the extent that 800 MHz and 2.6 GHz are substitutes for the ALF bands.
 - b) 2.3 GHz and 3.4 GHz bands were not expected to be a close substitute for ALF spectrum bands.¹⁰⁵

¹⁰² In some auctions we have introduced measures in spectrum awards to address competition concerns due to large asymmetries in spectrum holdings. In the case of mobile spectrum trading, we are required to take into account whether competition is likely to be distorted before deciding whether or not to consent to a trade.

¹⁰³ August 2014 consultation, paragraph A5.13.

¹⁰⁴ August 2014 Consultation, paragraph A5.13.

¹⁰⁵ We have further considered the potential substitutability of 2.3 GHz for 1800 MHz in Annex 5 (paragraph A4.74).

- c) The 700 MHz band might be a closer substitute especially for the 900 MHz band. Our current expectation is that this band will be usable from Q2 2020.¹⁰⁶
- d) Spectrum awards are relatively infrequent, and in particular there might be little scope for a further award of sub-1 GHz spectrum following a 700 MHz award.
- 5.43 Overall we agreed that at least in principle future spectrum releases would provide some opportunity for inefficient allocations of spectrum to be mitigated, but this did not change our view that there was a risk that efficiency-improving changes of licensees would not occur if ALFs were inadvertently set too low.¹⁰⁷
- 5.44 There has been one auction of mobile spectrum in the UK since 2015 and the results of this award of 2.3 GHz and 3.4 GHz spectrum were published in April 2018.¹⁰⁸ Telefónica, which has lower spectrum holdings than BT/EE or Vodafone, acquired the largest amount of spectrum, and this may be an example of spectrum awards tending to correct disparities in spectrum holdings.¹⁰⁹ In addition to bands mentioned in paragraph A5.13 of our August 2014 consultation, we are now also planning to auction 3.6 GHz – 3.8 GHz spectrum in 2019 alongside the 700 MHz band. Since the publication of our 2015 Statement we have also issued a Call for Inputs on 5G spectrum access at 26 GHz spectrum¹¹⁰ and opportunities for innovation in the 3.8-4.2 GHz spectrum.¹¹¹
- 5.45 The Expert Report¹¹² notes that in the mobile sector all incumbent operators typically buy new spectrum when available in auctions and consider opportunity costs when preparing for auctions. The report contends that this implies that these operators are responsive to market forces and thus that the allocation of spectrum is likely to be efficient.
- 5.46 As set out in our August 2014 consultation and summarised above, we agree that auctions have an important role in the efficient allocation of spectrum. However, spectrum auctions are relatively infrequent, and licences in different frequency bands are not necessarily good substitutes for one another because specific auction bands tend to be more suitable

¹⁰⁶ See Ofcom, Award of the 2.3 and 3.4 spectrum bands, June 2017 statement, paragraph 5.11.

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.

¹⁰⁷ August 2014 Consultation, paragraph A5.14.

¹⁰⁸ Ofcom, Award of 2.3 and 3.4 GHz spectrum by auction, 13 April 2018 <https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-in-progress/2-3-and-3-4-ghz-auction>.

¹⁰⁹ See: <https://www.ofcom.org.uk/about-ofcom/latest/features-and-news/results-auction-mobile-airwaves>.

¹¹⁰ See Ofcom, Call for inputs on 5G spectrum access at 26 GHz and update on bands above 30 GHz, July 2017.

https://www.ofcom.org.uk/_data/assets/pdf_file/0014/104702/5G-spectrum-access-at-26-GHz.pdf. We have also recently launched our Innovation and Trial portal to help applicants access spectrum for innovative uses. See Ofcom, Enabling 5G in the UK, March 2018. https://www.ofcom.org.uk/_data/assets/pdf_file/0022/111883/enabling-5g-uk.pdf

¹¹¹ See Ofcom, 3.8 GHz to 4.2 GHz: Opportunities for Innovation, April 2016.

https://www.ofcom.org.uk/_data/assets/pdf_file/0031/79564/3.8-GHz-to-4.2-GHz-band-Opportunities-for-Innovation.pdf. We also indicated in our 2017 Statement on Improving consumer access to mobile services at 3.6 to 3.8 GHz (https://www.ofcom.org.uk/_data/assets/pdf_file/0019/107371/Consumer-access-3.6-3.8-GHz.pdf) that we plan to bring forward a consultation on enabling further sharing in the 3.8GHz to 4.2GHz band in 2018, with a view to enabling innovative uses (paragraph 3.49).

¹¹² Paragraph 90 (c).

for some purposes than others. We consider – consistent with our view in the August 2014 consultation – that these considerations may limit the scope for spectrum auctions to correct inefficiencies in spectrum holdings, and there would be scope for ALFs at market value to promote efficient allocation of spectrum licences alongside spectrum awards.

Spectrum trading

- 5.47 In summary, mobile operators are able to trade spectrum licences, and this could in principle create appropriate incentives for firms to only hold licences of which they are the highest-value users, even in the absence of ALFs set at market value. However, we consider there is a risk that operators may be less responsive to the opportunity cost of holding spectrum (through forgoing the revenue from trading it) than to fees at market value.
- 5.48 In Annex 5 of our August 2014 consultation¹¹³, we considered whether licence holders were likely to trade spectrum holdings for which they were not the highest-value user, as follows:
- a) *“In principle, operators have an incentive to trade spectrum if there is a higher-value user. This will tend to reduce the risk that they will hold spectrum inefficiently (i.e. when they are not the highest-value user). However, we consider that operators may be less responsive to foregone receipts from trading spectrum than they would be if faced with a direct cost of ALFs.*
 - b) *Direct costs such as ALFs are visible to shareholders in company accounts. In contrast, it is not clear that the opportunity cost of holding licences - in this context, the potential receipts that could be obtained by trading the spectrum - is visible to shareholders in the same way. While the business may be aware of the opportunity cost of holding spectrum rights which it could otherwise trade to rivals, it may be less responsive to these opportunity costs than to the direct cost of an ALF.*
 - c) *The presence of this distinction between foregone receipts and direct costs appears to be borne out by MNOs' accounts of how the imposition of ALFs will affect them. Consultation responses have set out in some detail the pressure that managers will be under to respond to an increase in ALFs. For example: [3<]*
 - d) *While these responses have focused on pressures to increase prices or delay investment in response to ALFs, rather than trading, such pressures would not arise if the opportunity cost of foregone receipts were already fully reflected in operators' decisions.*
 - e) *We therefore consider that, even though ALF spectrum is tradable, operators may be less responsive to foregone receipts from trading spectrum than they would be if faced with a direct cost of ALFs.”*
- 5.49 While trading should in principle give MNOs an incentive to hold spectrum licences efficiently (i.e. only doing so where they are the highest-value user), in practice no

¹¹³ Paragraphs A5.15-A5.19.

spectrum trade has taken place between two MNOs in the UK since licences were made tradeable in 2011,^{114 115} despite significant changes in demand, market structure, network sharing arrangements and technology over this period.

- a) One possible reason for this would be if licence-holders had at all times been the highest value users of all the licences they hold.
- b) Another possibility is that a licence holder could have a strategic reason for holding spectrum for which it might not be the highest-value user from a social value perspective.¹¹⁶
- c) However, another possible explanation is that firms are not taking full account of the opportunity cost of the spectrum licences they hold.

5.50 The Expert Report¹¹⁷ cites an example of a voluntary spectrum trade in the UK, namely the sale of spectrum licences by Qualcomm to H3G and Vodafone, and argues that this is consistent with “*spectrum trading operating to support allocative efficiency*”.

5.51 However, the example cited was of a firm which is not a mobile network operator selling to two MNOs. ALF spectrum is all held by the four MNOs, to whom it is an important strategic resource, and it remains the case that there has never been a voluntary trade of mobile spectrum between any of the four (or by any of them to an outside party).

5.52 The Expert Report¹¹⁸ argues that “*Ofcom’s claim that operators do not properly consider opportunity cost is not supported by the evidence*”. In support of this argument, the report comments that players in the market know who holds which spectrum, have the same technological knowledge “*and therefore may also have reasonably clear ideas about the potential spectrum demand of others*”, so “*it is then not difficult to express an interest in buying or selling spectrum*”. The report also comments that “*in preparing for auctions operators consider alternative ways of meeting future growth in demand in great detail to determine what is the most cost efficient way to do so.*”¹¹⁹

5.53 We agree that MNOs are likely to be able to identify potential buyers of their spectrum licences (among the other MNOs). We do not have evidence on the extent to which operators are well informed of each other’s spectrum demand, but they could try to ascertain this demand by offering some of their own spectrum for sale. However, we do not agree with the conclusion drawn in the Expert Report, that “[t]his is a clear indication that operators do consider opportunity costs.” Rather, the Expert Report has demonstrated

¹¹⁴ Ofcom *Mobile spectrum trading given go-ahead*, June 2011 <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2011/mobile-spectrum-trading-given-go-ahead>.

¹¹⁵ With the exception of a divestment of spectrum by EE as a merger commitment.

¹¹⁶ Any such strategic value would also be present with ALFs at market value, so while strategic holding of spectrum may lead to an inefficient outcome, it is not an inefficiency which we would necessarily expect to be corrected by ALFs at market value.

¹¹⁷ Paragraph 60.

¹¹⁸ Paragraph 90.

¹¹⁹ While it is not made explicit, the point appears to be that operators will seek to acquire spectrum in order to avoid bidding for it in an auction.

that certain possible barriers to operators considering opportunity costs are not present, but these are not barriers we referred to in the text quoted above.

- 5.54 Next, the Expert Report comments that the possibility that businesses may not appropriately consider opportunity costs in holding assets “*should be seen as a too easy “justification” for market intervention*” and would imply a need to intervene in many markets.
- 5.55 Our view that MNOs could potentially be more responsive to ALFs at market value than to the opportunity costs of holding spectrum is consistent with our broader strategy for spectrum pricing. Our general policy position on spectrum pricing and trading, set out in the SRSP statement¹²⁰ is that:
- “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.”*
- 5.56 In the SRSP statement we also commented that:¹²¹
- “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.”*
- 5.57 In our view, for ALF spectrum to be priced at market value is a normal commercial outcome, similar to many other inputs or assets, rather than an example of intrusive intervention when we conduct an ALF review.
- 5.58 The Expert Report¹²² comments that:
- “I believe that Ofcom has drawn an incorrect conclusion, however, from the statements regarding ALFs being likely to cause price rises or investment delays...if ALFs are set above opportunity cost they will cause a rise in consumer prices even when operators fully take into account opportunity cost. Paragraph 2.7 of Ofcom’s August 2014 Consultation indicates that operators thought that Ofcom’s proposed ALFs were in danger of being set above actual market value.”*
- 5.59 In response, we note that while operators disagreed with our assessment of the market value of the spectrum, the evidence summarised in paragraph 5.48c) above from [§<] related to the impact that fee increases above current levels would have on investment or

¹²⁰ SRSP statement, page 3. Cited in our September 2013 consultation, paragraphs A9.26-A9.28.

¹²¹ SRSP statement, paragraph 4.203.

¹²² Paragraph 90e).

consumer prices. These submissions did not link arguments about the effect of fee increases to the risk of fees being set above opportunity cost, and in particular they did not distinguish between fee increases up to opportunity cost and fee increases above opportunity cost.

5.60 Finally, on this point, the Expert Report comments¹²³ that:

“Second, however, even if Ofcom were right and operators are less responsive to opportunity costs than they are to actual costs, this does not automatically imply that ALFs bring benefits on all four objectives [efficiency, consumer welfare, investment and competition]. In particular, Ofcom would be required to consider a trade-off between the benefit that it claims in terms of allocative efficiency and the concomitant harm to consumers in terms of increased prices and reduced investment. However, Ofcom has conducted no such analysis...”¹²⁴

5.61 The purpose of the present impact assessment is to consider the effect of ALFs being at or below market value, and in doing so we consider possible positive or negative impacts on efficiency, consumer welfare, investment and competition.¹²⁵ As set out below, we have not identified a harm to consumers or investment which needs to be weighed against the benefits of more efficient use of spectrum.

Risks of ALFs above market value

5.62 In our August 2014 consultation we also considered the risk that (inadvertently) setting ALFs above market value would lead to inefficiency, particularly if it led to licence holders relinquishing their licences, and spectrum lying fallow for a period of time, with no efficiency gain from re-allocation of the spectrum to a higher-value user.¹²⁶ We considered this risk was mitigated by a number of factors:

- a) The outcome of the 4G auction was that private values of spectrum greatly exceeded the auction price (determined by the highest losing bidder), suggesting that a large proportion of operators’ spectrum holdings may be “inframarginal” spectrum which they would not relinquish even at relatively high ALFs.

¹²³ Paragraph 91.

¹²⁴ The Expert Report then makes two specific points relating to consumer welfare and auctions, which we consider elsewhere in this chapter.

¹²⁵ We also note that, contrary to the apparent suggestion in the Expert Report, the assessment which informed our 2015 Statement (particularly Annex 5 of our August 2014 consultation) performed a similar function of considering efficiency, consumer welfare, investment and competition, in relation to the question of whether there was an asymmetry of risk in setting ALFs too low or too high.

¹²⁶ Paragraphs A5.20-A5.24.

- b) Any inefficiency cost from spectrum lying fallow will need to be set against the efficiency gain from transferring spectrum to a higher-value user.¹²⁷
 - c) If ALFs were below market value but above the current licence holder's value, trading could speed up the reallocation process.
- 5.63 However, on balance we considered that the risk of inefficiency from spectrum lying fallow if ALFs were set too high may be greater than the risk that efficiency-improving changes of licensees will not occur if ALFs were set too low. For this reason, we took a conservative approach when interpreting the evidence about market value.
- 5.64 The Expert Report¹²⁸ argues that there is a high degree of uncertainty about the market value, and that we chose not to set ALFs "*at or below the lowest conceivable market value*". This report argues that because of this there is a "*real danger*" that ALFs would lead to inefficient use of spectrum.
- 5.65 Our view is that the factors set out above materially reduce the risk of inefficiencies arising from spectrum lying fallow as a result of ALFs, and that in the 2015 Statement we appropriately addressed the asymmetric risk to the optimal use of spectrum which arises from spectrum lying fallow, by taking a conservative approach when interpreting the evidence about market value. While stakeholders argued that we should have been more conservative, we considered – and rejected – those arguments in our 2015 Statement.¹²⁹

Other impacts of ALFs at or below market value

- 5.66 ALFs at market value could potentially have an impact on consumer welfare, investment, or competition.
- 5.67 In our August 2014 consultation (Annex 5) we considered stakeholder views, and presented our assessment, on the risks to efficiency through the effect of ALFs on (a) consumer prices and (b) investment if ALFs were above or below market value. We take account of the issues discussed there in the following assessment.

Impact on consumers

- 5.68 It is possible that setting ALFs at market value would lead to higher consumer prices than would prevail than if ALFs were set at a discount to market value. However, we generally 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.
- 5.69 In our August 2014 consultation¹³⁰ we set out our view that:

¹²⁷ We note that, even if ALFs were above market value, this could potentially lead to an efficiency gain if the current licence holder was not the highest-value user (although ALFs would need to be reduced before the highest-value user would agree to acquire it).

¹²⁸ Paragraphs 92-97.

¹²⁹ Paragraphs 1.38-1.43.

¹³⁰ Paragraph A5.25-A5.27.

- a) *“In an efficient market, consumer prices will reflect the resource costs of inputs to supply goods and services, and to the extent that consumer demand reflects those prices, it will appropriately reflect the cost of supply.*
- b) *The level of ALFs could have an effect on downstream consumer prices for mobile services, and there is a risk of inefficiency from setting ALFs either above or below market value.*
 - i) *If ALFs were set above market value, and if operators could pass on this cost through inflated consumer prices, the result of these inflated prices could be to artificially depress the growth in mobile traffic.*
 - ii) *If, as described above, operators are not fully responsive to the opportunity cost of spectrum, then, with ALFs set below market value, operators may tend to set consumer prices which do not reflect the full resource cost of providing their services. If instead prices already reflected the opportunity cost of holding spectrum, then setting ALF below market value would not lead to inefficiency, and the only risk to inefficiency of this kind would be in setting ALFs above market value. However, the responses to the October 2013 consultation indicate that operators’ prices are not independent of the level of ALF when fees are below market value (as they are currently).*
- c) *On balance, therefore, we consider the risk to efficiency through the effects on consumer prices if ALF is set too low or too high to be broadly symmetric.”*

5.70 We remain of the view that the question we considered in our August 2014 consultation was the right one, namely whether there is a risk to efficiency through effects on consumer prices of setting ALF below (or above) market value.

5.71 The Expert Report comments¹³¹ that

“If the actual cost associated with ALFs makes operators realise the true opportunity cost of spectrum, then this will certainly have a negative impact on retail prices and consumer welfare.”

[The Expert Report next refers to our comments above relating to the efficiency effects of setting ALFs above or below market value]

“I note, however, that this is an implication for allocative (in)efficiency and not an implication for consumer welfare...the point remains that, even if Ofcom were incorrect on this potentially support [sic] for allocative efficiency, ALFs would still directly harm consumers because they would face higher prices.”

5.72 Our view on this comment is that it would not be appropriate to maintain the cost of ALF spectrum below its market value in order artificially to suppress consumer prices through such a subsidy. As noted in our August 2014 consultation, absent market failures, in an efficient market, consumer prices will reflect the resource costs of inputs to supply goods

¹³¹ Paragraph 91 (a).

and services, and to the extent that consumer demand reflects those prices, it will appropriately reflect the cost of supply.

Impact on investment

- 5.73 In summary, our view is that ALFs at market value can be expected to promote efficient investment, and, as discussed below, we do not agree with the arguments against this view which were previously presented by stakeholders, or those in the Expert Report. While it is theoretically possible that some investments would be deterred by ALFs at market value, rather than at some discount to market value, we do not have evidence that efficient investment would be deterred.
- 5.74 As demand for mobile data grows, ongoing investment by mobile operators in their networks will be needed to ensure they have the capacity to meet this growing demand. In our Strategic Review of Digital Services¹³² we said that our strategy in mobile continues to focus on competition, but we will monitor the levels of investment and consumer outcomes. In particular, we noted the concerns of some stakeholders that returns in the mobile sector are below operators' cost of capital, with the associated risk that this could affect their appetite to invest in improving their UK networks. However, our assessment was that the UK mobile sector appeared to be earning returns materially above its cost of capital within the current market structure and regulatory environment – with, for example, EE having a 27-28% return on capital employed, compared to its 9% cost of capital.
- 5.75 In our August 2014 consultation¹³³ we set out our view on the risk to efficiency, through the effect of ALFs on investment, if ALFs were above or below market value, as follows:

“In general, investment decisions should be informed by the true cost of inputs. In their responses mobile operators (in particular EE) described how the increased costs associated with ALFs will reduce funds available for investment in the short term. It is possible that a firm which has to pay ALFs will have its capital budget reduced by its shareholders. In some cases, this may prevent the firm from making investments which would be economically worthwhile or, more likely, affect the timing of a profitable investment through deferring it. However, this does not necessarily give rise to longer-term inefficiency on which we focus in this annex.

As regards specific arguments that there is a risk of inefficient under-investment in the longer term in response to ALFs, in the October 2013 consultation we addressed arguments about regulatory risk associated with perceived asset expropriation and incentives to innovate. We do not consider that stakeholder responses provide a

¹³² Paragraphs 4.57-4.64, February 2016 https://www.ofcom.org.uk/data/assets/pdf_file/0016/50416/dcr-statement.pdf. See also paragraphs 4.42-4.50 of Ofcom, Strategic Review Discussion Document https://www.ofcom.org.uk/data/assets/pdf_file/0021/63444/digital-comms-review.pdf.

¹³³ Paragraphs A5.28-A5.29.

basis to change our views. Therefore, on balance, we consider the risk to efficiency in the longer term through the effect on investment if ALF is set too low or too high to be broadly symmetric.”

- 5.76 Our views on arguments about regulatory risk associated with perceived asset expropriation and incentives to innovate were set out in Annex 9 to the October 2013 consultation.¹³⁴ In summary, we said that:
- a) ALFs above market value could potentially appropriate the legitimate return on sunk investment. However, ALFs below market value could constitute a windfall gain. With ALFs based on our best estimate of market value (with no systematic bias upwards or downwards) then windfall losses should not be more likely than windfall gains. The potential for ALF to become out of line with market value is one of many uncertainties operators face, and it is not clear that it gives rise to a significant risk premium.
 - b) A stakeholder argued that innovation by a mobile operator could lead to an increase in the value of spectrum, which would subsequently be reflected in higher ALFs, that this was more likely with higher than lower ALFs, and that as a result there was a risk that higher ALFs would deter innovation. We noted that innovation would not necessarily increase the value of spectrum – in some cases innovation may (temporarily) improve the innovator’s competitive strength, but if the benefits are passed to consumers through competition it may not lead to an increase in industry profits. We also considered that mobile operators had a strong incentive to innovate in order to remain competitive or differentiate their services. We considered it unlikely that the possibility of an increase in ALFs would deter innovation.
- 5.77 We remain of the view that investment decisions should reflect the true cost of inputs, and we consider that setting ALFs at market value can be expected to promote efficient investment decisions.
- 5.78 The Expert Report argues that:
- a) ALFs reduce internal funds which may prevent some investments from taking place.
 - b) ALFs should be set below market value to compensate firms for meeting the Geographic Coverage Obligation, in order to avoid deterring future investment.
 - c) ALFs will reduce the expected returns from investments using 900 MHz and 1800 MHz spectrum.
 - d) The possibility of changes to ALFs creates uncertainty about investment returns.

Internal funds vs external finance

- 5.79 The Expert Report¹³⁵ argues that:

¹³⁴ Paragraphs A9.39-A9.44.

¹³⁵ Paragraph 71.

“First, the economics and finance literature has identified that external finance can be more expensive than a company’s own internally generated funds because external providers of finance have less information on the quality and riskiness of the company’s investments. The implication is that a change, such as an increase in ALFs, that reduces a company’s profits will thereby reduce the amount of internal funds that the company has available to invest. This is in essence what Mr Paul Ceely confirms is the case for EE in his witness statement.¹³⁶ The reduction in available internal funds will, in turn, reduce investment because the company cannot access external finance at a cost that would make those investments economically worthwhile. This literature and its empirical support is discussed by the OECD¹³⁷.”

- 5.80 In our view, the Expert Report has not demonstrated that setting ALF at market value is likely to have a negative impact on efficient investment by MNOs through the mechanism described above. To begin with, the Expert Report does not distinguish between efficient and inefficient investment. In fact, 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 executives will make inefficient investments as a result, for example, of optimism bias, escalation of commitment, or moral hazard.
- 5.81 The findings reported in the OECD study, which is cited in the Expert Report, relate to firms with low internal funds or net worth being financially constrained and unable to carry out all profitable investment projects.¹³⁸ We do not consider that UK mobile operators meet this description. For example, the large sums paid by BT for EE (£12.5bn¹³⁹) and bid by H3G for O2 (£10.5bn¹⁴⁰) indicate the scale of the financial resources available to mobile operators. In addition, we have estimated EBITDA for the four largest mobile providers to be above £4bn in each year from 2009 to 2015, in December 2015 prices.¹⁴¹
- 5.82 In principle, it is possible that the effect described by the Expert Report could come about – i.e. there could be a prospective investment where the (internal) expected return exceeded the (external) cost of capital, but where the firm was unable to communicate to the market all relevant information about the risk and expected return, for example because of commercial sensitivity, or a credibility problem. However, for such a situation to arise because of ALFs at market value it would require that:

¹³⁶ Reference to paragraph 32 of Mr Ceely’s witness statement.

¹³⁷ Reference to OECD report “How do taxes affect investment and productivity”, 2008, paragraph 10. <http://www.oecd-ilibrary.org/docserver/download/230022721067.pdf?expires=1520334576&id=id&accname=guest&checksum=35237152F923B6624052A2699A9130A2>

¹³⁸ OECD report: “How do taxes affect investment and productivity”, 2008, paragraph 10.

¹³⁹ BT agrees definitive terms to acquire EE for £12.5bn to create the UK’s leading communications provider, BT News Release, 5 February 2015,

<http://www.btplc.com/Sharesandperformance/Presentations/downloads/EEAnnouncementFINAL.pdf>

¹⁴⁰ <https://www.ft.com/content/32018c52-1695-11e6-9d98-00386a18e39d>

¹⁴¹ Based on Ofcom analysis of financial statements. See Ofcom, Mobile Call Termination consultation, June 2017, Footnote 115, page 44, https://www.ofcom.org.uk/_data/assets/pdf_file/0011/103340/mobile-call-termination-consultation.pdf.

- 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.
- 5.83 There would also be the question of whether such investments were efficient or inefficient.
- 5.84 In considering the likelihood of such an outcome we note that setting ALFs at market value constitutes an increase in ALF payments of around £140m per annum. This is a small fraction (around 5%) of aggregate capital expenditure for the four largest mobile providers, which was over £2bn in 2016.¹⁴²
- 5.85 While the Expert Report refers to Mr Ceely's witness statement, that witness statement does not in fact present evidence that setting ALFs at market value would lead to such an outcome.
- 5.86 Even if there were evidence of specific investments which would be (or have been) made with internal funds in the event of a lower ALF, but which would not be made if ALFs were at market value, in our view this would not be a sufficient reason for the appropriate level of ALFs to be below market value. The presence of a possible market failure does not necessarily mean that we should intervene to correct it by subsidising an input price. In the present case, the intervention (setting ALFs below market value) would effectively be an unconditional subsidy for mobile operators, which would not be targeted at the potential market failure in question.
- 5.87 Consistent with this, it has been standard practice in telecommunications and other sectors for many years to take the regulated firm's cost of capital as an appropriate estimate of its opportunity cost of finance and not as a systematic overstatement of it. If telecommunications providers were in fact able to fund efficient investments materially more cheaply than at the cost of capital, there would be a case for reflecting this in price controls.

Geographic coverage obligation

- 5.88 The Geographic Coverage Obligation (GCO) 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.
- 5.89 The Expert Report comments¹⁴³ that:

¹⁴² Based on Ofcom analysis of financial statements. See Ofcom, Mobile Call Termination final statement, March 2018, Footnote 142, page 57, https://www.ofcom.org.uk/data/assets/pdf_file/0021/112458/Final-Statement-Mobile-Call-Termination-Market-Review-2018-2021.pdf

¹⁴³ Paragraphs 29-30.

“The value of spectrum generally depends on the conditions that are assigned to its use (including coverage obligations). The more conditions that are imposed, the lower the value of the spectrum concerned. These conditions differ from country to country...The fact that UK coverage obligations have become more severe implies that the spectrum to which these obligations apply has become less valuable.”

5.90 The Expert Report also comments¹⁴⁴ that:

“I understand that, while operators agreed to the GCO, they did so under the expectation that Ofcom would consider the costs that they would be likely to incur in meeting this new GCO when deciding at what level to set ALFs, and in particular whether to reduce ALFs from the levels proposed in Ofcom’s provisional decision prior to the GCO having been agreed to...If the regulator and the Government behave so as to create a substantial new cost on operators (such as that entailed in meeting the GCO) without compensating them in return, it will raise the perceived risk of future investment in the sector in the UK...”

5.91 In essence, stakeholders have made two sets of arguments in relation to the GCO.

- a) That the GCO had an impact on the market value of 900 MHz or 1800 MHz spectrum, which should be reflected in the level of ALFs.
- b) That the GCO is a reason for setting ALFs below market value.

Impact of the GCO on market value

5.92 To begin with the first point, Section 4 of our 2015 Statement set out our view of the impact of the GCO on the market value of the ALF bands. The market value of spectrum for the purpose of ALFs depends on the value to the marginal operator. Each of the four MNOs is subject to the GCO whether or not it acquires additional spectrum in the 900 MHz or 1800 MHz bands. So, if the marginal operator for a spectrum licence is one of the four existing MNOs, it is already subject to the geographic coverage obligation whether or not it acquires the additional spectrum in question. This will be the case regardless of whether the private value of spectrum to the current holder has been affected by the geographic coverage obligation. While it is possible that the marginal user of a spectrum licence could be an operator other than one of the four MNOs, our view was this possibility was unlikely to increase the market value of the 900 MHz or 1800 MHz bands, for a number of reasons. In particular, (i) it was not clear that the GCO would be imposed on an operator who acquired a spectrum licence but was not one of the four MNOs, and (ii) valuations of operators other than the four MNOs had a limited effect on our assessment of the value of the 900 MHz and 1800 MHz licences.

5.93 In light of this, we do not consider that the GCO had an impact on the market value of 900 MHz or 1800 MHz spectrum, which ought to be reflected in the level of ALFs.

¹⁴⁴ Paragraph 75(ii).

The GCO as a reason for setting ALFs below market value

5.94 Turning to the second point, our 2015 Statement¹⁴⁵ considered arguments from stakeholders that we should adjust ALFs to reflect the effects of the GCO, for reasons which did not directly relate to the market value of the spectrum. In particular we reported that:¹⁴⁶

“EE argued ... that “it had a legitimate expectation that Ofcom would not only consider whether the incremental costs of the geographic coverage obligation would affect the market clearing price for 900 and 1800 MHz spectrum, but would properly consider whether to make an adjustment to ALFs (or the way in which they are implemented) to take account of the incremental costs of the geographic coverage obligation” ... In this context, EE said that it relied on Ofcom’s letter of 27 January 2015.

Vodafone ... stated that “changes in the private values of operators given the enhanced coverage obligation ... need to be taken into account either directly or indirectly in the calculation of ALF, given the statement by the Secretary of State that the costs of meeting the new obligation should be taken into account in the consideration of ALF levels”.

Telefónica ... argued that “effectively penalising mobile operators in the way Ofcom has proposed would completely remove any incentive on future co-operation with the Government”. It said that private companies may no longer agree to undertake “socially beneficial initiatives which adversely affect their enterprise value, if they are not to be reasonably compensated”.

5.95 In response, we said that:¹⁴⁷

“In relation to EE’s claim that it had a legitimate expectation that we would properly consider whether to make an adjustment to ALFs to take account of the incremental costs of the geographic coverage obligation, we are confident that through our February 2015 consultation and our consideration of the responses to it, we have properly considered whether the geographic coverage obligation should impact future ALFs, taking account of the associated incremental costs incurred by the MNOs. This is in accordance with what we said we would do in our letter to the Secretary of State of 17 December 2014¹⁴⁸ (in response to the letter of the Secretary of State of the same date¹⁴⁹) and our letter to EE of 27 January 2015.

As regards Vodafone’s comment, to the extent that Vodafone is suggesting that the letter of the Secretary of State of 17 December 2014 meant that the Government Direction should be interpreted differently in light of the agreement reached between the Government and the MNOs in respect of the geographic coverage

¹⁴⁵ Paragraphs 4.101-4.107.

¹⁴⁶ 2015 Statement, paragraphs 4.102-4.104.

¹⁴⁷ 2015 Statement, paragraphs 4.105-4.107.

¹⁴⁸ http://media.ofcom.org.uk/content/posts/news/2015/Letter_to_Secretary_of_State.pdf

¹⁴⁹ http://media.ofcom.org.uk/content/posts/news/2015/Ed_Richards_Mobile_Coverage_Agreement.pdf

obligation and/or that the Secretary of State was instructing us to adjust ALF level in light of the geographic coverage obligation, we do not agree with Vodafone. The Secretary of State in his letter of 17 December 2014 set out his view that interested parties should be given a reasonable opportunity to comment on whether they consider the geographic coverage commitment, taking account of the associated incremental costs incurred by the MNOs, should impact on future ALFs. We agreed that all interested parties should be given that opportunity, and we gave them that opportunity as set out above. We do not consider that the Secretary of State's letter bears any further or alternative interpretation in this regard.

Finally, we note Telefónica's claim that we are penalising mobile operators. As we said above, we have properly considered whether the geographic coverage obligation should impact future ALF, in accordance with our letter to the Secretary of State of 17 December 2014. We do not accept that we are penalising the mobile operators in any way. We make no comment as to operators' potential future incentives."

- 5.96 We remain of the view that imposing ALFs at market value does not have the effect of penalising mobile operators. We do not consider that it is appropriate to reduce ALFs to reflect the incremental cost of the GCO. The GCO was a voluntary commitment, no direct compensation was offered for it at the time it was agreed, and so neither Ofcom nor the Government behaved "so as to create a substantial new cost on operators".¹⁵⁰ In general, if and when MNOs cooperate with Government, it is for them to satisfy themselves as to the terms on which they do so. We also note that as part of the GCO agreement, the Government committed to reforming the Electronic Communications Code to include provisions for rights to upgrade/share infrastructure, and clearer rules about the process for enforcing emergency access or granting interim access to sites.

Effect of ALF on expected future returns

- 5.97 Next, the Expert Report argues¹⁵¹ that ALFs can "be expected to reduce the expected future returns to investments that require the use of the 900 MHz and 1800 MHz bands", "even if ALFs are set at market value and do not increase the opportunity cost of spectrum".
- 5.98 The relevant issue for the incentive to invest is the incremental profitability of the investment. While a higher level of ALFs may reduce the operator's overall level of profitability under certain circumstances, it is unclear that it would change the incremental revenue or incremental cost of a proposed investment.
- a) ALF spectrum might not be incremental to the investment. No evidence has been presented of investment where ALF spectrum is incremental, e.g. that the MNO would hand back or divest one or more of its ALF spectrum licences if it did not make the investment.

¹⁵⁰ i.e. to the extent that the MNOs incurred costs as the result of the GCO, this was a result of their voluntary commitment.

¹⁵¹ Paragraphs 76-77.

- b) If ALF spectrum is incremental to the investment, we would expect ALFs at market value to be efficient – i.e. to send an appropriate signal of the cost of the investment. In this case, if the cost of continuing to hold the spectrum (whether this is ALFs at market value, or foregone revenue from a spectrum trade) means that the investment does not have a positive expected return above the cost of capital, then it is appropriate for the firm not to make the investment. In contrast, with ALFs below market value, a licence-holder which did not take full account of the opportunity cost of its spectrum licences could make an investment to which ALF spectrum was incremental, in a case where an alternative spectrum-user had a higher value for the spectrum than was expected from the licence-holder's investment. As a result, if licence holders do not take full account of the opportunity cost of their spectrum licences, ALFs at market value could promote efficient investment decisions.

The possibility of changes to ALFs creating uncertainty about investment returns

- 5.99 The Expert Report argues¹⁵² that *“a firm will not be willing to make large specific investments (in its network) if, after the investment is made, the regulator has the possibility and the incentive to change the regulatory conditions so as significantly to reduce the profitability of the investment.”* The report refers to *“Ofcom’s statement that it may change ALFs in the future¹⁵³, which further raises the uncertainty about the returns to current investment for the mobile operators holding spectrum in the ALFs bands.”*
- 5.100 The report continues:¹⁵⁴
- “I note Ofcom is unlikely to provide a compensating reduction in ALFs if investments in new technologies do not succeed. In particular, I expect that Ofcom will hold that the value of the spectrum will not fall if new investments fail because the value will still reflect the use of current technology. Accordingly, operators would be presented with bearing the full cost of any failed investments (as old technology effectively places a floor on market value) while only receiving a part of the return on any successful investments.”*
- 5.101 The argument made here by the Expert Report is essentially the same as one we considered – and disagreed with – in our October 2013 consultation (see paragraph 5.76b above).
- 5.102 We recognise the importance of future mobile investment in the UK, and hence of MNOs having appropriate incentives to invest. It is possible that a mobile operator could make an investment which would increase the market value of spectrum and subsequently lead to an increase in ALFs paid by that operator. However, we consider this possibility is unlikely to deter operators from investing, and we do not consider there is a need for a compensating reduction in ALFs if investments in new technologies do not succeed. In particular:

¹⁵² Paragraphs 78-79.

¹⁵³ Reference to our 2015 Statement, paragraph 6.84.

¹⁵⁴ Paragraph 80.

- a) It is appropriate for operators to pay the market value of their spectrum holdings. A successful investment could increase the value of a scarce input but this is not generally a market failure (as an illustrative example, a successful investment by Samsung could lead to increased demand for smartphones, potentially resulting in an increase in the price of lithium which would increase Samsung's costs).
- b) If an investment in new technology does not succeed, it may well be that the spectrum holdings will retain their value, and there is no reason why ALF should be reduced.
- c) A successful investment by a mobile operator will not necessarily increase the market value of ALF spectrum.
- d) To the extent that the value of spectrum is influenced by such investments, this will depend on investments across the sector, not by that particular firm.
- e) We consider that a rational mobile operator would be unlikely to pursue a strategy of avoiding potentially profitable investments on the grounds that they could, if successful, ultimately lead to an increase in ALFs. The obvious risk to such a strategy is that the mobile operator's rivals would make the investment and profit from it, while the entire sector would experience any subsequent increase in ALFs, including the operator which did not make the investment.

5.103 If spectrum holdings fell in value for any reason, we would expect to consider this in future ALF reviews, as noted in our 2015 Statement:

*"We do not agree with the suggestion that in future reviews we would be more likely to revise ALF upwards than downwards. It is reasonable to expect we would initiate a review where a material misalignment had arisen between the level of these fees and the value of the spectrum in either direction (i.e. the value of the spectrum had changed such that it was either materially above or materially below the level of ALF)."*¹⁵⁵

Impact on competition

- 5.104 We do not consider that ALFs at market value would be likely to have an adverse impact on competition, and there is some risk that setting ALFs below market value would have such an adverse impact. Overall, we consider that ALFs at market value are consistent with promoting competition.
- 5.105 The UK benefits from network-based competition among the four mobile network operators. We want the UK to continue to enjoy effective competition between four

¹⁵⁵ 2015 Statement, paragraph 6.85.

national network providers, and a range of other retail competitors (such as MVNOs and resellers).¹⁵⁶

- 5.106 In general, we consider that ALFs at market values would tend to be pro-competitive. Operators have a mix of ALF spectrum and spectrum acquired in auctions. Giving firms an incentive to relinquish spectrum for which they are not the highest-value users could help to relieve spectrum scarcity and enable market entry or expansion by smaller providers.¹⁵⁷
- 5.107 We consider three potential arguments about the impact on competition of ALFs being at or below market value.
- a) The risk that setting ALFs at market value would lead operators to relinquish spectrum which they need to be credible.
 - b) The risk of a distortion to competition from setting ALFs below market value.
 - c) An argument that the GCO imposed higher costs on operators with networks designed for 1800 MHz spectrum than for 900 MHz spectrum, and that ALFs should be set to compensate for this.

Risk to competition between credible MNOs from relinquishment of spectrum

- 5.108 We considered potential impacts on competition of setting ALFs above market value in Annex 9 of our October 2013 consultation.¹⁵⁸ Our view was that the UK mobile market was broadly competitive and that all four operators had the spectrum licences they needed to be credible. We said that any operator that needed a particular block of spectrum to be credible was relatively unlikely to relinquish it to avoid paying ALFs. Our view remains that none of the four operators is likely to relinquish spectrum licences which it needs to be credible, in response to ALFs being at market value.

Possible competitive distortion from ALFs below market value

- 5.109 In the SRSP¹⁵⁹ we noted that AIP was unlikely to introduce distortions to competition in downstream markets when set to reflect the opportunity cost of spectrum. We consider that it is appropriate for firms to pay the market value of spectrum licences regardless of whether they are ALF licences or have been won in auctions. Given differences between MNOs in their holdings of ALF spectrum or their mix of ALF and auction spectrum, subsidising ALF spectrum by setting it below market value would have differential financial effects on operators. In our view, setting ALF licences at market value is consistent with promoting competition.

¹⁵⁶ Ofcom, Initial Conclusions from Strategic Review of Digital Communications, paragraph 4.57.
https://www.ofcom.org.uk/_data/assets/pdf_file/0016/50416/dcr-statement.pdf

Ofcom, Award of the 2.3 and 3.4 GHz spectrum bands, July 2017, paragraphs 1.10.

¹⁵⁷ SRSP statement, paragraph 5.165.

¹⁵⁸ Paragraph A9.32.

¹⁵⁹ SRSP statement, paragraph 4.68.

5.110 H3G (in a Witness Statement given by Bryn Jones) supported, in principle, the idea of ALFs for 900 MHz and 1800 MHz spectrum reflecting full market value in a manner consistent with the EU regulatory objectives. H3G has historically advocated an increase in ALFs because it believed that the other MNOs were paying artificially low fees for their 900 MHz and 1800 MHz spectrum and considered that this put H3G at a competitive disadvantage.¹⁶⁰

Compensation for GCO costs

5.111 The Expert Report¹⁶¹ argues that setting ALFs at market value would distort competition because the ALFs do not take the asymmetric impact of the GCO on the different operators into account. That is, the report contends that the GCO imposes a much greater cost on the operators with networks designed for 1800 MHz spectrum compared to the cost on operators with networks designed for 900 MHz spectrum and that this risks distorting competition *“to the extent that the lack of compensation affects the operators with the higher costs of meeting the GCO more severely if they, in practice, have less funds available to spend on areas where they might otherwise have been able to achieve greater competitive effects.”*

5.112 We disagree that ALFs at market value would distort competition on this basis. Firstly, the claimed negative impact on competition, if it exists, arises from the GCO and not the level at which the ALFs are set. Secondly, the argument that in the absence of the GCO operators might have made different investments which could have increased competition is not supported by any evidence. It also relies on the suggestion that investment is adversely affected by reducing internal funds available for investment which we discuss in paragraphs 5.79 to 5.87. Thirdly, it is not clear how providing operators with a subsidy through setting an ALF below opportunity cost would be an effective remedy to any competition concern.

¹⁶⁰ Paragraph 21.

¹⁶¹ Paragraph 85-88.

6. Conclusions and implementation

Levels of ALFs for 900 MHz and 1800 MHz frequency bands

- 6.1 As discussed in Section 5 (paragraphs 5.16 and 5.17), our view is that setting ALFs at the full market value of the spectrum will have either a positive impact or no impact with regard to each of our statutory duties, and that, in the round, doing so will have a positive impact in terms of our statutory duties.
- 6.2 As summarised in Section 4, paragraph 4.91, our estimate of the base level of annual licence fees based on market value, expressed in April 2018 prices (i.e. before adjustment for CPI inflation), are:
- a) £460,000 per each 2 x 200 kHz national channel in the 900 MHz band, which is equal to £1.150 million for 1 MHz within the same band; and
 - b) £363,200 per each 2 x 200 kHz national channel in the 1800 MHz band, which is equal to £0.908 million for 1 MHz within the same band.

Implementation

- 6.3 This section sets out how we propose to implement the revised fees proposed in this consultation, including:
- a) Common effective date;
 - b) Phasing in; and
 - c) Implementation of inflation indexation.

Common effective date

- 6.4 We consider it appropriate to introduce the revised ALF 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. We propose to maintain 31 October as the common actual payment date, with the common effective date for the new fee regulations to be set as soon as practicable after the new fees regulations come into force.
- 6.5 If fee regulations come in force after 31 October 2018, we propose to pro-rate the ALF payable for the period between the date the regulations come into force and the first payment date. Where licensees have elected to pay the existing ALF in instalments over the year, we will adjust their current instalment plans to reflect the new fee levels.

Phasing in

- 6.6 We have considered whether, in this case, it is appropriate to phase in the new fee rates over time.

- 6.7 Our view is that there should not be a phase in period for these new fee rates with the full new fees due from the common effective date. In taking this view, we take into account:
- a) 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 so that licensees have had a long notice period that their fees would be increased; and
 - b) that the proposed fee levels are similar to those that licensees were paying under the now quashed 2015 Regulations.

Implementation of inflation indexation

- 6.8 We consider that it is appropriate for us to take account of inflation in setting ALF and therefore propose to implement inflation indexation as set out below. We propose to adopt the same approach that we took in our 2015 Statement.¹⁶²
- 6.9 Specifically, we propose a formula for calculating each year's ALF (ALF_t) that would incorporate an annual increase in ALF in line with inflation, as measured by the CPI index. In particular, we propose that the nominal value of ALF would be inflated by the ratio:

$$\left[\frac{CPI_t}{CPI_{t_0}} \right]$$

where:

- a) CPI_{t_0} is the level of the CPI (all items) index in April 2018 (which is 105.4); and
 - b) CPI_t is the latest available figure for the same index published in the Consumers Price Inflation Reference Tables by the Office for National Statistics ("ONS").
- 6.10 In practice, the latest available CPI index figure at any time is likely to be two months old because inflation data related to each month is usually published by the ONS between the 13th and the 23rd of the following month.
- 6.11 The draft fees regulations in the Notice published alongside this consultation set out the formula that we propose to use to derive inflation-adjusted ALF rates for the fees due on the CED and subsequently for the fees due on the common actual payment date.

Future reviews of ALFs

- 6.12 Subject to considering any responses we receive to this consultation, we propose to make new fee regulations accordingly. Our Notification of proposed new fee regulations is set out in Annex 3. Should we proceed with making new regulations, the fees set in these regulations will remain applicable until we amend or revoke such regulations. This means that, in effect, ALFs are set for an indefinite period and are not time limited.
- 6.13 Generally, we consider that there is benefit in a period of certainty for licensees. We would therefore be likely to review ALFs only if there were grounds to believe that a material

¹⁶² See paragraphs 8.46-8.54.

misalignment had arisen between the level of these fees and the value of the spectrum, in keeping with our general policy on fee reviews.

- 6.14 It is possible that grounds for a review could arise following an award of the 700 MHz spectrum in the UK and/or the review that we will need to undertake of the fees for the 2.1 GHz licences. The 700 MHz spectrum is currently planned for 2019 and the fees review for the 2.1 GHz would apply from 2022. We would consider whether or not to review the level of ALFs at the time, if evidence suggested that a material misalignment had arisen.

This consultation

- 6.15 We invite comments on our proposals and the basis for them, and on the drafting of our proposed fee regulations.

A1. Responding to this consultation

How to respond

A1.1 Ofcom would like to receive views and comments on the issues raised in this document, by 5pm on 3 August 2018.

A1.2 You can download a response form from <https://www.ofcom.org.uk/consultations-and-statements/category-2/annual-licence-fees-900-1800-mhz>. You can return this by email or post to the address provided in the response form.

A1.3 If your response is a large file, or has supporting charts, tables or other data, please email it to reuben.braddock@ofcom.org.uk, as an attachment in Microsoft Word format, together with the cover sheet (<https://www.ofcom.org.uk/consultations-and-statements/consultation-response-coversheet>).

A1.4 Responses may alternatively be posted to the address below, marked with the title of the consultation:

Reuben Braddock
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A1.5 We welcome responses in formats other than print, for example an audio recording or a British Sign Language video. To respond in BSL:

- Send us a recording of you signing your response. This should be no longer than 5 minutes. Suitable file formats are DVDs, wmv or QuickTime files. Or
- Upload a video of you signing your response directly to YouTube (or another hosting site) and send us the link.

A1.6 We will publish a transcript of any audio or video responses we receive (unless your response is confidential)

A1.7 We do not need a paper copy of your response as well as an electronic version. We will acknowledge receipt if your response is submitted via the online web form, but not otherwise.

A1.8 You do not have to comment on all the issues raised in the consultation if you do not have a view; a short response on just one point is fine. We also welcome joint responses.

A1.9 It would be helpful if you could explain why you hold your views, and what you think the effect of Ofcom's proposals would be.

A1.10 If you want to discuss the issues and questions raised in this consultation, please contact Reuben Braddock on 020 7981 3108, or by email to reuben.braddock@ofcom.org.uk.

Confidentiality

- A1.11 Consultations are more effective if we publish the responses before the consultation period closes. In particular, this can help people and organisations with limited resources or familiarity with the issues to respond in a more informed way. So, in the interests of transparency and good regulatory practice, and because we believe it is important that everyone who is interested in an issue can see other respondents' views, we usually publish all responses on our website, www.ofcom.org.uk, as soon as we receive them.
- A1.12 If you think your response should be kept confidential, please specify which part(s) this applies to, and explain why. Please send any confidential sections as a separate annex. If you want your name, address, other contact details or job title to remain confidential, please provide them only in the cover sheet, so that we don't have to edit your response.
- A1.13 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and try to respect it. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.14 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's intellectual property rights are explained further at <https://www.ofcom.org.uk/about-ofcom/website/terms-of-use>.

Next steps

- A1.15 Following this consultation period, Ofcom plans to publish a statement as soon as practicable.
- A1.16 If you wish, you can register to receive mail updates alerting you to new Ofcom publications; for more details please see <https://www.ofcom.org.uk/about-ofcom/latest/email-updates>

Ofcom's consultation processes

- A1.17 Ofcom aims to make responding to a consultation as easy as possible. For more information, please see our consultation principles in Annex 2.
- A1.18 If you have any comments or suggestions on how we manage our consultations, please email us at consult@ofcom.org.uk. We particularly welcome ideas on how Ofcom could more effectively seek the views of groups or individuals, such as small businesses and residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.19 If you would like to discuss these issues, or Ofcom's consultation processes more generally, please contact Steve Gettings, Ofcom's consultation champion:

Steve Gettings
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA
Email: corporationsecretary@ofcom.org.uk

A2. Ofcom's consultation principles

Ofcom has seven principles that it follows for every public written consultation:

Before the consultation

- A2.1 Wherever possible, we will hold informal talks with people and organisations before announcing a big consultation, to find out whether we are thinking along the right lines. If we do not have enough time to do this, we will hold an open meeting to explain our proposals, shortly after announcing the consultation.

During the consultation

- A2.2 We will be clear about whom we are consulting, why, on what questions and for how long.
- A2.3 We will make the consultation document as short and simple as possible, with a summary of no more than two pages. We will try to make it as easy as possible for people to give us a written response. If the consultation is complicated, we may provide a short Plain English / Cymraeg Clir guide, to help smaller organisations or individuals who would not otherwise be able to spare the time to share their views.
- A2.4 We will consult for up to ten weeks, depending on the potential impact of our proposals.
- A2.5 A person within Ofcom will be in charge of making sure we follow our own guidelines and aim to reach the largest possible number of people and organisations who may be interested in the outcome of our decisions. Ofcom's Consultation Champion is the main person to contact if you have views on the way we run our consultations.
- A2.6 If we are not able to follow any of these seven principles, we will explain why.

After the consultation

- A2.7 We think it is important that everyone who is interested in an issue can see other people's views, so we usually publish all the responses on our website as soon as we receive them. After the consultation we will make our decisions and publish a statement explaining what we are going to do, and why, showing how respondents' views helped to shape these decisions.

A3. Consultation coversheet

BASIC DETAILS

Consultation title: organisation realise

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing

Name/contact details/job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts? _____

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

A4. Spectrum awards since 2015

Introduction

- A4.1 In this annex we discuss the results of mobile spectrum awards in Europe since the publication of our 2015 Statement.
- A4.2 We focus on countries in which at least one of the ALFs bands has been auctioned. We have identified the following such auctions in Europe since our 2015 statement:
- a) the Danish 1800 MHz auction in September 2016;
 - b) the Norwegian 1800 MHz auction in January 2016; and
 - c) the Norwegian 900 MHz auction in May 2017.
- A4.3 We note that:
- a) **Poland** awarded spectrum in the 800 MHz and 2.6 GHz bands in 2015. However, neither of the ALF (900 MHz and 1800 MHz) bands have been awarded in Poland in the relevant time period (i.e. since the beginning of 2010).
 - b) **Cyprus** awarded spectrum in the 800 MHz and 2.6 GHz bands in 2016, but neither of the ALF bands has been awarded in Cyprus in the relevant time period.
- A4.4 We understand that **Switzerland** will auction unsold spectrum in the 2.6 GHz band in 2018. In 2015 we were unable to derive band-specific prices from Switzerland's award of ALF bands (see our September 2015 statement, Annex 8, paragraph A8.924). As a result, we do not expect that we will be able to derive relevant benchmarks for ALF spectrum from the planned 2.6 GHz award.
- A4.5 This annex contains separate sections for Denmark and Norway. In each we first summarise the auctions we considered in Annex 8 of our 2015 Statement and then, following the structure of Annex 8 of our 2015 Statement, we include for each auction since 2015:
- a) The circumstances and outcome of the auction. This includes a table summarising the amount of spectrum won by each winning bidder, and the prices paid. Where available, we report the final price mark-up over reserve price. It also includes a table detailing the major rules and features of the auction design.
 - b) Our assessment of whether the absolute and relative values derived from each auction are likely to reflect market value in the country concerned, and also whether market value in the country concerned is likely to reflect UK market value.
 - c) A summary of the benchmarks and our assessment. This includes our interpretation of each benchmark in terms of the likelihood, scale and direction of any overstatement or understatement of UK market value.
- A4.6 We also discuss the UK PSSR award.

Denmark

Awards considered in our 2015 Statement

A4.7 We considered three relevant auctions in Denmark in Annex 8 of our 2015 Statement:¹⁶³

- a) **2.6 GHz:** May 2010;
- b) **900 MHz and 1800 MHz:** September 2010;
- c) **800 MHz:** June 2012.

A4.8 Denmark has four MNOs: TDC, Telenor, Telia and Hi3G.

May 2010 2.6 GHz award

A4.9 The May 2010 award of 2.6 GHz spectrum used a Combinatorial Clock Auction (CCA) format.¹⁶⁴ The results are set out in Table A4.1 below.

Table A4.1: May 2010 2.6 GHz auction results¹⁶⁵

	2.6 GHz	Unpaired 2.6 GHz	Price Paid	Package mark-up on reserve price
Total Available	2x70 MHz	50 MHz	-	
TDC	2x20	-	€44.8m	8233%
Telenor	2x20	10	€44.8m	6567%
Telia	2x20	15	€45.2m	6015%
Hi3G	2x10	25	€953k	58%
Unsold	-	-	-	

A4.10 In our 2015 Statement¹⁶⁶, we noted that most 2.6 GHz spectrum sold above reserve price. Hi3G acquired 2x10 MHz at reserve price because the three largest incumbents purchased up to their spectrum cap, although its package, which included unpaired 2.6 GHz, was above reserve price overall. We considered that the price for 2.6 GHz, based on the winning bids by TDC, Telia and Telenor, was reflective of market value in Denmark. For the

¹⁶³ For further detail on each of these auctions and our assessment of them, see 2015 Statement, Annex 8, pages 74-84.

¹⁶⁴ See page 14: <http://www.dotecon.com/assets/images/dp1001.pdf>

¹⁶⁵ See our 2015 Statement, Annex 8, Table A8.3.1.

¹⁶⁶ Paragraph A8.270 and A8.282.

calculations of the benchmarks, we use TDC's price (which was for a package of paired 2.6 GHz only, whereas other winning packages also include unpaired 2.6 GHz spectrum).

September 2010 900 MHz and 1800 MHz award

A4.11 In September 2010, 900 MHz and 1800 MHz spectrum was re-farmed and offered for sale by auction. The three largest incumbents were not allowed to participate, in an attempt to improve competition in the downstream market by encouraging new entry.¹⁶⁷ As set out in Table A4.2 below, only one bidder (Hi3G) participated and it acquired the spectrum at the reserve price.

Table A4.2: September 2010 multiband auction results¹⁶⁸

	900 MHz	1800 MHz	Price Paid 900 MHz	Price Paid 1800 MHz
Total Available	2x5	2x10	-	-
Hi3G	2x5	2x10	DKK 8m	DKK 4m
Unsold	-	-	-	-

In our 2015 Statement¹⁶⁹, we considered that the exclusion of incumbent operators from the September 2010 auction created a larger risk that the 900 MHz and 1800 MHz prices were a larger understatement of market value in Denmark.¹⁷⁰

June 2012 800 MHz award

A4.12 The results of the June 2012 award of 800 MHz spectrum (which used a CCA format¹⁷¹) are set out in Table A4.3 below.

¹⁶⁷ See: <https://www.telegeography.com/products/commsupdate/articles/2010/10/14/telestyrelsen-awards-900mhz-1800mhz-licences-to-hi3g/>

¹⁶⁸ See our 2015 Statement, Annex 8, Table A8.3.3. The table above corrects an error in the table presented in Annex 8 of our 2015 Statement where the prices paid for the 900 and 1800 MHz spectrum were shown the wrong way round (although the calculations in the 2015 Statement used the correct figures).

¹⁶⁹ Paragraph A8.279 and A8.280.

¹⁷⁰ We also considered that the timing of the Danish award meant that the 900 MHz value observed in Denmark risks understating the forward-looking market value of 900 MHz spectrum in the UK, although we said we cannot be sure of the scale or likelihood of this risk. See our 2015 Statement, paragraph A7.163.

¹⁷¹ See: <http://www.dotecon.com/news/danish-800mhz-auction-completed/>

Table A4.3: June 2012 800 MHz auction results¹⁷²

	800 MHz	Price Paid	Package mark-up on reserve price
Total Available	2x30	-	
TDC	2x20	DKK 627.8m	214%
TT-Netvaerket	2x10	DKK 111.5m	123%
Hi3G	-	-	
Unsold	-	-	

Note: 2x10 MHz was won by TT-Netvaerket which is a joint venture between Telenor and Teliasonera.

- A4.13 The award contained an obligation to ensure average download access speeds of at least 10 Mbit/s outdoors across 207 post code areas. Operators were not explicitly required to use the 800 MHz spectrum to meet this. An innovative component allowed bidders to bid for regional exemptions from the coverage obligation imposed on the 800 MHz licences. The band was also subject to strict coexistence restrictions.
- A4.14 Telenor and Telia participated in the auction in the form of the joint venture between them (TT-Netvaerket) and won the 2x10 MHz lot of 800 MHz. We said there was a risk that the joint venture may have reduced the intensity of competition in the auction.¹⁷³
- A4.15 On balance, we considered that the absolute 800 MHz price in Denmark carried an unknown risk of understatement of Danish market value of unknown scale.

Benchmarks considered in our 2015 Statement

- A4.16 In our 2015 Statement¹⁷⁴, we did not include a distance method benchmark for Denmark because the formula generated a negative number, which we did not consider to be in any way sensible as an indication of the UK market value of 1800 MHz. We considered that, in any case, any benchmark for 1800 MHz based on the award of this band in Denmark would at best be third-tier evidence.

¹⁷² See our 2015 Statement, Annex 8, Table A8.3.5.

¹⁷³ We noted that the Danish Competition Council (DCC) raised a competition concern about the joint venture, but this related to a possible future imbalance in spectrum holdings and was addressed by an undertaking from the parties.

¹⁷⁴ Paragraph A8.285.

A4.17 We considered that the 900 MHz / 800 MHz paired ratio of 18% (which implied a UK equivalent market value in March 2013 prices of £5.7m per MHz for 900 MHz spectrum) carried a larger risk of understatement of UK market value and that it should be in Tier 3.¹⁷⁵

Award since our 2015 Statement

September 2016 1800 MHz award

A4.18 In September 2016, an award of 1800 MHz spectrum took place in Denmark. The award used a combinatorial multi-round ascending (CMRA) format.¹⁷⁶

A4.19 The results of this auction are set out in Table A4.4 below, with the auction features summarised in Table A4.5 below.

Table A4.4: September 2016 1800 MHz results

	1800 MHz	Price Paid ¹⁷⁷	Package mark-up on reserve price
Total Available	2x65	-	
TDC	2x20	DKK 300.2m	200%
Hi3G	2x20	DKK 300.2m	200%
TT-Netvaerket	2x25	DKK 425.2m	240%
Unsold	-	-	

Note: TT-Netvaerket is a joint venture between Telenor and Telia.

¹⁷⁵ See paragraphs A8.286-A8.296 and Table A8.3.7.

¹⁷⁶ See <https://www.dotecon.com/news/danish-1800-mhz-auction-third-auction-stage-begins/>

¹⁷⁷ See <https://ens.dk/en/our-responsibilities/spectrum/auctions>

Table A4.5: September 2016 1800 MHz auction ¹⁷⁸

	Description	Implications
Number of bidders; number of lots; lot sizes	3 bidders. ¹⁷⁹ 2 categories of lots: A lots: 3 lots of 2x10 MHz subject to a coverage obligation in one of three coverage area groups. B lots: 7 lots of 2x5 MHz ¹⁸⁰ .	As in the June 2012 800 MHz auction, Telenor and Telia participated in the auction in the form of the joint venture between them (TT-Netvaerket). All bidders acquired spectrum in the auction.
Spectrum caps / Restrictions	A 2x30 MHz cap applied to all bidders (not including existing holdings). Each bidder could acquire at most one A lot.	The overall cap was not binding on any bidder. Each bidder acquired one A lot at the reserve price. ¹⁸¹
Reserve prices	DKK 50m for A lots and DKK 25m for B lots (i.e. DKK 25m per 2x5 MHz)	
Obligations	The auction rules identified three coverage area groups (two consisting of 82 coverage areas of 1 km ² and one consisting of 81 coverage areas of 1 km ²), where there was no access to a download speed of 30 Mbit/s. Each bidder who acquired an A lot in the auction was assigned one of these groups with the obligation to ensure provision of a mobile voice service and a mobile broadband service offering users, for most of the time, a connection with a download speed of 30Mbit/s and an upload speed of 3Mbit/s across the coverage areas in their group.	

A4.20 The auction had four stages:

- a) **1st stage - assignment of A lots:** ¹⁸² in their applications, bidders could apply for one A lot (2x10 MHz with coverage obligation) at the reserve price of DKK 50m. As there were three bidders for (one each of the) three A lots, each bidder was assigned one A lot for a price of DKK 50m.¹⁸³

¹⁷⁸ See: https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf

¹⁷⁹ See: <https://www.telegeography.com/products/commsupdate/articles/2016/09/30/danish-cellcos-awarded-1800mhz-spectrum-for-mobile-broadband-services/>

¹⁸⁰ If A lots had not all been assigned (as they were), the unassigned lots would have been offered as additional B lots. In this case, B lots would have been subject to the coverage obligation in all coverage area groups in which the coverage obligation was not assigned along with A lots.

¹⁸¹ See: Danish Energy Authority. <https://ens.dk/ansvarsomraader/frekvenser/auktioner-og-udbud-frekvenser>

¹⁸² See: https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf, pages 48-49.

¹⁸³ If more than 3 bidders had applied for an A lot then a sealed-bid process would have been used to determine the winners of A lots.

- b) **2nd stage – assignment of coverage area groups:** each winner of an A lot was assigned a different coverage group. These coverage area groups were assigned based on bids submitted during the application process with prices determined using an opportunity-cost-based pricing rule.¹⁸⁴
- c) **3rd stage – multiround ascending auction for B lots:** seven 2x5 MHz lots were available with a reserve price of DKK 25m per lot.¹⁸⁵
- d) **4th stage – assignment of spectrum:** specific frequencies were assigned to each winner of A and B lots. Bidders could submit a bid for different frequency options. Prices were determined using an opportunity-cost-based pricing rule.¹⁸⁶

Assessment

- A4.21 We have considered whether absolute and relative values derived from this auction are likely to reflect market value in Denmark, and also whether market value in Denmark concerned is likely to reflect UK market value.
- A4.22 As in our 2015 Statement¹⁸⁷, the likelihood and scale of overstatement or understatement are each categorised as smaller or larger, or as unknown if we consider that we cannot be sure of the likelihood, scale and / or direction of understatement or overstatement (for example where different factors may influence the benchmark but operate in different directions with the net effect being unclear).

Whether award outcomes are likely to reflect market value

- A4.23 Package prices for 1800 MHz spectrum in the 2016 Danish auction sold for well above the combined reserve prices of the lots won, all incumbents were able to participate, and the spectrum cap was not binding on any of the bidders.
- A4.24 In the following, we consider whether the auction award outcomes are likely to reflect market value in light of:
- a) Coverage obligations;
 - b) Auction design, in particular the capping of one A lot per bidder;
 - c) The effect of the joint venture; and
 - d) The possibility that the auction was subject to strategic bidding.

Coverage obligations

¹⁸⁴ See: https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf, pages 49-50.

¹⁸⁵ For further detail see: https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf, pages 51-74.

¹⁸⁶ See: https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf, pages 74-80.

¹⁸⁷ See Annex 7, paragraphs A7.146-A7.147.

- A4.25 In our 2015 Statement, we took into account the coverage obligations that applied to auction lots.
- A4.26 For 800 MHz:¹⁸⁸
- a) when coverage obligations applied which were likely to be over and above commercial levels, and price differentials between 800 MHz lots in the benchmark country could be ascribed to differences in these coverage obligations, we included only blocks without, or with less onerous, coverage obligations in the calculation of an average price of 800 MHz for the benchmark country. We then used the corresponding UK value of 800 MHz (i.e. without coverage obligation) when deriving the relative value benchmark.
 - b) Denmark was the only exception to this. In that case we used the larger 2x20 MHz lot which was subject to a coverage obligation. This was because the other 800 MHz lot, which did not include a coverage obligation, was affected by DTT co-existence costs. We then used the corresponding UK value of 800 MHz (i.e. with coverage obligation and gross of expected DTT co-existence costs) when deriving the relative value benchmark.
 - c) when there were no differences in coverage obligations across 800 MHz lots in the benchmark country, we calculated the value of 800 MHz as the average of all available lots. We then considered whether or not any coverage obligation (i.e. on all 800 MHz lots) was likely to be onerous. Where there was a basis for believing coverage obligations to be onerous, we used the UK value of 800 MHz with coverage obligation in the derivation of the relative value benchmark; otherwise we used the UK value of 800 MHz without coverage obligation for this purpose.
- A4.27 In calculating the European auction prices of 900 MHz, 1800 MHz and 2.6 GHz we included all available lots in our dataset, irrespective of their coverage obligations, and we considered the implications of the coverage obligations qualitatively if and when necessary. In principle, if such obligations were likely to require deployments significantly in excess of commercial levels then we considered that the auction price could risk understating the value of that band (without coverage obligation) in the UK in our assessment.¹⁸⁹
- A4.28 Table A4.6 below summarises the countries we identified as having coverage obligations on 900 MHz, 1800 MHz or 2.6 GHz.¹⁹⁰

Table A4.6: Countries identified in 2015 Statement as having coverage obligations on 900 MHz, 1800 MHz or 2.6 GHz.

	900 MHz	1800 MHz	2.6 GHz
Czech Republic		✓	✓

¹⁸⁸ See 2015 Statement, Annex 7, paragraph A7.96 and Tables A7.3 and A7.4.

¹⁸⁹ See 2015 Statement, Annex 7, paragraph A7.95.

¹⁹⁰ See 2015 Statement, Annex 8 for details of these obligations and our assessment of them.

	900 MHz	1800 MHz	2.6 GHz
Ireland	✓	✓	
Italy			✓
Romania	✓	✓	✓
Slovenia	✓	✓	
Switzerland	✓	✓	

Source: Ofcom, 2015 Statement, Annex 8.

- A4.29 We did not consider that the obligations were likely to require deployments significantly in excess of commercial levels in these bands for any of these countries.¹⁹¹
- A4.30 The Danish 2016 1800 MHz auction was conducted by the Danish Energy Agency, and its stated purpose was to *“improve mobile coverage – especially in sparsely populated areas – and to promote effective competition in the telecommunications market to ensure the provision of innovative and advanced services in the Danish market.”*¹⁹²
- A4.31 The coverage obligations set in the 1800 MHz licences were described by the Danish Energy Agency as *“ambitious”*¹⁹³, and were aimed at improving the availability of voice and broadband services in areas where the current availability was lowest.¹⁹⁴
- A4.32 While in our 2015 Statement we concluded that none of the non-800 MHz coverage obligations were likely to require deployments significantly in excess of the commercial level, we do not consider that we are able to reach this view in the case of the Danish 2016 1800 MHz auction, particularly given the regulator’s view that the obligations are ambitious.

Restrictions on A lots

- A4.33 The constraint on bidders only being able to acquire one of the three A lots of 2x10 MHz spectrum with a coverage obligation meant that, with only three bidders in the auction, these lots were sold at the reserve price of DKK 50m. As a result, we consider that there is a risk that the overall award outcome may understate market value in Denmark.
- A4.34 We have calculated an alternative estimate of market value which attempts to account for this risk by removing the A lots and the DKK 50m paid for them from the auction outcomes. That is, the estimate is based on the total prices paid by operators minus reserve prices for A lots, divided by the amount of spectrum in B lots. For example, in considering TT-Netvaerket’s winning bids, if we consider all of its lots (including its A lot) then it acquired 2x25 MHz of spectrum for DKK 425.2m, that is DKK 8.5m per MHz. If we remove its A lot

¹⁹¹ See 2015 Statement, Annex 7, paragraph A7.95.

¹⁹² See Danish Energy Agency, *1800 MHz Auction, Information Memorandum*, page 1. https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_june_2016.pdf

¹⁹³ Ibid.

¹⁹⁴ Ibid.

and the DKK 50m paid for it then TT-Netvaerket acquired 2x15 MHz of spectrum for DKK 375.2m, that is DKK 12.5m per MHz. On this basis, the estimate of the prices paid by TDC and Hi3G for B lots is also DKK 12.5m per MHz.

- A4.35 One limitation of this approach is that the total price paid also includes any payments for assignment of the coverage obligations, determined in the second stage of the auction. We do not know what prices, if any, were paid for particular coverage obligations in the second phase. This creates a risk that this alternative approach could overstate market value as any sum paid in the second phase of the auction would be included in our estimate of the market value of B lots.
- A4.36 We do not know what payments were made for assignment of the coverage obligations. It is possible that an operator could have had a high valuation for having one obligation rather than another, for example if the coverage area groups for one particular obligation could be more easily reached by extension of its existing network than would be the case with the other coverage obligations in the auction. However, we note that these payments (and hence the risk of overstatement) may have been limited for a number of reasons:
- a) The coverage obligations included a similar number of areas (81 or 82);
 - b) The coverage area groups were described as being “equally distributed throughout Denmark”;¹⁹⁵
 - c) Under the price determination rule for the coverage obligation assignment stage, the bidder’s payment in this stage depends on bids by other operators, and its own losing bids for other coverage obligations, but not on its own bid for the coverage obligation it acquires. As a result, even if a single bidder had a very high valuation for a particular obligation which it won, this would not determine the price it paid for that obligation.
 - d) As noted, the estimated price for B lots is the same for all operators. This is consistent with an outcome where the winning bids for the third stage were headline bids (at clock prices) and the prices for the second and fourth stages were zero. While it is not impossible that prices in the second or fourth stages were non-zero, in this case these prices would have had to perfectly offset any differences between the price per B lot paid by each bidder, which appears unlikely.
 - e) On a related point, we understand it would not have been possible for all three bidders to face a positive price for the second stage (as all three bidders would have been guaranteed to win one coverage area). Therefore, at least one bidder would have paid the price of DKK 12.5m per MHz for its B lots. Again, this is consistent with an outcome where the winning bids for the third stage were headline bids (at clock prices) and the prices for the second and fourth stages were zero (unless the other two bidders each made perfectly-offsetting bids in the second and fourth stages).
- A4.37 In view of the above, we consider there is a case for identifying an unknown risk of smaller overstatement from an 1800 MHz price based on excluding A lots and their reserve prices

¹⁹⁵ Page 10 of the Information Memorandum.

as described in paragraph A4.34 above. However, on balance we have taken a conservative approach of identifying this as an unknown risk of unknown overstatement.

Effect of the joint venture

A4.38 There is a risk that the joint venture may have reduced the intensity of competition in the auction. As noted above, in the 2012 800 MHz auction we considered that there was an unknown risk of understatement in light of this joint venture.

Strategic bidding

A4.39 In our 2015 Statement we considered the risk that firms would bid differently from their intrinsic value of the spectrum, such as by bidding higher to exclude a rival or raise its costs, bidding lower to reduce the amount they pay in the auction, or placing bids as a signal to rivals, as part of a coordinated strategy of demand reduction.¹⁹⁶

A4.40 In considering the Danish 2016 1800 MHz auction we do not have access to bid data which could potentially be informative as to whether strategic bidding occurred.

A4.41 We considered whether Hi3G (as the operator with the smallest spectrum holding prior to the auction) could have been a target for strategic investment or price driving. Prior to the auction it held no 800 MHz spectrum but held spectrum in the other bands (2x5 MHz of 900 MHz spectrum, 2x10 MHz of 1800 MHz spectrum and 2x10 MHz of 2.6 GHz spectrum). It is not clear that Hi3G needed to win spectrum in this auction in order to remain a credible competitor in the downstream market. In any case, it acquired 2x20 MHz of 1800 MHz spectrum in the auction, at a price that was around 12% lower than TT but the same as TDC. In our view, these results do not provide clear support of effective strategic investment or price driving.

A4.42 We also considered the possibility that with 2x65 MHz spectrum available, an outcome of each bidder getting at least 2x20 MHz (including one of the A lots with the coverage obligations) and the joint venture getting the remaining 2x5 MHz could have been a focal point for strategic demand reduction. While we cannot rule out the possibility of strategic demand reduction, we do not have clear evidence that it took place.

A4.43 Overall, we consider that we are not in a position to take a view as to whether strategic bidding affected prices in Denmark.¹⁹⁷

Risk of understatement or overstatement

A4.44 On the basis of the above assessment, we consider that there is a risk that the auction prices of the Danish 1800 MHz spectrum based on B lots only are an overstatement of market value, as they may include payments for the assignment of coverage obligations. The risk of overstatement may be small, but on a conservative approach we consider this to be an unknown risk of unknown overstatement.

¹⁹⁶ For more details see 2015 Statement, Annex 7, paragraphs A7.182-A7.186.

¹⁹⁷ This is consistent with our approach in our 2015 Statement. See Annex 7, paragraph A7.186.

A4.45 We consider there is a risk that the auction prices of the Danish 1800 MHz spectrum based on all lots are an understatement of market value. This is due to the coverage obligations and the restrictions on A lots, which meant that each operator acquired an A lot at reserve price. Our view is that there is a larger risk of a larger understatement to this estimate. As an illustration, in the example in paragraph A4.34, if the price based on B lots were correct, the price based on all lots would understate it by over 30%.

Likelihood of reflecting UK market value

A4.46 We are not aware of any country-specific factors that would cause the 2016 1800 MHz spectrum auction in Denmark to be an understatement or overstatement of the value in the UK.

Relative benchmarks

Distance method benchmark

A4.47 Our focus on the distance method for 1800 MHz benchmarks is based on our view that because of its technical and commercial characteristics, the market value of this band is likely to be between the values of 800 MHz and 2.6 GHz spectrum.¹⁹⁸ In our October 2013 consultation¹⁹⁹ we commented that *“...we do not consider it credible that 1800 MHz spectrum has a lower value than 2.6 GHz spectrum in the UK, and we consider that any international auction benchmarks which imply a lower value for 1800 MHz than for paired 2.6 GHz spectrum should be treated as less important evidence.”* This was on the basis of technical and commercial evidence (such as its propagation characteristics and ability to support UK-wide LTE rollout), and bidding behaviour in the UK 4G auction (which was consistent with 1800 MHz being a closer substitute than 2.6 GHz for 800 MHz spectrum).

A4.48 As set out in paragraph A4.16, we did not include a distance method benchmark for Denmark in our 2015 Statement because the formula generated a negative number, which we did not consider to be in any way sensible as an indication of the UK market value of 1800 MHz.

A4.49 We have calculated a distance method benchmark for Denmark using the results of the 2016 1800 MHz auction, the 2010 2.6 GHz auction and the 2012 800 MHz auction. We have generated estimates using both approaches to calculating the market value from the 2016 auction, as set out in paragraphs A4.33 and A4.34.

Considering all lots in 2016 1800 MHz auction

A4.50 Using an 1800 MHz price based on both A and B lots in the auction leads to a Y/X value of -6%. This is because the UK equivalent market value of the Danish 1800 MHz derived from the 2016 auction is slightly less than the UK equivalent market value of the Danish 2.6 GHz auction. This would imply an 1800 MHz distance method benchmark of £4.2m per

¹⁹⁸ Paragraph 3.24 of our August 2014 consultation.

¹⁹⁹ Paragraphs 4.43 to 4.45.

MHz, that is, less than the value of 2.6 GHz. As noted above, we do not consider this to be credible in a UK context.

- A4.51 The advantage of the distance method is that it generates a benchmark for each country using the information on spectrum values in each of the 800 MHz, 1800 MHz and 2.6 GHz bands. We considered this to be more relevant than the ratios of 1800 MHz to either 800 MHz or to 2.6 GHz on their own.²⁰⁰ However, when the implied values of 1800 MHz and 2.6 GHz are close together the output of the distance method becomes highly insensitive to the relative values of 1800 MHz and 800 MHz. For example, if we ruled out the possibility of a negative value and assumed the value of 1800 MHz and 2.6 GHz in Denmark to be equal, this would mean the Y/X ratio in the distance method (i.e. the “distance” element) would be zero, and the benchmark would simply be the value of 2.6 GHz spectrum in the UK (£5.9m per MHz). However with this approach the value of 800 MHz in Denmark has no effect on the value of the benchmark, and it delivers the same result as a benchmark based on the 1800 MHz to 2.6 GHz ratio.
- A4.52 We have used the 1800 MHz price based on both A and B lots in the auction to derive the ratios of 1800 MHz to both 800 MHz and to 2.6 GHz on their own as a possible indication of the range for the UK market value of 1800 MHz:
- a) The ratio of 1800 MHz/800 MHz for Denmark is 62%. This implies a UK 1800 MHz value of **£20.9m per MHz**.²⁰¹ We consider that this carries a risk of either under or over-statement, because we consider that this estimate of 1800 MHz market value carries a larger risk of larger understatement (see paragraph A4.45) and the 800 MHz market value (see paragraph A4.15) carries a risk of understatement.
 - b) The ratio of 1800 MHz/2.6 GHz for Denmark is 97%. This implies a UK 1800 MHz value of **£5.7m per MHz**. We consider that this carries a larger risk of larger understatement, because we consider that this estimate of 1800 MHz market value carries a larger risk of larger understatement while we consider the estimate of 2.6 GHz was reflective of market value (see paragraph A4.10).

Considering only B lots in 2016 1800 MHz auction

- A4.53 If we consider only B lots, this leads to a Y/X value of 68%, which would imply a 1800 MHz distance method benchmark of **£24.8m per MHz**.
- A4.54 Considering each of the tiering criteria our view is that:
- a) As A lots were sold at reserve price, final package prices indicate that B lots were acquired at prices significantly above reserve, and as such appear likely to have been primarily determined by a market-driven process of bidding. 800 MHz and 2.6 GHz prices also appear to have been reached through a market-driven process.

²⁰⁰ August 2014 consultation, paragraph 3.27.

²⁰¹ This is based on a UK 800 MHz value of £33.8m per MHz (gross of expected DTT co-existence costs and with coverage obligation). This is the £31.45m figure from our 2015 Statement updated for inflation. See 2015 Statement, Annex 7, Tables A7.3 and A7.4.

- b) Based on our assessment of strategic bidding, we consider that the relative prices in the 1800 MHz auction are at least as likely to reflect intrinsic valuation of spectrum in Denmark as to reflect strategic bidding. We have no evidence of strategic bidding in the 800 MHz and 2.6 GHz awards.
- c) We do not have clear, evidence-based reasons to consider the auction outcome is less informative of forward-looking relative values in the UK (having regard to country-specific circumstances and auction dates).

A4.55 Next we consider whether this benchmark carries a risk of understatement or overstatement. There are several effects on the benchmark which may cause understatement or overstatement:

- a) Effect of the TT Joint Venture. This affects both the 1800 MHz and 800 MHz. If it affected both bands to a similar extent, the combined effect might be the distance method benchmark having a risk of understatement. For example, if both bands would have been 50% higher absent the JV, then the benchmark would have been 17% higher.
- b) Coverage obligation assignment payments: as mentioned above, these could lead to a risk of overstatement of the 1800 MHz price, and hence of the distance method benchmark.
- c) Combining auction prices from three different auctions in three different years, 2010 (2.6 GHz), 2012 (800 MHz) and 2016 (1800 MHz). There is a risk that these gaps in time affect the risk of understatement or overstatement, although we have not identified a clear direction or magnitude of the possible effects.²⁰²
- d) Sensitivity of the distance method benchmark, given that the 800 MHz and 2.6 GHz auction prices in Denmark are relatively close together (e.g. much closer together than in the UK).²⁰³ Again, we have not identified a clear direction or magnitude of the possible understatement or overstatement.²⁰⁴

A4.56 Taking the first two effects together there is a risk of either understatement or overstatement in the distance method benchmark.

Absolute benchmarks

A4.57 The data from the 2016 1800 MHz award enables us to derive absolute value benchmarks for the 1800 MHz band in Denmark which are (in April 2018 prices):

²⁰² In our assessment of relative value benchmarks for Germany, we initially considered that a time difference of five years could create a risk of understatement or overstatement (2015 Statement, Annex 8, paragraphs A8.378 and A8.379), and concluded that changing expectations about 700 MHz availability over this period created a risk of understatement in both 900 MHz and 1800 MHz benchmarks (paragraphs A8.487 and A8.489). Our dataset for deriving international benchmarks also includes separate awards in Austria (2.6 GHz in 2010 and other bands in 2013), Greece (900 MHz and 1800 MHz in 2011, 800 MHz and 2.6 GHz in 2014), and Spain (separate awards of 800 MHz and 900 MHz in 2011).

²⁰³ For example, in Denmark the ratio of prices of 2.6 GHz to 800 MHz is 62%, whereas in the UK it is 17%.

²⁰⁴ Denmark had the lowest value for 800 MHz and the second-highest value for 2.6 GHz among awards we included in our dataset for deriving international benchmarks (see 2015 Statement, Table 3.1).

- a) **£11.5m per MHz** based on considering all lots. We consider that this carries a larger risk of larger understatement.
- b) **£16.4m per MHz** based on considering only B lots. We consider that this carries a risk of overstatement.

Summary of our assessment

A4.58 The following table summarises the available benchmarks (along with our interpretation of them) from the Danish award:

Table A4.7: Summary of evidence points from Denmark using only B lots from 2016 1800 MHz auction (in April 2018 prices)

	Absolute values (£m/MHz)				Relative value benchmarks ²⁰⁵ (£m/MHz)		Ratios (%)			
	800 MHz	900 MHz	1800 MHz	2.6 GHz	900 MHz / 800 MHz	Distance method	1800 MHz / 800 MHz	1800 MHz / 2.6 GHz	1800 MHz / 900 MHz	2.6 GHz / 800 MHz
Final values	17.6	3.1	16.4	11.1	6.1	24.8	88%	138%	488%	62%
					(18%)	(68%)				
					Tier 3					
Assessment of risk	Risk of understatement	Larger risk of larger understatement	Risk of overstatement	No risk identified	Larger risk of larger understatement	Risk of over or understatement	Risk of overs-tate-ment	Risk of over-statement	Larger risk of over-statement	Risk of over-statement

²⁰⁵ Based on the UK 800 MHz value with coverage obligation and gross of expected DTT co-existence costs.

Norway

Awards considered in our 2015 Statement

A4.59 In Annex 8 of our 2015 Statement we considered the Norwegian December 2013 combinatorial multiband award which was a sealed bid, first price combinatorial auction awarding licences for the use of 800 MHz, 900 MHz and 1800 MHz spectrum.²⁰⁶

A4.60 The auction awarded the whole 2 x 30 MHz in the 800 MHz band and the parts of the other two bands which were either near the expiry date (2 x 15.1 MHz at 900 MHz expiring on 31 December 2013) or unallocated at that time (2 x 55 MHz at 1800 MHz).²⁰⁷ One of the three incumbent MNOs, Tele2, did not win any spectrum in the auction, while new entrant Telco Data acquired the largest package. The results of the auction are set out in Table A4.8 below.

Table A4.8: December 2013 multiband auction results²⁰⁸

	800 MHz	900 MHz	1800 MHz	Price Paid	Package mark-up on reserve price
Total available	2 x 30	2 x 15	2 x 55	-	-
TeliaSonera	2 x 10	2 x 5	2 x 10	NOK 626.7m	527%
Telco Data	2 x 10	2 x 5.1	2 x 20	NOK 705m	315%
TeleNor	2 x 10	2 x 5	2 x 10	NOK 453m	183%
Tele2	-	-	-	-	-
Unsold	-	-	2 x 15	-	-

A4.61 As set out in our 2015 Statement²⁰⁹, the spectrum in the 2013 multiband auction sold well above reserve prices. However, we agreed with consultation respondents that the sealed bid, first-price nature of the auction gave bidders a strong incentive for bid shading.

A4.62 We considered that Tele2's failure to win any spectrum was consistent with bid shading; we understood from NPT that Tele2 stated in the media that it did not anticipate strong competition by a new entrant and has, since the auction, publicly expressed interest in the unsold 2x15 MHz. Similarly, we said the substantially different prices for the same package

²⁰⁶ For further detail on this auction and our assessment of it, see 2015 Statement, Annex 8, pages 179-181.

²⁰⁷ TeliaSonera and TeleNor each had a 2x10 MHz existing licence expiring on 31 December 2017. At 1800 MHz, the same operators have each a 2 x 10 MHz existing licence, renewed with an administrative procedure in 2009 (after lack of interest from potential applicants following a public announcement). See sections 2.2 and 2.3 of the Auction Rules, available here: <http://www.npt.no/aktuelt/h%C3%B8ringer/attachment/9106?download=true&ts=1407b7941b3>

²⁰⁸ See: 2015 Statement, Table A8.10.1 and <https://eng.nkom.no/topical-issues/news/final-result-of-the-auction>

²⁰⁹ Paragraphs A8.662-A8.663.

paid by Telenor and TeliaSonera may partially depend on different degrees of bid shading by each bidder and not only on different intrinsic valuations of the spectrum.

A4.63 We noted that NPT was unable to provide us with LRP or other band-specific price information for the 2013 multiband auction. Since total receipts from the auction were well above reserve prices, we considered that it was not possible to use reserve prices as an approximation of the market value of spectrum by band. We did not derive benchmarks from the Norwegian auction.²¹⁰

Awards since our 2015 Statement

A4.64 There have been two relevant auctions in Norway since our 2015 Statement:

- a) **1800 MHz** in January 2016
- b) **900 MHz** in May 2017

January 2016 1800 MHz award

A4.65 This award was a multiround ascending clock auction for the 2x15 MHz of 1800 MHz spectrum that was unsold in the 2013 multiband auction.²¹¹ The results of this auction are set out in Table A4.9 below, with the auction features summarised in Table A4.10 below.

Table A4.9: January 2016 1800 MHz auction results²¹²

	1800 MHz	Price Paid	Package mark-up on reserve price
Total Available	2x15	-	
TeliaSonera	2x5	NOK 292.7m	5754%
TeleNor	2x10	NOK 585.3m	5753%
Ice Communication ²¹³	-	-	-
Unsold	-	-	-

²¹⁰ See 2015 Statement, Annex 8, paragraphs A8.664-A8.667.

²¹¹ See: <https://eng.nkom.no/technical/frequency-auctions/auctions/planned-completed-auctions/attachment/20880?download=true&ts=150f040a7c3>

²¹² See: <https://eng.nkom.no/technical/frequency-auctions/auctions/planned-completed-auctions/auction-23-1800-mhz>

²¹³ Telco Data who won spectrum in the December 2013 multiband auction was re-named Ice Communication in 2014. See: <https://icegroup.com/blog/telco-data-becomes-integrated-in-fully-financed-ice/>

Table A4.10: January 2016 1800 MHz auction features

	Description	Comment
Number of bidders; number of lots; lot sizes	There were 3 bidders and 3 lots of 2x5 MHz each. Only 2 bidders (the main incumbents) secured spectrum.	The three lots were the unsold spectrum from the December 2013 multiband auction.
Spectrum caps / Restrictions	No spectrum cap.	
Reserve prices	NOK 5m for each paired lot.	
Obligations	No coverage obligations.	

May 2017 900 MHz award

A4.66 A Simultaneous Multiple Round Ascending (SMRA) auction of 2x20 MHz 900 MHz spectrum. The results of this auction are set out in Table A4.11 below, with the auction features summarised in Table A4.12 below.

Table A4.11: May 2017 900 MHz auction results²¹⁴

	900 MHz	Price Paid	Package mark-up
Total available	2x20		
TeliaSonera	2x10	NOK 394.0m	41%
TeleNor	2x10	NOK 396.2m	42%
Third bidder ²¹⁵	-	-	-
Unsold	-	-	-

²¹⁴ See: <https://www.dotecon.com/news/nkom-announces-900-mhz-auction-results/>

²¹⁵ See <https://www.dotecon.com/news/nkom-announces-900-mhz-auction-results/>. This notes that there were three bidders but their identity is not given.

Table A4.12: May 2017 900 MHz auction features²¹⁶

	Description	Implications
Number of bidders; number of lots; lot sizes	There were 3 bidders and 4 lots of 2x5 MHz each. Only 2 bidders (the main incumbents) secured spectrum.	
Spectrum caps / Restrictions	Spectrum cap of 2x15.1 MHz including existing holdings in the band.	Following the auction both TeliaSonera and TeleNor held 2x15 MHz of spectrum.
Reserve prices	NOK 140m for each paired block	
Obligations	No coverage obligations.	

Assessment

Whether award outcomes are likely to reflect market value

- A4.67 The January 2016 1800 MHz spectrum sold well above reserve price. We consider that the price for 1800 MHz, based on the winning bids in the January 2016 auction, may be reflective of market value in Norway.
- A4.68 The May 2017 900 MHz spectrum sold above reserve price. We note that for both TeliaSonera and TeleNor the spectrum cap was binding which could create a risk that the auction price understates market value in Norway. This may be mitigated in part by the presence of the third bidder who did not secure any spectrum. On balance, we consider that there is a risk that the price for 900 MHz, based on the winning bids in the May 2017 auction might understate market value in Norway.

Likelihood of reflecting UK market value

- A4.69 We are not aware of any country-specific factors that would cause the 2016 1800 MHz auction and the 2017 900 MHz auction in Norway to be an understatement or overstatement of the value in the UK.

Relative benchmarks

- A4.70 While the more recent 1800 MHz and 900 MHz auctions provide us with prices for those ALF bands, without data on the price of the 800 MHz or 2.6 GHz bands, we are unable to derive relative value benchmarks for the ALF bands in Norway. We considered whether we

²¹⁶ See https://www.nkom.no/teknisk/frekvensauksjoner/auksjoner/planlagte-avsluttede/attachment/27995?_ts=15adcabcd30

could apply the prices for 1800 MHz and 900 MHz spectrum from the 2016 and 2017 auctions to the 2013 auction to infer a price for 800 MHz spectrum. However this implied a negative price for 800 MHz²¹⁷ which we do not consider to be in any way sensible as an indication of the market value of 800 MHz.

A4.71 For these reasons, we do not propose to derive relative value benchmarks for Norway.

Absolute value benchmarks

A4.72 The data from the 2016 1800 MHz and 2017 900 MHz award does enable us to derive the following absolute value benchmarks for the ALF bands in Norway (in April 2018 prices):

a) **900 MHz: £28.3m per MHz**

b) **1800 MHz: £38.3m per MHz**

A4.73 However, as set out in paragraphs 4.20 - 4.28 above, our proposed approach (consistent with the approach taken in our 2015 Statement) is to use relative value benchmarks to reach a view of the market value of the ALF bands, and use absolute values as cross-checks. We note that these estimates for 900 and 1800 MHz give a 1800 MHz/900 MHz ratio of 131%.

Summary of our assessment

A4.74 The following table summarises the available benchmarks (along with our interpretation of them) from the Norwegian awards:

Table A4.13: Summary of evidence points from Norway (in April 2018 prices)

	Absolute values (£m/MHz)				Relative value benchmarks (£m/MHz)		Ratios (%)			
	800 MHz	900 MHz	1800 MHz	2.6 GHz	900 MHz / 800 MHz	Distance method	1800 MHz / 800 MHz	1800 MHz / 2.6 GHz	1800 MHz / 900 MHz	2.6 GHz / 800 MHz
Final values	-	28.3	38.3	-	-	-	-	-	131%	-

²¹⁷ In other words, the price paid for 1800 MHz and/or 900 MHz spectrum in the recent auctions was higher than in the 2013 multiband auction.

	Absolute values (£m/MHz)				Relative value benchmarks (£m/MHz)		Ratios (%)			
	800 MHz	900 MHz	1800 MHz	2.6 GHz	900 MHz / 800 MHz	Distance method	1800 MHz / 800 MHz	1800 MHz / 2.6 GHz	1800 MHz / 900 MHz	2.6 GHz / 800 MHz
Assessment of risk										

Assessment of risk

Risk of understatement

No risk identified

Risk of overstatement

UK

PSSR award

A4.75 We completed the public sector spectrum release (PSSR) auction of the 2.3 and 3.4 GHz bands on 13 April 2018.²¹⁸ The lump-sum auction prices of these bands were £5.1474m per MHz for 2.3 GHz and £7.5648m per MHz for 3.4 GHz.²¹⁹ In our view, these auction prices do not provide evidence that would lead us to change our assessment of the forward-looking market values for ALF spectrum:

- a) These auction prices are for different bands than the ALF spectrum.
- b) We have previously commented that the 2.3 GHz and 3.4 GHz bands were not expected to be a close substitute for ALF spectrum (see paragraph 5.42 above).
- c) In our July 2017 statement on the PSSR auction, we noted that the 2.3 and 3.4 GHz spectrum is likely to be used by mobile network operators to deliver additional *capacity* for mobile broadband.²²⁰ This emphasises that these PSSR auction bands are unlikely to be a close substitute for 900 MHz spectrum (which is low-frequency spectrum with advantages in providing *coverage*).
- d) To the extent that 2.3 GHz could be a substitute for 1800 MHz spectrum, we note that the auction price of the 2.3 GHz band was broadly similar to the market value for 2.6 GHz spectrum in our 2015 Statement (£5.5m per MHz), and is TDD²²¹ (unpaired) spectrum which might have a different value to FDD²²² (paired) spectrum, such as the ALF bands.
- e) Whilst the auction price of the 3.4 GHz band was significantly larger than for 2.3 GHz (even though it is at a higher frequency), we also note that it is part of the wider 3.4-3.8 GHz band that has been identified as the primary band for the introduction of 5G in Europe.²²³

²¹⁸ <https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-in-progress/2-3-and-3-4-ghz-auction>

²¹⁹ These are the base prices from the principal stage of the auction (i.e. excluding additional prices for specific frequency locations in the assignment stage). The figure for 3.4 GHz is the lower of the two auction prices paid by winning bidders for 3.4 GHz spectrum (Telefónica paid an auction price that was 5% higher).

²²⁰ July 2017 PSSR auction statement, paragraph 1.2.

²²¹ Time Division Duplex – a technology that deals with traffic asymmetry where the uplink is separated from the downlink by the allocation of different time slots in the same frequency band in unpaired spectrum.

²²² Frequency Division Duplex – a technology that deals with traffic asymmetry between uplink and downlink where separate frequency bands are used to send and receive operations in paired spectrum.

²²³ July 2017 PSSR auction statement, paragraph 2.15 b).

A5. Notice of proposed regulations

Notice of proposals

- A5.1 This notice is given in accordance with section 122(4) and (5) of the Wireless Telegraphy Act and covers a proposal to make a statutory instrument.
- A5.2 This proposed statutory instrument sets out how we would give effect to Ofcom's proposals to revise the fees for licences in the 900 MHz and 1800 MHz bands set out in this consultation document, if our final decisions following the overall consultation process were in line with our current proposals.

Proposed regulations

- A5.3 Ofcom has the power under sections 12 and 122(7) of the Wireless Telegraphy Act to make regulations to prescribe sums payable in respect of wireless telegraphy licences.
- A5.4 Ofcom proposes to make regulations to prescribe the sums payable in respect of the licences for the use of 900 MHz and 1800 MHz spectrum.
- A5.5 A draft of the regulations is set out at Annex 6 and their general effect is set out in this Annex.
- A5.6 Hard copies of this notice and the proposed regulations can be obtained from:
- Reuben Braddock
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Email: reuben.braddock@ofcom.org.uk
- Tel: 020 7981 3108
- A5.7 Comments or representations with respect to the proposed regulations are invited by 5pm on 3 August 2018. Comments should be sent to the contact named at the above address.
- A5.8 Following completion of the overall consultation process, Ofcom intends to make the final regulations as soon as practicable.

General effect of the proposed Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) Regulations 2018

The legislative framework

- A5.9 Under section 12 of the Wireless Telegraphy Act, Ofcom may make regulations to prescribe sums payable in respect of wireless telegraphy licences. When doing so, section 122(7) of

the Wireless Telegraphy Act enables Ofcom to make different provisions for different cases and to make incidental provisions.

- A5.10 On 20 December 2010, the Secretary of the State made directions pursuant to section 5 of the Wireless Telegraphy Act (the Direction referred to above), which among other things require Ofcom to revise the sums prescribed by regulations under section 12 of the Wireless Telegraphy Act for 900 MHz and 1800 MHz licences so that they reflect the full market value of the frequencies in those bands, having particular regard to the sums bid for 800 MHz and 2.6 GHz licences in the UK 4G auction.
- A5.11 The sums which are currently payable for 900 MHz and 1800 MHz licences are set out in the 2011 Regulations. In particular, these are the sums prescribed in Schedule 2 to the Fees Regulations for the “Public Wireless Networks” licences, which are as follows:
- £142,560 for each 2 x 200 kHz national channel in the band 880.0-960.0 MHz, payable at payment intervals of 12 months; and
 - £110,880 for each 2 x 200 kHz national channel in the band 1710.0-1880.0 MHz, payable at payment intervals of 12 months.
- A5.12 Therefore, Ofcom is now giving notice of its proposal to make the Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) Regulations 2018 (the “**Proposed Regulations**”), which would give effect to Ofcom’s proposals, as set out in this consultation.

The general effect of the Proposed Regulations

- A5.13 The Proposed Regulations will revoke the provisions in the 2011 Regulations prescribing the sums which are currently payable for 900 MHz and 1800 MHz licences from the first payment date (31 October following the making of the Proposed Regulations) and set out the revised level for such licences. In the period between the commencement of the Proposed Regulations and the first 31 October, an additional amount will be payable under the Proposed Regulations.

Extent of application of the Proposed Regulations (reg. 1)

- A5.14 The Proposed Regulations will apply in the United Kingdom, but would not extend to the Channel Islands or to the Isle of Man. For the avoidance of doubt, the Proposed Regulations will not modify the sums prescribed for the licences belonging to the “Public Wireless Networks” licence class which relate to the use of spectrum in Guernsey, Jersey and the Isle of Man.

Entry into force of the Proposed Regulations (reg. 1)

- A5.15 The Proposed Regulations will come into force as soon as practical after making. The final regulations will be made after Ofcom has concluded its consultation process on the fees and made final decisions as to the level of fees payable.

Definitions (reg. 2)

A5.16 Regulation 2 defines the meaning of a number of terms which are relevant to understand the other provisions in the Proposed Regulations.

Relevant spectrum and licences

A5.17 In particular, the definitions of “licence”, “licensee”, “900 MHz frequency band” and “1800 MHz frequency band” are relevant to define the scope of the Proposed Regulations, which will prescribe the fees payable by the holders of a licence belonging to the “Public Wireless Networks” licence class for the use of the radio frequencies within the 880.0—960.0 MHz band (the 900 MHz spectrum) and/or the 1710.0—1880.0 MHz band (the 1800 MHz spectrum).

A5.18 For the avoidance of doubt, other users of the spectrum included within such bands would not be required to pay the fees prescribed in the Proposed Regulations.

The amendment of the 2011 Regulations (reg. 3)

A5.19 Regulation 3 will amend the Fees Regulations to remove the sums and payment intervals that are currently prescribed in Schedule 2 under the “Public Wireless Networks” licence class as the licence fees for using the relevant spectrum from the first payment date (31 October).

A5.20 As explained above, Regulation 3 will not amend the fees payable for the other “Public Wireless Networks” licence classes that relates to Guernsey, Jersey and the Isle of Man.

A5.21 Any outstanding payment of the fees due under the 2011 Regulations at the entry into force of the final regulations (including any payment by instalments) will continue to be due.

Concurrent licences (reg. 4)

A5.22 Where a licence is held concurrently by two or more persons, then the holders of the licence will be jointly and severally liable for the fee payable.

The fee payable for 900 MHz spectrum on each payment date (reg. 5)

A5.23 Regulation 5 prescribes the fees payable on 31 October 2018 and on each subsequent anniversary by the holders of a “Public Wireless Networks” licence for 900 MHz spectrum for each 2 x 200 kHz national channel in the 880.0-960.0 MHz band.

A5.24 As explained in this consultation, we propose that these fees will be derived by means of the formula set out in regulation 5, which adjusts the “base level” of ALF by inflation. The “base level” of ALF reflects Ofcom’s estimate of the market value of 900 MHz spectrum at the “base date” of April 2018.

A5.25 According to the formula specified in regulation 5, the fee payable on 31 October 2018 and on each anniversary of that date will be derived by multiplying the base level of ALF by the ratio between the latest available inflation index at the date falling one month before the date when the fee is due and the corresponding inflation index related to April 2018.

- A5.26 The formula uses the CPI as the relevant indicator of inflation, which is the index that is currently proposed by Ofcom. The relevant figures for CPI will be published by the Statistics Board.
- A5.27 The CPI published by the Statistics Board for April 2018 is 105.4. The other relevant CPI figure which goes into the formula to determine the amount of the fee payable each year is the latest available CPI at the date falling one month before the date when the fee is due. Inflation data related to each month is usually published between the 15th and the 20th of the following month. Therefore, the latest available CPI should normally relate to the second to last month before the date when the fee is due (i.e., 2 months before the date when the fee is due). This mechanism for the inflation adjustment should give sufficient time to allow Ofcom to notify licensees of the sum due approximately one month before the payment date.
- A5.28 The Proposed Regulations will specify the base level of ALF for 900 MHz spectrum as decided by Ofcom in its final statement in light of stakeholders' responses. For the purpose of the Proposed Regulations, this is equal to Ofcom's proposal of setting such base level at £1.150m per MHz (equivalent to £460,000 per each 2 x 200 kHz national channel).

The fee payable for 1800 MHz spectrum on each payment date (reg. 6)

- A5.29 Regulation 6 prescribes the fees payable on 31 October 2018 and on each subsequent anniversary by the holders of a "Public Wireless Networks" licence for 1800 MHz spectrum for each 2 x 200 kHz national channel in the 1710.0-1880.0MHz MHz band.
- A5.30 These fees will be calculated according to the same formula used for 900 MHz spectrum, where the "base level" of ALFs reflects Ofcom's estimate of the market value for 1800 MHz spectrum at April 2018. The indexation mechanism to ensure that ALFs will remain constant in real terms is the same as the one proposed for 900 MHz spectrum.
- A5.31 The Proposed Regulations will specify the base level of ALF for 1800 MHz spectrum as decided by Ofcom in its final statement in light of stakeholders' responses. For the purpose of the Proposed Regulations, this is equal to Ofcom's proposal of setting such base level at £ 0.908m per MHz (equivalent to £363,200 per each 2 x 200 kHz national channel).

Payment by instalments (reg. 7)

- A5.32 Regulation 7 will retain the current option of paying by 10 monthly instalments, in line with regulation 4 of the 2011 Regulations.

Licence charges payable for the 900 MHz and 1800 MHz frequency bands for the period between the commencement date and the first payment date (reg. 8)

- A5.33 Ofcom proposes only to include Regulation 8 in the legislation if the Proposed Regulations will come into force between 31st October 2018 and 1st October 2019. Regulation 8 prescribes the fee payable by the holder of a "Public Wireless Networks" licence for 900 MHz spectrum for each 2 x 200 kHz national channel in the 880.0-960.0 MHz band and for 1800 MHz spectrum for each 2 x 200 kHz national channel in the 1710.0-1880.0MHz MHz band.

- A5.34 This will be a pro-rated amount, additional to the amount due under the 2011 Regulations, for the period between the date the Proposed Regulations come into force and 30 October 2019.
- A5.35 Where licensees have elected to pay the fees due under the 2011 Regulations in instalments over the year, their current instalment plans will be adjusted to reflect the new fee levels.

A6. Draft of the Proposed Regulations

DRAFT STATUTORY INSTRUMENT

2018 No.

ELECTRONIC COMMUNICATIONS

The Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) Regulations 2018

Made - - - - *-[date to be specified in the final regulations]*

Coming into force - *-[date to be specified in the final regulations]*

The Office of Communications (“OFCOM”) make the following Regulations in exercise of the powers conferred by sections 12, 13(2) and 122(7) of the Wireless Telegraphy Act 2006⁽²²⁴⁾, (the “Act”) and as required by article 6(1) and (2) of the Wireless Telegraphy Act (Directions to OFCOM) Order 2010⁽²²⁵⁾.

Before making these Regulations, OFCOM have given notice of their proposal to do so in accordance with section 122(4)(a) of the Act, published notice of their proposal in accordance with section 122(4)(b) of the Act, and have considered the representations made to them before the time specified in the notice in accordance with section 122(4)(c) of the Act.

Citation and commencement

1.—(1) These Regulations may be cited as the Wireless Telegraphy (Licence Charges for the 900 MHz frequency band and the 1800 MHz frequency band) Regulations 2018 and shall come into force on **[date to be specified in the final regulations]**.

(2) These Regulations shall not extend to the Channel Islands and the Isle of Man.

Interpretation

2. In these Regulations—

“commencement date” means the day on which these Regulations come into force;

“concurrent licence” means a licence held simultaneously by two or more persons;

“kHz” means kilohertz;

“licence” means a wireless telegraphy licence of the Public Wireless Networks licence class;

⁽²²⁴⁾ 2006 c. 36.

⁽²²⁵⁾ S.I. 2010/3024.

“licensee” means a person who is the holder of a licence authorising use of frequencies within the 900 MHz frequency band or frequencies within the 1800 MHz frequency band;

“MHz” means megahertz;

“OFCOM” means the Office of Communications;

“paired 200 kHz channel” means two associated blocks of frequencies of 200 kHz each;

“payment date” means 31st October in each year after the commencement date;

“900 MHz frequency band” means the frequencies from 880.0 to 960.0 MHz;

“1800 MHz frequency band” means the frequencies from 1710.0 to 1880.0 MHz; and

“2011 Regulations” means the Wireless Telegraphy (Licence Charges) Regulations 2011⁽²²⁶⁾.

Amendment to the 2011 Regulations

3.—(1) The 2011 Regulations shall be amended in accordance with paragraph (2) with effect from the first payment date.

(2) In Schedule 2 (licence charges and payment intervals), under the heading “Public Wireless Networks”, omit the following entries—

“Public Wireless Networks	(a) £142,560 for each 2 x 200 kHz national channel in the band 880.0–960.0 MHz.	12 months
	(b) £110,880 for each 2 x 200 kHz national channel in the band 1710.0–1880.0 MHz.	12 months”

Concurrent licences

4.—(1) Any sum payable under these Regulations by the holder of a licence shall, in the case of a concurrent licence, be a sum for which the licence holders are jointly and severally liable.

(2) Any notice required to be given under these Regulations by the holder of a licence may, in the case of a concurrent licence, be given by any of the licence holders and shall be deemed to have been given for and on behalf of them all.

Licence charges payable for the 900 MHz frequency band

5.—(1) On the first payment date and on each payment date thereafter, the holder of a licence authorising the use of frequencies in the 900 MHz frequency band shall pay to Ofcom a total sum which comprises the amount in pounds sterling calculated in accordance with paragraph (2) and rounded, if paragraph (3) applies, in accordance with that paragraph, for each authorisation under its licence of use of a paired 200 kHz channel in that band.

(2) The formula to calculate the total sum mentioned in paragraph (1) is—

$$S = [\text{£}460,000 - \textit{see explanation in Notice}] \times (P \div 105.4)$$

where—

(a) “S” means the total sum;

(b) “P” means the most recent CPI that is available on 30th September of the year in which the charges are due; and

(c) “CPI” means the monthly all items consumer prices index published by the UK Statistics Authority.

⁽²²⁶⁾ S.I. 2011/1128, amended by S.I. 2012/1075, 2013/917, 2014/1295, 2015/1334, 2015/1995, 2016/643.

(3) If the total sum calculated in accordance with paragraph (2) is a fraction of a whole number, it shall be rounded to the nearest whole number.

(4) If OFCOM receive notice from a licensee of the licensee's intention to make payment of the total sum due under paragraph (1) in ten equal instalments, regulation 7 shall apply.

Licence charges payable for the 1800 MHz frequency band

6.—(1) On the first payment date and on each payment date thereafter, the holder of a licence authorising the use of frequencies in the 1800 MHz frequency band shall pay to OFCOM a total sum which comprises the amount in pounds sterling calculated in accordance with paragraph (2) and rounded, if paragraph (3) applies, in accordance with that paragraph, for each authorisation under its licence of use of a paired 200 kHz channel in that band.

(2) The formula to calculate the total sum mentioned in paragraph (1) is—

$$S = [\pounds 363,200 - \textit{see explanation in Notice}] \times (P \div 105.4)$$

where—

- (a) “S” means the total sum;
- (b) “P” means the most recent CPI that is available on 30th September of the year in which the charges are due; and
- (c) “CPI” means the monthly all items consumer prices index published by the UK Statistics Authority.

(3) If the total sum calculated in accordance with paragraph (2) is a fraction of a whole number, it shall be rounded down to the nearest whole number.

(4) If OFCOM receive notice from a licensee of the licensee's intention to make payment of the total sum due under paragraph (1) in ten equal instalments, regulation 7 shall apply.

Payment by instalments

7.—(1) If OFCOM receive notice from a licensee of the licensee's intention to make payment in ten equal instalments of the total sum prescribed in regulations 5 or 6, the licensee—

- (a) shall not be required to make payment at the prescribed time other than in accordance with this paragraph; and
- (b) shall make payment of the sum in ten equal instalment payments with the first instalment to be paid to OFCOM on the day which shall be the same day as the total sum was due to be paid to OFCOM and each subsequent instalment to be paid on the same day in each of the nine consecutive months thereafter (or in a month in which there is no such day, on the last day of the month).
- (c) Where at any time the licensee fails to make payment in accordance with paragraph (1)(b), the total of the outstanding instalment payments shall become immediately due for payment.

Licence charges payable for the 900 MHz and the 1800 MHz frequency bands for the period between the commencement date and the first payment date

8.—(1) On the commencement date, in addition to any sums due or paid under regulation 4 of the 2011 Regulations as of 31 October prior to the commencement date, the licensee shall pay to Ofcom an amount calculated in accordance with this regulation.

(2) For the holder of a licence authorising the use of frequencies in the 900 MHz frequency band, the additional amount shall be calculated as follows—

- (a) an amount shall be calculated in accordance with regulation 5 for each authorisation under its licence of use of a paired 200 kHz channel in that band;
- (b) the amount shall be reduced by the amount of any payments due to Ofcom in respect of the 900 MHz frequency bands under regulation 4 of the 2011 Regulations as of 31 October prior to the commencement date; and

- (c) the amount shall be divided by 12 and multiplied by the number of complete months between the commencement date and the first payment date.
- (3) For the holder of a licence authorising the use of frequencies in the 1800 MHz frequency band, the additional amount shall be calculated as follows—
- (a) an amount shall be calculated in accordance with regulation 6 for each authorisation under its licence of use of a paired 200 kHz channel in that band;
 - (b) the amount shall be reduced by the amount of any payments due to Ofcom in respect of the 1800 MHz frequency bands under regulation 4 of the 2011 Regulations as of 31 October prior to the commencement date; and
 - (c) the amount shall be divided by 12 and multiplied by the number of complete months between the commencement date and the first payment date.
- (4) If —
- (a) the licensee is making payments in instalments pursuant to regulation 4(8) of the 2011 Regulations in respect of a sum due under those regulations as of 31 October prior to the commencement date; and
 - (b) the last instalment date has not passed;
- the total additional amount due pursuant to this regulation shall be paid in equal instalments on each of the instalment dates remaining between the commencement date and the first payment date.

For and by the authority of the Office of Communications