Non-confidential

Proposed annual licence fees for 2100 MHz spectrum

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Executive summary

1. BT[1] is pleased to provide its views on Ofcom's proposals[2] for Annual Licence Fees (ALFs) for 2100 MHz spectrum that are due to apply from 1 January 2022. The proposed fees amount to *c.*£26m/annum in addition to the *c.*£77m/annum that EE already pays for 1800 MHz spectrum.

2. Setting ALFs to reflect (Ofcom's estimate of) the full market value of mobile spectrum is unnecessary to secure optimal and efficient use of spectrum and is ultimately detrimental to the interests of consumers. Excessive fees can inhibit trading of spectrum and the ability of operators to invest in network infrastructure. We recommend that Ofcom puts greater emphasis on auctions and the secondary spectrum trading market as the best means to achieve optimal distribution of mobile spectrum and its most efficient use. We also consider there is a strong case for Ofcom (with Government) to review its 2010 policy on pricing of mobile spectrum.

3. BT has reviewed Ofcom's proposals for ALFs for 2100 MHz spectrum, including the models and assumptions used to develop the proposed fee levels. We have identified areas where Ofcom's assumptions should be updated or changed to ensure that the fees are set at a reasonable level.

4. For paired 2100 MHz spectrum we agree that if Ofcom seeks to estimate full market value, it should use the "distance method" to determine the "lump sum value" of such spectrum because it appropriately grounds the valuation in UK evidence and uses international evidence to refine the estimate within UK-based bounds. However, we disagree with some aspects of the international spectrum auction benchmarking data and how it is used. Making appropriate adjustments for these issues, UK 2100 MHz spectrum value should be calculated as £8.0m/MHz rather than £10.5m/MHz.

5. We also believe that Ofcom has used a higher discount rate than is appropriate for setting the annualisation rate used to convert the lump sum value of the 2100 MHz spectrum to a recurring annual fee that rises with CPI each year. BT considers that the discount factor should be estimated assuming that the licensee bears any risk around the market value of spectrum; and should be adjusted to reflect the low risk related to ALF payments. Making these adjustments, we estimate an annualisation rate of 4.5%, rather than 5.4% as proposed by Ofcom.

6. Use of BT's proposed lower lump sum value of *paired* 2100 MHz spectrum and lower annualisation rate reduces the annual fee from £0.567m/MHz to £0.364m/MHz, a level 36% less than Ofcom has proposed. We regard this as a reasonable, evidence-based estimate of market value which, if used to set licence fees, is less likely to undermine the secondary trading market and harm consumers.

7. For the *unpaired* 2100 MHz spectrum, we disagree with Ofcom's assessment that fees should reflect high power mobile use and be aligned with the 2018 UK 2.3 GHz auction price. There are significant regulatory, technical and commercial hurdles to the use of this band for high power mobile. Ofcom's approach is, therefore, wrong and risks sub-optimal and inefficient use of this spectrum.

8. Before introducing ALFs on unpaired 2100 MHz spectrum, Ofcom should first clarify how the licences for this spectrum could be liberalised to make them more readily tradable and properly identify the real opportunity costs based on the actual expected use of this band (which currently is not for high power mobile). Prior to this, any fees should be set to reflect administrative costs rather than market value. If Ofcom does proceed with ALFs now, they should not be based on the UK 2.3 GHz auction results, but a wider range of benchmarks, and be substantially discounted to reflect the very significant limitations of this band and uncertainties relating to its use.

9. Finally, we request that, in view of the obvious misalignment between current spectrum values and the existing levels of ALFs for 900/1800/3400/3600 MHz bands (as revealed in the recent UK 700 MHz and 3.6 GHz auction), Ofcom should review those fees and reduce them to align more closely with the latest indication of UK market values.

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[1] Including its subsidiary EE Ltd.

[2] https://www.ofcom.org.uk/__data/assets/pdf_file/0032/221999/1900_2100-mhz-condoc.pdf

1 Introduction

This document sets out BT's views on Ofcom's proposals for annual licence fees (ALFs) that are due to be applied to the 2100 MHz spectrum licences from 1 January 2022.

In **section 2** we provide an overview of our position on the principle of annual licence fees based on estimated full market value and on the methodological approach that Ofcom proposes to use.

In **section 3** we have provided answers to the consultation questions.

Finally, in **section 4**, we set out the next steps that we think are appropriate to consider, including wider consideration of ALFs beyond this present consultation on 2100 MHz fees.

We look forward to Ofcom's Statement on this matter and are ready to discuss any of the points in more detail if this would be helpful.

2 Overview of BT's position on ALFs for mobile spectrum

2.1 Use of ALFs for 2100 MHz spectrum is disproportionate and unjustified

Ofcom has provided limited, if any, evidence to support its claim that 2100 MHz ALFs promote efficiency, investment, competition, or consumer benefits. Instead, Ofcom relies heavily on the Strategic Review of Spectrum Pricing (SRSP) policy it set in 2010 to support a range of theoretical predictions on the claimed positive effects of ALFs on market outcomes. At the same time Ofcom gives insufficient weight to recent empirical evidence that suggests ALFs are no longer required to promote its statutory duties, especially where mobile spectrum licences are tradeable.

For instance, Ofcom argues that absent an explicit fee it cannot rule out the possibility that spectrum might not be traded to another MNO with a higher value in the future. Hence Ofcom argues that ALFs remain a necessary complement to spectrum trading to promote the optimal use of spectrum.

BT considers that this approach to regulation is inconsistent with the principle that regulation must be proportionate to the expected harm it seeks to mitigate. The proposed ALFs for 2100 MHz will cost the sector nearly £75m per year – on top of £250m a year for 900 MHz, 1800 MHz and 3.4/3.6 GHz ALFs - or £325m a year in total. ALFs will likely have a significant negative impact on investment and consumer benefits (relative to a counterfactual with no ALFs). With no good evidence that spectrum assignments in the 2100 MHz bands are currently inefficient, nor that trading will be insufficient to ensure assignments remain efficient in the future, introducing ALFs is disproportionate relative to the perceived (but unsubstantiated) harm Ofcom seeks to mitigate.

We also highlight that the proposed introduction of 2100 MHz ALFs coincides with BT's recently announced - and uniquely ambitious - plans for EE to offer high performance 5G solutions across the entire UK by 2028. However, where profitability is impaired by Ofcom's 2100 MHz ALF proposals, some of these investment plans and the related 5G service improvements for UK mobile consumers may be put at risk. Ofcom also risks the UK falling further behind North America and Asia if the regulatory environment is not favourable to investment. In short, we consider that Ofcom's 2100 MHz proposals work against our efforts to bring 5G services to all UK consumers.

In section 3.5 below, where we respond to Question 5, we explain in detail why setting ALFs based on estimated full market value is not the most appropriate way of addressing Ofcom's statutory duties. We explain why the arguments that ALFs promote efficiency, investment, competition, or consumer benefits, are flawed.

2.2 Use of international benchmarks to estimate UK spectrum value

We can see the difficulties faced by Ofcom when attempting to set ALFs for mobile spectrum at estimated full market value given the lack of obvious directly relevant UK auctions. Relying on UK and international benchmarks for other bands may give a rough indication of the current market value of 2100MHz spectrum, but it is inevitably subject to a large margin of error.

Use of the "distance method" (where UK high and low band auctions are used as anchor points with international auction data used to position the estimated value of 2100 MHz within these bounds) is a convenient way to estimate market value in the absence of other options. For the distance method to be meaningful, however, it must be applied appropriately and with due caution given the asymmetry in the impact of an over- or under-estimate. Over-estimating market value, or not allowing margin for a fall in value (as has been seen between the 2018 3.4 GHz and 2021 3.6 GHz auctions) risks harming spectrum trading or seeing spectrum returned to Ofcom that is then difficult to efficiently reassign.

Although practical, the distance method has its shortcomings. Firstly, Ofcom relies on auction data from very few countries to value the UK 2100 MHz paired spectrum. Secondly, there are differences in market situations over time which limit the value of auction benchmarks (for example, changes in the number of players for in Germany between 2015 and both the earlier and later benchmarks from 2010 and 2019). Given the uncertainties that these issues create, the results of the benchmarking must be interpreted conservatively, particularly given harmful consequences if market values are over estimated. As noted, this risk is asymmetric because harms do not arise if market values are under-estimated as spectrum is tradable.

3 Answers to consultation Questions

3.1 Highest value use of 2100 MHz

Question 1: Do you agree that mobile services are the highest value use for both the paired and unpaired 2100 MHz spectrum? If not, please provide evidence to support your answer.

3.1.1 2100 MHz paired spectrum

Yes, we agree that mobile services are the highest value use of the paired 2100 MHz spectrum. This band is harmonised globally for International Mobile Telecommunications (IMT) and was widely used for national public mobile networks from c. 2000 for 3G mobile and is now being re-farmed by national mobile network operators to support newer (4G/5G) technologies. The band is widely supported in mobile devices, for original 3G technologies as well as newer technologies.

3.1.2 2100 MHz Unpaired spectrum

Status of 1900 - 1920 MHz band

The 2100 MHz unpaired spectrum (1900-1920 MHz band) was originally a band specified in 3GPP (Band 33). It is now considered obsolete and not included in current equipment specifications. This reflects the absence of any harmonised use of the band for mobile in Europe.

EE has been exploring the use of its 1900 - 1910 MHz band for a niche application for the Emergency Services Network, where gateway devices are connected to a suitable mobile base station using other frequency bands and the 2100 MHz provides local connectivity to emergency services users. This solution would be deployed at a particular location where and when required for a specific incident. {✂ }

The unpaired 2100 MHz spectrum is, apart from EE's additional authorisation for the niche Emergency Services Network (ESN) application, restricted to 3G technology use only within the UK 2100 MHz licences. With 3G technology rapidly becoming obsolete[3], and with TDD mode of 3G not having been deployed in Europe, this limitation is highly significant for licensees. Although Ofcom indicates that it would be willing to consider future liberalisation, the restriction exists today (and for the foreseeable

[3] https://blog.telegeography.com/3gs-sun-is-setting-in-europe

future). Further, it is not yet clear how compatibility of 4G/5G in the unpaired and adjacent paired 2100 MHz can be achieved.

The CEPT studied the 2100MHz unpaired band in 2015[4] and noted that:

> *The mobile licences (UMTS TDD) in force on the unpaired 2 GHz bands are not in use in Europe, noting also that the lack of interest of mobile operators for spectrum in the unpaired terrestrial 2 GHz band has been demonstrated during the auctions in some CEPT countries in 2011. The duration of those licences vary from country to country, from 2014 - 2029 (or even unlimited duration, in United Kingdom). In addition it has to be mentioned that some licences have already been surrendered in a number of countries.*

We are not aware that the situation has changed since this report was produced in terms of mobile network use, other than, as Ofcom has noted, in 2020 CEPT identified part of the 1900 - 1920 MHz band for Railway Communications. We conclude that, without arrangements for harmonised mobile use across Europe and with licence restrictions in the UK, the 2100 MHz unpaired spectrum has only niche applications.

Source of opportunity cost for establishing fees

Ofcom's rationale for identifying high power mobile as next best use

Ofcom provides three reasons why high-power mobile use is the appropriate basis for identifying the relevant opportunity cost for setting fees for unpaired 2100 MHz spectrum. These are: (i) the equipment ecosystem already exists for mobile terminals; (ii) the band is deployed for mobile in China; and (iii) there is interest to access the spectrum from other users.

Taking each of these points in turn, we firstly observe that according to data from the GSA[5], the number of handsets available for 2100 MHz TDD (band 39, 1880 – 1920 MHz) is roughly half that for the 2300 MHz TDD (Band 40, 2300 – 2400 MHz). That said, the main issue is not whether suitable handsets are, or will be, available for the band in the UK, but the availability of 1900 – 1920 MHz base stations that would achieve compatibility with the networks in adjacent paired 2100MHz spectrum in the absence of guard bands. Such standardised equipment for the full 1900-1920MHz band is not to our knowledge available.

The fact that a 35 MHz block of frequencies overlapping the UK DECT band and part of the UK 2100 MHz band may be used for 4G in China (along with two other TDD bands) does not mean that it will be adopted elsewhere in the world where at most 20MHz would be available (less with guard bands, and fragmented). 3G TDD was deployed in China for high-power wide area mobile but was not deployed elsewhere in the world. There is no reason to suppose 4G would be different. Even if adjacent band compatibility issues could be solved and guard bands put in place if needed, global harmonisation is unlikely due to PCS uplink use in the USA and other Region 2 countries. In contrast the 2.3 GHz band that Ofcom compares with 2100 MHz has been deployed in several large markets prior to award in the UK, including Australia, Hong Kong, India, Saudi Arabia, Singapore and South Africa.

Ofcom mentions that other users are interested in the unpaired 2100 MHz spectrum[6] but does not elaborate on the nature of such use. We would be interested to know more details of this alternative demand so that we could understand whether this could potentially be accommodated by us under spectrum trading. Also, if there is clear demand for alternative use (i.e., other than high power mobile use) then this would be relevant to the question of opportunity cost of the spectrum that should be relevant to Ofcom's present consideration of annual fees.

We note that there have been no trading applications for the unpaired 2100 MHz spectrum. This is further evidence that 2100 MHz spectrum is not as useable for high power mobile services as 2.3 GHz.

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[4] CEPT Report 052 https://docdb.cept.org/download/84

[5] GABBoD database, https://gsacom.com/gambod-lte-5g-devices/ [User account and Password required]

[6] Consultation document para 5.9(b)

If, as Ofcom suggests, the 2100 MHz unpaired and 2.3 GHz bands are of equivalent utility and worth, it would have been logical for those that bid for 2.3 GHz in the 2018 auction to have explored trading of 2100 MHz as a cheaper option. We have not been approached to trade our 2100 MHz spectrum and do not consider it to be of equivalent value to the 2.3 GHz spectrum.

Viability of high-power mobile use

Ofcom has not previously counted the 1900 - 1920 MHz in MNOs' total spectrum holdings when performing competition assessments and setting spectrum caps for auctions, even as recently as last year in the context of this year's 700 MHz and 3.6 GHz auction.[7] It is hard to reconcile that past position with the current proposal to now consider the spectrum to be of equivalent value and utility as other harmonised mobile spectrum bands that does count in spectrum caps, such as 2.3 GHz.

To support its current provisional view that "*it should be possible to use the unpaired 2100 MHz spectrum for the development of high-power mobile services* ***in the future***" [emphasis added], Ofcom explains that it expects improvements in LTE base station filtering[8] will solve potential interference problems with 4G macro networks operating in the adjacent paired 2100 MHz spectrum.

Recent studies published by CEPT as recently as last year, in the context of a macro base station coverage of a future railway mobile communication system, suggested that even with the 10 MHz guard band that would exist between base stations transmitting in 1900 – 1910 MHz and base stations receiving in 1920 – 1980 MHz, it might not be possible to avoid interference in all cases, even with measures such as improved base station receiver filtering[9]. We are therefore concerned that Ofcom's conclusion is overly optimistic and guard bands might be needed, which would affect the viability of deploying the spectrum for high power mobile, even if the existing fragmented assignments were to be resolved by trading to make a potentially more viable bandwidth available.

The very limited bandwidth available in this band would also make deployment of base stations much less viable compared to other mobile bands where wider bandwidths are available. In other words, the marginal value of an extra 5 MHz of 2.3 GHz to an MNO over say 20 MHz is quite different to the value of just 5 MHz that some licensees have available at 2100 MHz as that cannot be economically deployed at 2100 MHz in the same way as it could at 2.3 GHz. Ofcom recognised this concern about small amounts of spectrum that are not viable to deploy when it allowed bidders to set minimum requirements of up to 20 MHz in the 3.4 GHz auction[10].

We conclude that using the unpaired 2100 MHz spectrum for high-power mobile use is extremely unlikely and is not, therefore, a reasonable assumption for assessing opportunity cost. Even if the band were in future to become useable for high power mobile in the way Ofcom envisages, the opportunity cost used as a basis to determine market value should reflect the fact that there would be delay (potentially several years) before such use becomes possible, meaning that any new fees should be scaled back / phased in gradually.

Conclusion on highest value use of unpaired 2100MHz

Given the above evidence, we do not agree that mobile services are the highest value use of the 2100 MHz band, at least not in the near term and conventional sense of national wide area mobile networks. We would agree that the highest value use could be an application in the mobile service,

[7] Ofcom explains in some detail why high power mobile is not viable and why different and very significant power constraints are necessary at Paras A3.113 – A3.117 of https://www.ofcom.org.uk/__data/assets/pdf_file/0013/104305/Statement-annexes-Award-of-the-2.3-and-3.4-GHz-spectrum-bands.pdf . In the more recent auction consultation for 700 MHz and 3.6GHz Ofcom again notes the band is "unlikely to be able to be used for high power macro sites in practice due to compatibility with the adjacent uplink band of the paired 2100 MHz spectrum".

[8] Consultation document para 3.10 (b)

[9] See section 5 of ECC report 318, July 2020 https://docdb.cept.org/download/3e89c08b-5982/ECC%20Report%20318.pdf

[10] See para 6.38 of the PSSR consultation https://www.ofcom.org.uk/__data/assets/pdf_file/0025/78055/Public_Sector_Spectrum_Release_2-3_and_3-4_ghz_award.pdf

as that service is defined in the ITU Radio Regulations, as this covers a wider range of applications than national public mobile networks.

Given all the above considerations we think Ofcom is wrong to propose basing the annual licence fees for unpaired 2100 MHz spectrum based on market value of other public mobile network bands for which harmonised use is in place today, such as 2.3 GHz.

3.2 Market value of paired 2100 MHz spectrum

Question 2: Do you agree with our proposed market value for the paired 2100 MHz spectrum? If not, please provide evidence to support your view.

3.2.1 Comments on methodology used

Tiering of auction benchmarks

In each of the four countries that Ofcom has identified as having Tier 1 auction benchmarks, all auctions in those countries are identified as Tier 1. We assume that this follows from each individual auction having been considered on its merits, rather than deciding on a single tier for each country. As explained below, we have concerns about specific auctions (*e.g.,* 700 MHz in Germany in 2015) and so consider that not all auctions in a given country should necessarily be the same tier, even if that then means that fewer Tier 1 distance method benchmarks are available to estimate UK market value for paired 2100 MHz. Ofcom has previously followed this approach of assigning a tier to individual benchmarks rather than all benchmarks from the same country being assigned the same tier for 900MHz and 1800MHz ALF (for example, Portugal and Denmark)[11].

Use of 3.4 GHz and 3.6 GHz UK auction benchmarks

Ofcom has given equal weight to the UK 3.4 GHz and UK 3.6 GHz auction results.

We understand Ofcom is trying to estimate the *current* UK market value of 2100 MHz spectrum and therefore greater emphasis should be put on the more recent 2021 UK 3.6 GHz high frequency benchmark than the older 3.4 GHz benchmark of 2018. In fact, it would be logical and in line with Ofcom's objectives to only use the UK 3.6 GHz benchmark as we consider that this reflects the current marginal value of spectrum in the 3.4 - 3.8 GHz band.

The higher prices seen in the 3.4 GHz auction compared to the 3.6 GHz auction can be explained by the limit placed on the amount of spectrum auctioned (150 MHz) combined with the fact it was "must have" for three operators who needed to secure at least 40 - 80 MHz each to launch 5G in the UK and be competitive with Three which already held such spectrum.

The 3.6 GHz auction covered spectrum that could be used by the same base station equipment as 3.4 GHz and, therefore, is a truer reflection of the marginal value of spectrum had the 3.4 - 3.8 GHz band been awarded at the same time and in its entirety. It was awarded as a whole band in many other countries and, crucially, in the ones used to derive the (Y/X) distance that are then applied to the UK low and high band benchmarks.

The correct approach is for Ofcom to only consider the latest 3.6 GHz auction for a UK high frequency benchmark. This would not reduce the number of international benchmarks that would be relevant, since other countries considered by Ofcom have a single data point with no distinction between 3.4 and 3.6 GHz bands.

[11] In 2018 in relation to setting 900MHz and 1800 MHz fees, Ofcom tiered Portugal 900 MHz benchmark as Tier 2 and 1800 MHz as Tier 3, and Denmark 900 MHz benchmark as Tier 3 and 1800MHz as Tier 1. See Tables A2.1 and A2.2 at https://www.ofcom.org.uk/__data/assets/pdf_file/0021/130548/Annexes-1-6.pdf

Use of proxies for missing country values

For the Netherlands Ofcom has calculated proxies for missing high frequency bands (2.3 GHz, 2.6 GHz, 3.4 - 3.8 GHz) that enables it to then use the available 700 MHz and 2100 MHz auction data to derive Tier 1 distance benchmarks for the Netherlands.

Whilst we fully agree with Ofcom that it is important to take the very relevant benchmarks from the Netherlands into account, we have two concerns with Ofcom's approach to the Netherlands.

Firstly, in past fees consultations[12] when following the approach of using proxy values for missing band data for auction benchmarks that would otherwise be Tier 1, Ofcom has considered the benchmark results to be Tier 1 and considered them on an equal basis with other Tier 1 benchmark results. Here Ofcom has simply used the Netherlands results as a sense check rather than considered the results on the same basis as other Tier 1 benchmarks. Had the benchmarks been used in the same way as Ofcom has previously done when using proxies, i.e., on an equal basis with the other Tier 1 benchmarks, this would tend to support a lower estimate of full market value for the UK 2100 MHz paired spectrum than the one Ofcom proposes.

Secondly, given that proxy values for the Netherlands are themselves derived from a simple relativity method, a more sensible approach would surely be to just look at the relativity of the available Netherlands 700 MHz and 2100 MHz auction prices given that there is a UK 700MHz auction reference point available? That would yield a benchmark price of £7.3m/MHz for the UK, so again would support a lower value for the UK 2100 MHz paired spectrum than the one Ofcom proposes.

In summary, we request that Ofcom gives the same weighting to the Netherlands Tier 1 proxy benchmarks as it gives to the benchmarks for Tier 1 auctions in other countries that it has considered. This will reduce the lump sum value for 2100 MHz given that all results for the Netherlands are less than the currently proposed UK 2100 MHz lump sum value.

Countries where 2100 MHz prices exceed the price of low band spectrum

Some benchmarks have a Y/X ratio above 1, which puts the UK 2100 MHz lump sum value (LSV) even above the UK 700 MHz value. This is contrary to Ofcom's expectation[13] that the appropriate UK value for 2100 MHz is below 700 MHz and above 3.4/3.6 GHz:

> *"We also consider it would be unlikely to be valued at significantly more than the lowest value sub-1 GHz auction price (£14.1m per MHz) and unlikely to be valued at significantly less than the highest value higher frequency band auction price (£7.9m per MHz)".*

Germany and Slovenia are examples where Ofcom calculates 2100 MHz price to exceed low frequency prices and therefore, when applying the Y/X ratio to the UK, ends up with:

- UK 2100 MHz valued above the UK 700 MHz.
- UK 2100 MHz value estimated at a higher level when using the UK 3.6 GHz high band benchmark than when using UK 3.4 GHz as the high band benchmark (despite UK 3.4 GHz prices being higher than UK 3.6 GHz prices).

Whilst the counterintuitive nature of the first point is clear (and acknowledged by Ofcom), the second point is also counterintuitive because a lower value of a spectrum anchor band should always indicate a lower LSV for 2100 MHz. The fact that it does not in this instance demonstrates that the distance method is being applied incorrectly (i.e., where an 'out of range' parameter is delivering an 'out of bounds' Y/X ratio). As the name suggests, the distance method is intended to be applied using only a Y/X ratio of between 0 and 1, in order to interpolate the distance between the two bounds

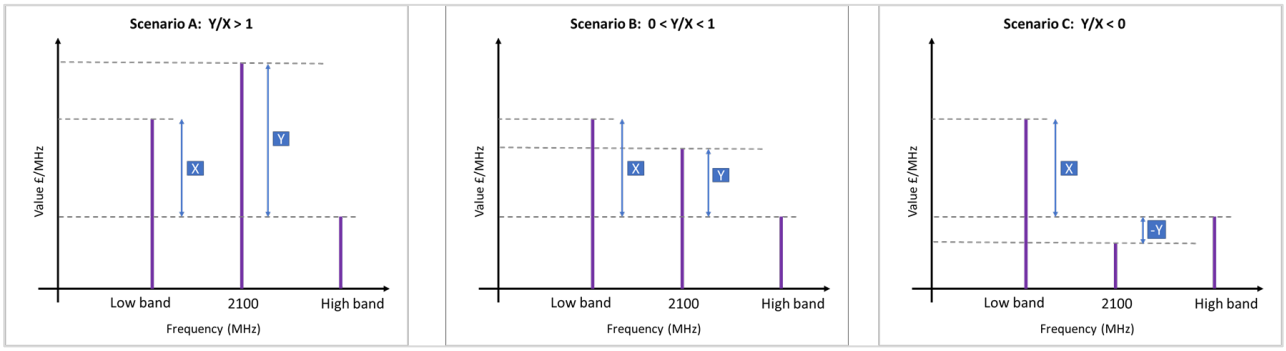
[12] For example in 2015 in relation to 1800MHz fees Ofcom developed and used Tier 1 2.6GHz band proxy values for Ireland and Sweden. See A8.356 and A8.641 of https://www.ofcom.org.uk/__data/assets/pdf_file/0023/78323/annual-licence-fees-annex_8.pdf

[13] Consultation document para 4.19

giving an estimated value of the band of interest (in this case 2100 MHz) – i.e., the distance between low band value (at the top of the range) and the high band value (at the bottom of the range).

In Figure 1 below the Y/X distance benchmark concept is illustrated for the three cases of the band of interest falling (i) above the low band value, (ii) between the low and high band value (as normally expected), and (iii) below the high band value.

Figure 1: illustration of the Y/X distance benchmark concept



To apply the distance method correctly, the Y/X ratio calculated from any set of benchmarks should always be capped at 1 (at the top end) and at 0 (at the bottom end). In this way, the distance method can never return a UK 2100 MHz market value higher than the value of the UK low frequency reference band (scenario A) or lower than the UK high frequency reference band (scenario C).

Outside of the 0 to 1 range for Y/X, the UK LSV is being extrapolated beyond the UK bounds rather than interpolated between the UK anchor prices and the distance method becomes meaningless.

This can be illustrated mathematically for scenario A, where an Y/X ratio greater than 1 results in an extrapolation of the UK 2100 MHz value estimate above the UK 700MHz value by the amount of $X \times (Y/X - 1)$.

It is apparent from this equation that with a fixed Y/X ratio (determined from the international benchmarks), it is the value of X (calculated as the value difference between the UK low and high bands) that determines the 2100 MHz value. This means that the lower the UK high band price the higher is the value of the estimate for UK 2100MHz (so the valuation becomes very sensitive to whether 3.6 GHz or 3.4 GHz UK auction benchmark is used). Oddly and counterintuitively, a lower UK high band auction price will result in a higher estimated UK 2100MHz price.

In other words, the UK 2100 MHz value estimate is higher because the incorrectly applied distance method extrapolates above the 700MHz value by an amount directly proportional to the value gap between 700MHz and 3.6GHz (which is greater than the value gap between 700MHz and 3.4GHz). This is clearly a meaningless artefact of trying to apply the distance method with mutually inconsistent input parameters.

These facts alone would suggest the data points where the ratio Y/X >1 should be excluded or adjusted. However, careful analysis of the circumstances of the German and Slovenian auctions indicates that they ought not to be considered as Tier 1 in any event. In other words, the counter-intuitive relativities of results from these auctions arise precisely because these auctions did not return reliable estimates of full market value for each of the bands in question (as we go on to discuss).

In its September 2015 consultation on 900 MHz and 1800 MHz ALFs[14], Ofcom observed similar issues with 'out of bounds' distance multipliers (Y/X ratios). In the case of Denmark, a Y/X ratio of below zero was derived, but Ofcom disregarded the benchmark on the basis that the negative lump sum value this

[14] Annual licence fees for 900MHz and 1800MHz spectrum, A8.285, September 2015, https://www.ofcom.org.uk/__data/assets/pdf_file/0032/78629/annex_8.pdf

delivered was not sensible; specifically, Ofcom "did not consider [the negative LSV] to be in any way sensible as an indication of the UK market value of 1800MHz." This situation is captured by Scenario C in Figure 1.

Just as Ofcom previously dismissed the case where Y/X was below 0, it should also disregard Y/X values of greater than 1. If it will not do that, then at least Ofcom should cap the Y/X ratio at 1 (and 0) for the reasons set out above.

In summary, we propose that Ofcom caps the Y/X ratio at 1 within its distance method to determine UK 2100 MHz value.

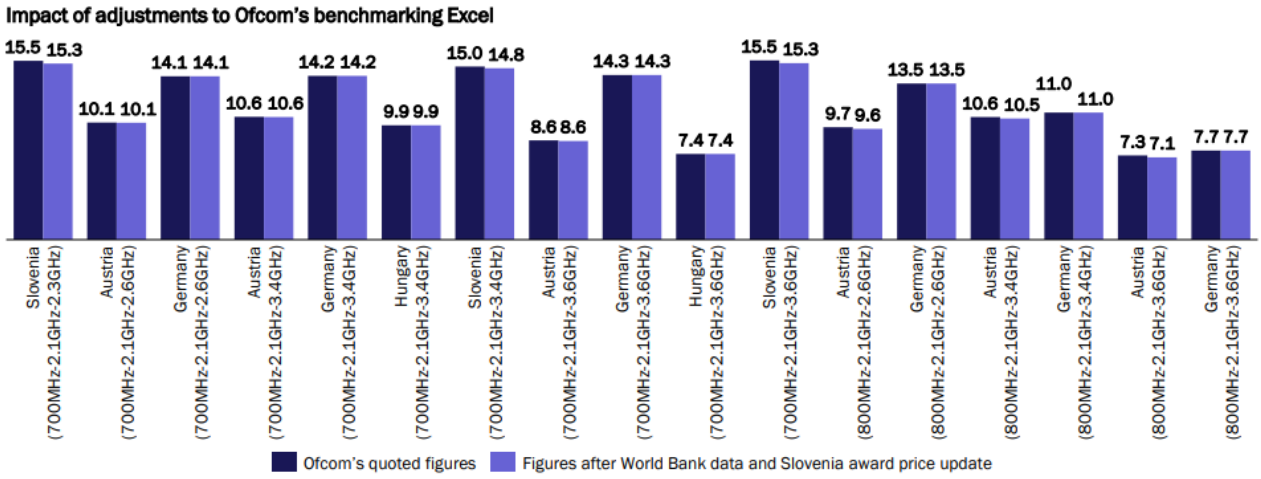
3.2.2 Comments on individual benchmarks

Validation of numerical calculations

We have reviewed Ofcom's model for calculation of UK lump sum values using international benchmarks, as detailed in the Excel model published alongside the consultation.

We have been able to replicate Ofcom's calculations and arrived at similar values for UK lump sum values based on the distance method in all cases except for the Austrian and Slovenian benchmarks, as illustrated in the Figure 2 below.

Figure 2: Comparison of BT and Ofcom calculations of international auction benchmarks



The differences for Austria are due to our use of the latest available population and PPP data available from the World Bank (2020 data vs. the 2019 data used by Ofcom), which we understand Ofcom plans to update when it issues its Statement. This will lead to a lower value of UK 2100 MHz LSV used for determining the ALF.

The differences for Slovenia appear to result from Ofcom using the 2021 auction 'final auction price' in its benchmarking Excel, including the assignment fee[15] . We believe that Ofcom should not include the additional assignment fee, consistent with its previous approach to setting ALFs[16]. We propose that if Slovenia is used to determine UK 2100 MHz lump sum values (we explain below why it should not be classified as Tier 1) then Ofcom should use the lower figures that we have calculated in the above chart for this benchmark. This would lead to a lower value of UK 2100 MHz LSV used for determining the ALF.

[15] Ofcom's Benchmark valuation model, sheet C_UKEq_detail, cells H122:H133 vs AKOS auction result available at https://www.akos-rs.si/radijski-spekter/raziscite/javni-razpisi-za-mobilna-omrezja#&gid=lightbox-group-824&pid=0

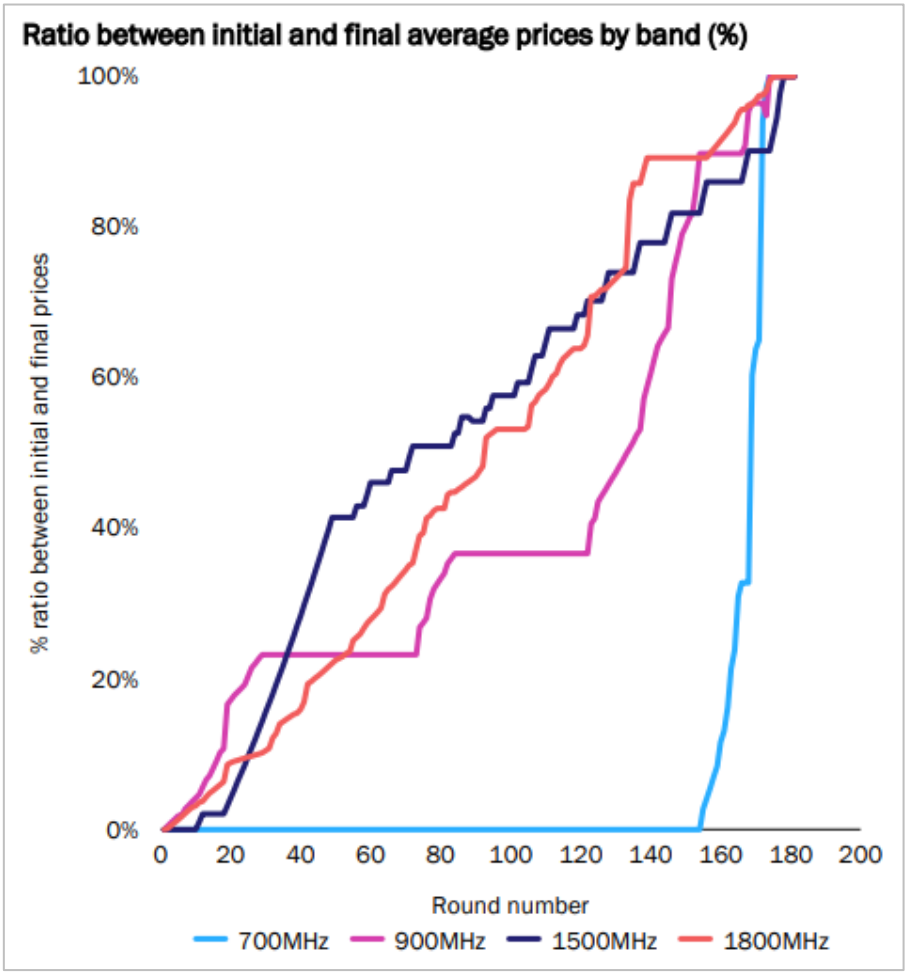
[16] For example, see Annual fees for 900Mhz and 1800MHz spectrum, A7.13, September 2015. https://www.ofcom.org.uk/__data/assets/pdf_file/0028/79534/annexes_1-7.pdf

Germany benchmarks

2015 auction

The strange progress of the bidding in the German 2015 auction over 181 rounds for 700 MHz, 900 MHz, 1500 MHz and 1800 MHz spectrum is illustrated in the Figure 3 below.

Figure 3: progress of lot prices in 2015 German auction



Source: from BNetzA data

The 2015 auction lasted 181 rounds and the 700 MHz spectrum remained at reserve price for 154 of these rounds. This is in complete contrast to the 900 MHz, 1500 MHz and 1800 MHz band prices that rose steadily over the course of the auction.

The 700 MHz auction benchmark from 2015 was widely considered to be the result of strategic bidding where, unsurprisingly, 3 MNOs were competing for 2 x 30 MHz of spectrum and just settled on 2x10MHz each. The three bidders initially bid strategically to get the spectrum at reserve price and the price only rose above that as part of a bidding war over the1800MHz band that couldn't be so neatly divided[17]. Indeed, a report by auction experts at Dot-Econ[18] published soon after the auction concluded:

> *"Operators paid more than they could have, given that the auction format afforded them every opportunity to keep prices low. That this did not happen certainly comes at a surprise in relation to the 700MHz and 900MHz bands, where* ***bidding appears to have been driven entirely by***

[17] See The German spectrum auction: Failure to negotiate? – Telecoms.com

[18] The German mobile broadband spectrum auction: tales of mystery and retaliation, sept 2015 https://www.dotecon.com/assets/images/dp1501.pdf

strategic considerations *rather than a true need to resolve conflicting demand." [emphasis added].*

Ofcom itself observed in its 2015 consultation[19] that:

> *"bidders were using the 700 MHz band to signal a strategic demand reduction outcome in 900 MHz and 1800 MHz"*

We also observe that Germany was a market with three mobile operators at the time of the 700 MHz auction in 2015, whereas in 2019 it was a market with four operators (with the addition of new entrant Drillisch), and back in 2010 (at the time of the 800 MHz and 2.6 GHz auction) it was also a 4 MNO market. This raises the question of whether the temporary change in market structure at the time of the 700 MHz award led to a difference in values compared to the earlier and later auctions which are being used by Ofcom to calculate distance benchmarks, given there would have been greater competitive tension in auctions which involved more bidders. This could be a further explanation as to why, oddly, the German 2100 MHz prices exceeded those of the 700 MHz.

700MHz benchmark is not Tier 1

Given the above evidence, the German 700 MHz auction benchmark that was affected by strategic bidding and a temporary 3 MNO market should not be considered Tier 1 evidence for the present benchmarking exercise as they do not meet the second and third of Ofcom's Tier 1 criteria, which are as follows:

> *"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*
>
> *c) outcome appears likely to be informative of forward-looking relative spectrum values in the UK, having regard to country-specific circumstances and auction dates"*

Ofcom has justified its classification of the Germany 2015 award of 700 MHz as Tier 1 despite evidence of strategic bidding as follows:

> *"As there is evidence that the price of 700 MHz in the 2015 auction might have been affected by strategic bidding, this could indicate that the second criterion for inclusion in Tier 1 is not met for benchmarks including the 700 MHz auction. However, we note that we cannot be sure of the scale of any such effect on relative prices"*[20]

Therefore, Ofcom acknowledges that strategic bidding took place, but believes it is unable to determine the scale of the strategic bidding.

According to Ofcom's Tier 1 criterion b) above, the burden of proof is on Ofcom to determine the likelihood of the auction being driven by intrinsic value bidding and the issue is not the scale of the strategic bidding, rather that intrinsic value bidding existed and was at least as likely to determine relative prices as the strategic bidding that Ofcom acknowledges took place.

Ofcom's provisional decision to include Germany 700MHz as Tier 1 appears contrary to its own criteria and must be re-examined and properly justified. Until Ofcom can provide evidence that there was any level of intrinsic bidding (which is not evident and is not supported by e.g., the Dot-Econ assessment), the German 700 MHz award should be treated as Tier 2 or Tier 3.

If Ofcom can demonstrate that some level of intrinsic value bidding existed, then it must also establish the likelihood that the relative prices in the auction are based on either i) intrinsic valuation and ii) strategic bidding, and that the likelihood of i) is greater than or equal to the likelihood of ii), in order to categorize the award as Tier 1. However, given that Ofcom has already said that it cannot establish

[19] Annual licence fees for 900 MHz and 1800 MHz spectrum, A8.423, September 2015 https://www.ofcom.org.uk/__data/assets/pdf_file/0032/78629/annex_8.pdf

[20] Consultation paragraph A7.42

the likelihood of ii), it cannot prove that i) is greater than or equal to ii) and therefore logically the 700 MHz award can at best only be classified as Tier 2.

We finally note that if the 700MHz auction is re-tiered to Tier 2 (or Tier 3), the 800 MHz low frequency German benchmark could remain as Tier 1 as it is a separate award. This would be consistent with previous Ofcom positions.[21]

Slovenia 2021benchmarks

The Slovenian 2021 auction resulted in a price for 2100 MHz spectrum above the price for 700 MHz spectrum, which is out of step with most other auctions.

With caps limiting two of the 700 MHz bidders (Telekom Slovenije and A1 Slovenija) to no more than 2 x 10 MHz each, the other two potential bidders (T-2 and Telemach) were able to bid strategically to win the remaining 2 x 10 MHz at a low price. It is also possible that one of these potential bidders (T-2) was only able to bid weakly because the coverage obligations attached to the spectrum were difficult for it to fulfil.[22] The constraining effect of the caps and the weak position of one of the two other players, leading to a three-way split of the 2 x 30 MHz, indicates a strong likelihood of strategic demand reduction and artificially low prices.

As well as the 700 MHz auction price being artificially low, strategic bidding in the form of price driving led to the 2100 MHz prices being artificially high. Prior to the auction, T-2 had only 2100 MHz spectrum rights with these due to expire in September 2021[23]. Therefore, it was imperative for T-2 to secure 2100 MHz spectrum in the auction, in order to be able to operate its 2100 MHz network beyond September 2021. This gave the other bidders strong incentives to bid strategically with the aim of eliminating or compromising a competitor by requiring it to spend its available budget on what, for T-2, would be a "must have" band, with less ability to compete for spectrum in other bands required for 5G.

Given the likelihood of strategic bidding, to which the odd result of 2100 MHz prices being higher than 700 MHz lends credence, the 700 MHz and 2100 MHz auction prices are not a reliable indicator of the market value of 700 MHz and 2100 MHz spectrum in Slovenia and the auction does not meet the second of Ofcom's Tier 1 benchmark criteria:

> *"b) relative prices in the auction are at least as likely to be based on bidders' intrinsic valuations of spectrum as on strategic bidding".*

In summary we suggest that the Slovenian auction benchmark should be considered as Tier 2 evidence rather than Tier 1.

Other country benchmarks

We agree that the Austrian and Hungarian auctions provide appropriate Tier 1 benchmarks.

As explained above, the Netherlands auctions use proxy values for high band benchmarks which should also be included as Tier 1 benchmarks on the same basis as the Tier 1 benchmarks from other countries.

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[21] In 2018 in relation to setting 900MHz and 1800 MHz fees, Ofcom tiered Portugal 900 MHz benchmark as Tier 2 and 1800 MHz as Tier 3, and Denmark 900 MHz benchmark as Tier 3 and 1800MHz as Tier 1. See Tables A2.1 and A2.2 at https://www.ofcom.org.uk/__data/assets/pdf_file/0021/130548/Annexes-1-6.pdf

[22] The coverage obligations attached to the 700 MHz paired spectrum would have been quite a stretch for T-2 to achieve given its starting position of relatively poor geographic coverage of Slovenia. In fact, based on Opensignal's 4G Coverage Experience metric, which is a measure of how mobile subscribers experience 4G coverage on an operator's network and is measured on a scale of 0-10, based on the locations where customers of a network operator received a 4G signal relative to the locations visited by users of all network operators, T-2 scored only 1.4 out of 10, relative to an average score of 8.8 for the other three operators. See Opensignal report of coverage in Slovenia at the time of the auction - https://www.opensignal.com/reports/2021/04/slovenia/mobile-network-experience

[23] See CEPT ERO Report 03 Page 178 https://docdb.cept.org/download/3464

3.2.3 Appropriate lump sum value of paired UK 2100 MHz spectrum

Drawing our various comments and proposals together, our view is that the more appropriate estimate of lump sum value of paired 2100 MHz spectrum from interpretation of auction data is as shown in Table 1, derived from the detailed analysis in Annex A.

Table 1: UK 2100 MHz Lump sum value derived from relevant Tier 1 benchmarks

Award	Distance method UK 2100 MHz benchmark (£m/MHz) LSV
Austria (700 MHz - 2.6 GHz)	10.13
Austria (700 MHz - 3.6 GHz)	8.55
Hungary (700 MHz - 3.6 GHz)	7.43
Austria (800 MHz - 2.6 GHz)	9.59
Germany (800 MHz - 2.6 GHz)	13.52
Austria (800 MHz - 3.6 GHz)	7.13
Germany (800 MHz - 3.6 GHz)	7.72
Netherlands (700 MHz - 2.3 GHz [proxy 2100 MHz])	9.22
Netherlands (700 MHz - 2.3 GHz [proxy 700 MHz])	8.52
Netherlands (700 MHz - 2.6 GHz [proxy 2100 MHz])	9.96
Netherlands (700 MHz - 2.6 GHz [proxy 700 MHz])	9.21
Netherlands (700 MHz - 3.6 GHz [proxy 2100 MHz])	8.17
Netherlands (700 MHz - 3.6 GHz [proxy 700 MHz])	7.24
Minimum	**7.13**
Average	**8.95**
Midpoint of minimum and average	**8.0**

The Table 1 benchmarks implement our proposals to:

- Use latest 2020 PPP and Population data
- Correct the Slovenian auction price to exclude assignment fee element
- Cap the Y/X ratio used in the distance method at 1
- Exclude non-Tier 1 Slovenian and German auctions
- Include the Netherlands proxy-derived LSVs as Tier 1
- Exclude benchmarks based on UK 3.4GHz prices (using only UK 3.6GHz prices)

Based on the results in Table 1, it is apparent that Ofcom's proposed UK 2100 MHz paired spectrum value of £10.5m/MHz is too high and most likely over-estimates the UK market value of this spectrum. The average of all the data points is £9.0m/MHz and the lowest value is £7.1m/MHz.

We suggest taking the mid-point of the average and minimum values of the evidence points in the Table 1 as the estimate of UK market value that is suitable for Ofcom's purposes. This is consistent with Ofcom's past practice[24] and carries a low risk of over-estimating the UK market value. That would give the estimate of UK market value of 2100 MHz spectrum as **£8.0m/MHz**.

[24] Ofcom has previously taken the midpoint of minimum and average values when reviewing Tier 1 benchmarks and has even considered using a value below the midpoint – see e.g. paras 4.44 - 4.45 of https://www.ofcom.org.uk/__data/assets/pdf_file/0022/114736/consultation-alf.pdf

3.3 Market value of unpaired 2100 MHz spectrum

Question 3: Do you agree with our proposed market value for the unpaired 2100 MHz spectrum? If not, please provide evidence to support your view.

3.3.1 Opportunity cost of 2100 MHz unpaired spectrum

As we discussed in section 3.1.2 in response to Question 1, we don't agree that the opportunity cost of the unpaired spectrum should be based on the value of its use for high-power mobile networks. This is because of the lack of any evidence of demand for this use of the spectrum; the barriers to such use presented by the current licence conditions; the limited available bandwidths; and the absence of standardised equipment that would be compatible with the adjacent paired 2100 MHz uplink band.

Even if the obvious barriers that exist today to the use of the unpaired 2100 MHz band for high-power mobile were overcome and this was the relevant use for assessing opportunity costs, the value of the unpaired spectrum would be far less than other bands such as 2.3 GHz given: (i) the lack of harmonised use of the spectrum and consequent lack of equipment that is compatible with adjacent band uses; (ii) the severe limitations on how the spectrum can be used under the current licences; (iii) the very limited available bandwidth that makes the economic case to roll out a wise area high-power mobile network difficult; and (iv) the time delay before a high power 4G/5G network even has the potential to be deployed given (i) and (ii).

We are unaware of any Local Access licence applications for the 2100 MHz unpaired spectrum; a further indication of zero market demand from other users/uses and hence indicative of zero opportunity cost of the present licensed uses.

Given the lack of use, lack of clear demand for alternative use, and the absence of any requests to trade the spectrum or to share it under Local Access licences, the opportunity cost of the 2100 MHz unpaired spectrum should at the present time be assessed as close to zero.

Ofcom's SRSP set out AIP principle 2 as follows:

> *"AIP should apply to spectrum that is expected to be in excess demand from existing and/or feasible alternative uses, in future, if cost-based fees were applied. In determining feasible alternative uses, we will consider over the relevant timeframe, any national or international regulatory constraints, the existence of equipment standards, and the availability and cost of equipment as well as other factors that may be appropriate."*

We contend that under this principle, Ofcom should not be seeking to set ALFs for the unpaired spectrum based on full market value at all, let alone estimating its value with no credible evidence supporting the contention that the opportunity cost is the same as high power mobile use in the 2.3 GHz band.

Ofcom's AIP principle 8 on setting AIP fees to take account of uncertainty says:

> *"Where there is uncertainty in our estimate of opportunity cost, for example arising from uncertainty in the likelihood of demand for feasible alternative uses appearing, we will consider the risks from setting fees too high, or too low, in light of the specific circumstances. When spectrum is tradable we will consider the extent to which trading is expected to promote optimal use, and will also have particular regard to the risk of undermining the development of secondary markets."*

We contend that under this principle, Ofcom should be very cautious in the level of fees that it sets and should look primarily to the secondary trading market to find the most efficient and optimal use. We welcome Ofcom's indication that it is willing to explore making the licences more technology neutral if requested to do so by licensees, which would support such trading.

3.3.2 2100 MHz value is different to 2.3 GHz value

We do not agree that the full market value of the 2100 MHz unpaired spectrum is the same as, or is at all similar to, the full market value of the 2.3 GHz band of £5.4m/MHz (lump sum value). There is no evidence indicating parity with the value of 2.3 GHz and many reasons, as set out above, why it would be expected to be worth much less.

Given the obstacles to deploying high power 4G/5G mobile in the unpaired 2100 MHz spectrum, a more relevant comparison would be the recently awarded 700 MHz SDL spectrum which is for a band where an ecosystem is yet to be suitably developed. That spectrum was acquired by BT at reserve price of £1m/5MHz which implied the value to others (and hence the market value) was less than this amount. A further, more relevant, comparator[25] is the 2013 auction price for 2.6 GHz unpaired (TDD) spectrum, where Ofcom established the market value to be c. £0.49m/MHz[26] (at 2013 prices); approximately a tenth of the value Ofcom is proposing to use.

If Ofcom does use another band as a proxy for 2100 MHz value (which we consider wrong as explained below), it should, consistent with its approach to paired spectrum, adopt a cautious approach and use a lower figure reflecting the fact that over estimating value is a greater risk to efficiency than underestimating it. It should also reduce the market value very significantly to reflect the difference in utility of the comparator band and the unpaired 2100 MHz spectrum due to limited available bandwidth which would make a business case to deploy it far more difficult; as well as the delay and uncertainty over its possible use for high power mobile due to regulatory and equipment availability concerns.

3.3.3 Appropriate lump sum value of unpaired 2100 MHz

Given all the above considerations, Ofcom should conclude that the present market value is close to zero and not charge an annual fee for the unpaired 2100 MHz spectrum. It should review the position in 3 years when the {✂}; the technical, regulatory and equipment availability issues are clearer; and any other demand to use the band may have crystalized.

In the interim Ofcom should work with licensees to make the 2100 MHz unpaired licence conditions more technology neutral and support any request to trade the spectrum or to share the spectrum on a geographic basis via Local Access licences. We raise a related issue as to whether the fees regulations might be a barrier to partial (geographic) spectrum trades in section 3.6.

If Ofcom were to maintain its position of valuing the unpaired 2100 MHz spectrum at the same level of its estimate of the current market value of the 2.3 GHz spectrum, it seems likely that some (or all) licensees might hand the spectrum back to Ofcom. This could occur if they were to consider the fees to be above the value to them of the licence and above the value of their licence to others (quite possible given the lack of interest in trading to date).

This would give Ofcom the task of having to re-award the spectrum if there is excess demand (that can be evidenced) or to assign it administratively to interested users for certain permitted types of uses/applications that Ofcom may decide. The dynamic nature of the foreseen emergency services use by EE might not fit such an authorisation model and is something that Ofcom might wish to pick up with the Home Office if it expects that licences may be returned to Ofcom because of the level of fees it proposes to implement for the existing 2100 MHz licences.

We think the better course of action would be for Ofcom to rely on market mechanisms to achieve the optimal and efficient use of this spectrum, augmented by the currently available Local Access licences for those that may wish to share the spectrum without a formal trading arrangement with the licensees. We consider that setting annual licence fees at anything close to the 2.3 GHz auction

[25] The 2.6 GHz TDD spectrum has some power constraints in parts and was not widely used at the time of award.
[26] See Table A6.6 of https://www.ofcom.org.uk/__data/assets/pdf_file/0030/76926/annexes_1-7.pdf

prices would not support a secondary market and would actually be counter to the requirement to promote optimal and efficient use of this spectrum, potentially representing an obstacle to trading.

If Ofcom were to proceed to set ALFs now for the unpaired spectrum these should be based on the opportunity cost of the next highest value user (which Ofcom has not identified) rather than a benchmark-derived value for high power wide-area mobile use.

3.4 Annualisation rate

Question 4: Do you agree with our proposed annualisation rate? If not, please provide evidence to support your view.

Ofcom calculates the annualisation rate using the same approach as in previous cases where it has set ALFs. The principal parameters in its calculation are the real post-tax discount rate and the estimated future corporate tax rate.

Ofcom's use of an upper polar case to inform the discount rate is inappropriate

In line with previous ALF decisions, Ofcom believes that the discount rate lies between two polar cases: (1) a lower case based on the cost of debt, to reflect a scenario where the licensee bears the risk associated with variation in the market value of the spectrum, and (2) an upper case based on the WACC, to reflect a scenario where the Government bears this risk, thereby exposing it to the systematic risk of MNOs' cash flows. Ofcom applies a 25% risk sharing factor to determine where, between these polar cases, the discount rate lies, placing 75% weight on the lower polar case and 25% weight on the upper polar case.

The degree to which Government bears risk in relation to the ALF payments depends on the likelihood of the market value of spectrum changing resulting in a revaluation of ALF payments. Ofcom indicates that it is the possibility of a future review of ALFs which exposes the government to a degree of systematic risk of the cash flows from the operation of the licences.[27] This means the degree of risk borne by Government depends solely on the likelihood of future fee reviews.

Future ALF payments may be reviewed in scenarios where a new spectrum auction indicates a material change in the market value of the spectrum. Ofcom uses historical spectrum auctions to calculate the lump sum value of the 2100 MHz spectrum, and future auctions could show the market value has changed relative to the value determined today.

Several spectrum auctions have been undertaken by Ofcom in recent years and there are currently no planned spectrum auctions for the next 20 years that are of obvious relevance to future reviews of 2100 MHz ALFs. Table 2 shows historical spectrum auctions in the last 20 years, which may have triggered a review of ALFs in one band or another. None of the auctions prior to the recent 2021 award have done so.

[27] Ofcom, 2021. Annual Licence Fees for 2100 MHz spectrum. Consultation. A8.22. p51.

Table 2: UK auctions timeline (national sub-6GHz spectrum)

Date	Bands	ALFs due
2000	2100 MHz	2022
2006	400 MHz	2021
2008	1400MHz	2023
2013	800MHz, 2600MHz	2033
2018	2.3 GHz, 3.4 GHz	2038
2021	700MHz, 3.6 GHz	2041

The only future spectrum auction anticipated in the sub-6 GHz category is the extended 1400 MHz SDL band spectrum auction. However, this has very different properties to the 2100MHz spectrum relevant to this consultation, and market value set by the 1400 MHz SDL auction would not be likely to be considered relevant to a review of the ALFs for 2100 MHz spectrum. The other anticipated auction of 26 GHz mmWave is clearly not relevant to 2100 MHz spectrum value as its technical properties are very different.

As such, there will be no market reference point to justify a change to 2100 MHz ALFs during the licence period. The situation may have been slightly different at the time of previous Ofcom decisions on ALFs. For example, at the time of the 2018 consultation on the ALFs for 900MHz and 1800MHz, the auction of 700 MHz and 3.6 GHz spectrum (which took place in 2021) was forthcoming, raising the prospect of a new indicator of spectrum market value and a potential review of ALFs. With the completion of this auction, and no future spectrum auctions of any relevance to the market value of 2100 MHz spectrum, there is no prospect of a review of 2100 MHz ALFs based on future UK auction information.

Specifically, when assessing the future risk of a material misalignment in market value with ALFs, Ofcom has previously remarked on the importance of the 700 MHz / 3.6 GHz auction for assessing risk as follows:

> *"[W]e have considered what assumptions it would be reasonable to make about the possibility of a review (or reviews) being carried out within the next 20 years. This affects the exposure that the licensees have to changes in the market value of spectrum over time and so is relevant to the choice of discount rate (as set out in Section 4 and Annex 10). In our view, it is reasonable to assume that these fee rates are likely to be reviewed at some stage during a 20- year period, although we cannot predict with any certainty at what point any such review (or reviews) might occur. For example, we recognise that it is possible there could be grounds for a review following an award of the 700 MHz spectrum and/or the review that we will need to undertake of the fees for the 2.1 GHz licences, though this would still depend on there being evidence of a material misalignment between ALF and market value around these times."*[28]

Ofcom's above approach should be applied in the context of both historic 900/1800 MHz ALFs (the 2018 ALFs Statement) and the current 2100 MHz ALFs consultation as follows.

First, the 700 MHz / 3.6 GHz auction results in 2021 show that there is a material misalignment in market value in relation to 900/1800 MHz ALFs, with the current ALFs likely to be significantly higher than the

[28] Annual licence fees for 900 MHz and 1800 MHz spectrum: Provisional decision and further consultation, Ofcom, para 7.41. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/83146/annual-licence-fees-900MHz-1800-further-consultation.pdf

underlying forward-looking long-run opportunity cost (see section 4). This should be addressed early in 2022 through a re-opening of these fee reviews and a downward revision to 900/1800 MHz ALFs.

Second, when Ofcom assessed the discount rate for annualising the lump sum values determined in the ALF Statement for 900/1800 MHz, it set the risk-sharing factor assuming that the 700 MHz / 3.6 GHz auction - which had not yet been held - could result in a fee review for 900 / 1800 MHz if it pointed to a material misalignment between ALFs and market values. This (higher) risk was, therefore, explicitly factored into the discount rate for 900 / 1800 MHz ALFs.

Third, in contrast to the situation in 2018 when ALFs for 900 / 1800 MHz were set, the 700 MHz / 3.6 GHz auction has now taken place and the result is known and can therefore be fully factored into the determination of the 2100 MHz ALFs. This implies that there must be a significantly lower risk of a future fee review due to a material misalignment between the market value for 2100 MHz and ALFs than for the 900 / 1800 MHz ALFs (again noting the limited number of relevant UK auctions over the next 20 years as set out in Table 2 above).

***International* spectrum benchmarks and UK spectrum trades**

We think it very unlikely that risk will arise (for either MNOs or Government) as a result of fee reviews triggered by future international auction outcomes. Ofcom often excludes international auctions from its benchmarking exercise because they have features that make the spectrum values implied by those auctions incomparable to the value of spectrum in the UK market. Even when they *are* included, international evidence always sits alongside in-country evidence and are used to provide relative value checks not information on absolute values (due, again, to difficulties with making like-for-like comparisons). An international auction outcome is very unlikely, therefore, to trigger a fee review. In fact, this has never happened since the inception of ALFs in 2015. A fee review triggered by a spectrum trade is also very unlikely given how infrequently these occur and the price of trades is generally kept confidential by the parties concerned.

In summary, the evidence indicates that there is negligible risk of events which indicate a variation in the market value of 2100 MHz spectrum, triggering a review of ALFs, during the next 20 years of the licence period. Ofcom's proposed sharing factor of 25% is, therefore, inappropriate, and it should set the discount factor only based on the scenario where the licensee bears the risk around the market value of spectrum, i.e., the (corrected) lower polar case. If Ofcom continues to believe that a sharing factor is appropriate then it should, at a minimum, revise the sharing formula toward the lower bound estimate. A 90%/10% sharing split would reflect a more reasonable assessment of the likelihood of the market value variations, triggering a future review of ALFs, compared to the current 75%/25%.

Ofcom uses an incorrect cost of debt estimate to set the lower polar case

In calculating the discount factor for the lower polar case, Ofcom estimates MNOs' cost of debt. This is used as an approximation of the low risk to the Government associated with the future ALF payment stream in a scenario where licensees bear the risk of any variation in the market value of the spectrum.

The degree of risk associated with the stream of ALF payments over the licence duration depends on the ranking of ALF payments, as a claim on cashflows, relative to a firm's other financing costs. Any firm that is financed with debt and equity is required to prioritise payments to debt holders ahead of equity holders, so the risk faced by debt holders is lower than that faced by equity holders. In situations where the firm's cash flows have declined due to a wider market shock, debt holders are more likely to receive their interest payments than equity holders are to receive dividends, because of debt holders' prior claim on the firm's cash flows. The cost of debt is lower than the cost of equity reflecting this lower relative risk.

In this instance, ALF payments are an operating cost to the MNO, and are paid to the Government (via Ofcom) before making any interest payments to debt holders. Because they are a prior claim relative to payments to debt holders, Government faces less risk around its receipts of ALF payments than MNOs' debt holders. This reduction in risk should be reflected in a lower discount rate for ALF

payments than MNOs' cost of debt. The low risk associated with ALF payments is demonstrated by the fact that no MNO has defaulted on their ALF payments since their inception in 2015.

To calculate the lower polar case, Ofcom should therefore estimate a discount rate below the cost of debt for UK MNOs. Setting the discount rate at the cost of debt would overstate the risk faced by Government of non-payment by MNOs.

To reflect the lower risk of ALF payments relative to debt, we have considered how a credit rating agency might perceive the risk associated with the stream of future ALF payments. When rating agencies assign credit ratings to securities, they ensure that two securities with the same credit rating have the same expected loss rate, which is the product of the probability of default and the expected severity of the loss given default.[29] Rating agencies apply this principle when assigning credit ratings to different classes of debt, including senior and subordinated debt, where senior debt holders are paid ahead of subordinated debt holders.

When evaluating the expected loss rate for different classes of debt, rating agencies consider senior debt to be less risky than subordinated debt, because the probability of default on senior debt is lower, and the expected severity of the loss given default is also lower. Because of this difference in risk, rating agencies typically assign a one notch higher credit rating to senior debt compared to subordinated debt. Standard and Poor's have a similar approach to assigning credit ratings, and also assign a one notch difference in rating between senior and subordinated debt.[30]

Moody's guidance on the difference in credit rating for sub-ordination is shown in Figure 4 below.

Figure 4: Moody's guidance on credit rating differences for subordination

Guidance on Notching for Subordination

	Security Class	Number of Notches ("+" greater than; "-" less than)	Reference Rating
If Sr. Unsecured or Corporate Family Rating is Ba2 or higher	Secured Bonds	+1	Sr. Unsecured
	Sr. Unsecured	0	Sr. Unsecured
	Sr. Subordinated	-1	Sr. Unsecured
	Subordinated	-1	Sr. Unsecured
	Jr. Subordinated	-1	Sr. Unsecured
	Preferred stock	-2	Sr. Unsecured

Source: Moody's, February 2007[31].

Moody's has applied this framework to the telecoms sector, when assigning credit ratings to different classes of Vodafone's debt.[32] Moody's assigned a two-notch credit rating difference between Vodafone's senior unsecured debt and junior subordinated debt to reflect the relative risk faced by different classes of debt holders.

This framework can also be applied to consider the relative risk of ALFs compared to MNO's debt. As described above, ALFs are paid as an operating cost ahead of any payments to debt holders and have a prior claim on the firm's cash flows relative to debt. As such, ALFs are more 'senior' than debt and therefore the risk of default on ALFs is lower than the risk of default on debt.

In addition, Moody's also assigns a one notch difference between bonds that are secured against an asset compared to bonds that are unsecured. A secured bond partially mitigates risk for the bond

[29] Moody's, Updated Summary Guidance for Notching Bonds, Preferred Stocks and Hybrid Securities of Corporate Issuers. February 2007, Page 1. https://www.moodys.com/sites/products/aboutmoodysratingsattachments/2006400000430106.pdf

[30] S&P Global, 28 March 2018. Reflecting Subordination Risk In Corporate Issue Ratings. Page 3.

[31] https://www.moodys.com/sites/products/aboutmoodysratingsattachments/2006400000430106.pdf Page 2.

[32] Moody's, 27 September 2018. https://www.moodys.com/research/Moodys-assigns-Baa3-ratings-to-Vodafones-new-hybrid-securities-ratings--PR_389508

holder because in the event of default, the bondholder retains the asset, which can then be sold to recoup some of their investment.

ALFs are similar to secured bonds because in the event of an MNO failing to pay ALFs, Government has the right to revoke the licence and re-sell it to another MNO, thereby recouping some of its loss. This partially mitigates the risk for Government, compared to a scenario where ALFs were unsecured against the MNO's licence.

In line with rating agencies' approach of assigning a one notch difference between senior and subordinated debt and an extra one notch difference between secured and unsecured debt, we believe a two-notch difference is appropriate to reflect the lower risk associated with ALFs relative to MNOs' unsecured debt. This is a conservative assessment because ALFs are only one type of operating cost for MNOs, and in times of financial distress, an MNO is more likely to cut other operating costs (such as labour and equipment) than stop paying ALFs, which would result in forgoing its licence for the spectrum, which it relies upon to serve customers. ALFs are likely to be one of the least risky elements of an MNO's operating costs, and two-notch credit rating difference is likely to be a lower bound for reflecting the difference in risk relative to debt.

To estimate the cost of debt in the lower polar case, Ofcom selects a BBB rated corporate bond index in line with the average credit rating of MNOs.[33] A two-notch credit rating above this to reflect the lower risk of ALFs would mean selecting an index with an A- credit rating.

Bloomberg does not provide an index that only includes A- bonds. We have therefore considered Bloomberg's equivalent index with an A credit rating, made up of bonds of A-, A and A+ ratings. We have then linearly interpolated between the yield on the BBB rated index and the A rated index to derive the implied yield on an A- rated index.

The average spread in yield between the BBB rated and A rated bond indices is 39bps over the last twelve months (the period Ofcom applies when calculating the average yield of the index).[34] Linearly interpolating between these indices to calculate the spread in yield for an A- rated index, we estimate a spread of 26bps relative to the BBB rated index that Ofcom applies.

This means that the appropriate discount rate for ALFs should be 26bps lower than the cost of debt that Ofcom derives from the BBB rated corporate bond index. Relative to Ofcom's lower polar case of 1.3%, we believe the pre-tax nominal discount rate should be 1.04% to reflect the lower risk of ALFs compared to MNO's debt.

This equates to a real post-tax discount rate of -1.2% (assuming a tax rate of 24.9% and CPI of 2% in line with Ofcom's assumptions.

If Ofcom chooses to apply an upper polar case, it should adjust it for inflation and liquidity risk

As discussed above, Government bears negligible risk of ALFs changing as a result of changes to the market value of spectrum, and therefore we believe Ofcom should only place weight on the lower polar case.

However, in the event Ofcom continues to believe that the upper polar case (which assumes ALF payments could vary in line with future after-tax MNO cashflows) is relevant, it should make two adjustments to its proposed estimate of 3.6% (post tax, real).

First, in line with its approach to the lower polar case, Ofcom should adjust its upper polar case for inflation risk. Ofcom adjusts its lower polar case down by 0.1% to reflect the fact that the cost of debt

[33] Consultation document, Footnote 9 on Page 49.

[34] This is calculated based on Bloomberg's BVCSGU10 BVLI Index (which Ofcom uses as the BBB rated index) and the BVCSGK10 BVLI Index, which is the equivalent A rated corporate bond index.

includes a premium for inflation risk, which Government does not actually bear since ALF payments are indexed annually to reflect actual inflation.

Ofcom's reasoning for adjusting the lower polar case for inflation also applies in the upper polar case. In the upper case, even if the Government was exposed to the systematic risk of cashflows, the ALF payments would still be fixed in real terms, and so Government would not bear any inflation risk. As a result, the upper polar case, which Ofcom estimates based on the WACC, should be adjusted down for the inflation risk premium. Ofcom's estimate of the WACC is based on nominal parameters and transformed into a real estimate using a CPI forecast. Ofcom should further adjust this WACC estimate for the inflation risk premium, which it estimates as 0.1%.

Second, in line with its approach for the lower polar case, Ofcom should adjust its upper polar case for liquidity risk. Ofcom's cost of debt estimate for the lower polar case includes a liquidity risk premium which Government does not need compensation for since there is no realistic prospect of Government wanting to resell the ALF payment stream. Based on this reasoning, Ofcom deducts 50bps from its cost of debt estimate to calculate the lower polar case.

The same reasoning applies in the upper polar case. In a scenario where Government bears systematic cashflow risk because ALF payments are linked to after-tax cashflows, there is no realistic prospect of Government reselling the ALF payment stream. Ofcom should also adjust the WACC estimate in the upper polar case for liquidity risk as follows:

- Cost of debt in WACC estimate: Since the cost of debt is the same as Ofcom's assumption in the lower polar case, Ofcom should apply the same liquidity premium adjustment of 50bps.
- Cost of equity in WACC estimate: The cost of equity also includes a premium for liquidity risk, based on the liquidity risk shareholders face in reselling shares. We believe Ofcom's liquidity premium adjustment of 50bps for the cost of debt is a reasonable conservative adjustment for the cost of equity. The relative liquidity of debt and equity markets can vary over time, but on average is expected to be similar in well-developed UK capital markets.

On this basis, Ofcom should adjust its WACC estimate down in the upper polar case by 50bps for the liquidity premium. Together with the adjustment for the inflation risk premium of 0.1%, Ofcom's upper polar case should be 3.0%.[35]

Ofcom should apply a discount rate of -1.2% (post-tax real) to reflect the lower risk of ALFs

In summary, Ofcom should adjust its estimates for both the lower and upper polar cases, and for the risk sharing factor.

To calculate the lower polar case, Ofcom's estimate of 1.3% (pre-tax, nominal), based on the cost of debt, does not reflect the prior claim which ALFs represent on the firm's cash flows ahead of payments to debt holders and that they are secured against a valuable spectrum licence asset, and are therefore less risky than an MNO's unsecured debt. We have provided a framework for calculating the implied credit rating of ALF payments and estimate that the lower polar case should be 1.04%, 26 bps lower than Ofcom's estimate. This equates to a real post-tax discount rate of -1.2%.

The risk sharing factor should be adjusted from 25% to 0% to reflect the irrelevance of the upper polar case. If Ofcom continues to believe that the upper polar case is of some relevance, then the risk sharing factor could be set at a maximum, to 10%. This would place more weight on the scenario where Government bears virtually no risk of variation in the future stream of ALF payments (because of the low likelihood of fee reviews).

If the risk sharing factor is not adjusted to 0%, as BT believes it should be, then Ofcom should also adjust its estimate for the upper polar case to remove inflation and liquidity risk premia. As per its approach in the lower polar case, in the upper polar case (which is only relevant if Government bears systematic

[35] This is derived by deducting 0.1% for inflation risk and 50bps for liquidity risk from Ofcom's real post-tax WACC of 3.6%.

cashflow risk because ALF payments are linked to variations in cashflows), Government is still protected against inflation risk due to indexation of ALFs and does not need to be compensated for liquidity risk (since there is no realistic prospect of Government re-selling ALF payments). Therefore, Ofcom should apply the adjustment it makes for inflation risk and liquidity risk in the lower polar case to the upper polar case too. This would lower Ofcom's upper polar case from 3.6% to 3.0%.

Taken together, we estimate a real post-tax discount rate of -1.2% based solely on the lower polar case, compared to Ofcom's estimate of 0.2%. Should Ofcom continue to factor in the upper polar case (at a risk sharing factor of 10%) then the discount rate becomes -0.78%.

The annualisation rate based on a real post-tax discount rate of -1.2% would be 4.55%.

The annualisation rate based on -0.78% real post-tax discount rate would be 4.80%.

Effects of rounding important values in intermediate steps of the calculations

In addition to the points raised above, we note that Ofcom has rounded certain parameter values at intermediate points within its current calculations, which appear to have resulted in higher proposed licence fees than if this rounding had not been done. We consider that Ofcom should instead apply a more conservative approach, including when undertaking each intermediate step in the annualisation calculation.

Using the formula to set the *Real post discount rate* between the polar cases of the stated *Post tax real cost of debt* of -1.0% and the stated *Post tax WACC of 3.6%* would give a *real post tax discount rate* of 0.15% rather than the value of 0.2% that Ofcom says arises from rounding to 1 decimal place.

Whilst we suggest that several of the key parameters in Ofcom's annualisation rate calculation are adjusted, as set out above, we propose that Ofcom also uses more significant figures in its intermediate calculations when determining the ALFs.

Carrying out the annualisation rate using Ofcom's proposed parameters, it can be seen that using 0.15% rather than 0.2% for the real post tax discount rate changes the annualisation rate from 5.40% to 5.37% (including the TAF change from 1.06 to 1.059 with the more precise 0.15% discount rate).

We raise this point as it is material given that the effect of the rounding appears to increase our annual fees payable by over £2m over 20 years.

3.5 Ofcom's statutory duties and setting fees to reflect full market value

Question 5: Do you agree with our provisional conclusion that fees set based on our estimates of market value is in line with our statutory duties?

3.5.1 Suitability of ALFs based on estimate of full market value

Ofcom's assessment that 2100 MHz ALFs promote efficiency, investment, competition, or consumer benefits is flawed

Ofcom has provided limited, if any, evidence to support its claim that 2100 MHz ALFs promote efficiency, investment, competition, or consumer benefits.

Ofcom argues that ALFs are required to promote the optimal use of spectrum by MNOs. However, we find that, where mobile spectrum licences are tradeable, licence fees set at full market value are unlikely to promote any of these objectives, while they are likely to be harmful in relation to delivery against Ofcom's statutory duties including investment and consumers benefits.

Moreover, as set out in Sections 3.2, 3.3 and 3.4, Ofcom is likely to have set ALFs above full market value which conflicts with its statutory duties and will likely result in material consumer harm.

A key argument made by Ofcom is that absent an explicit fee it cannot rule out the possibility that spectrum might not be traded to another MNO with a higher value in the future. Hence Ofcom argues that ALFs remain a necessary complement to spectrum trading to promote the optimal use of spectrum. BT considers that this approach to regulation is inconsistent with the principle that regulation must be proportionate to the expected harm it seeks to mitigate. This hypothetical risk must be balanced against the real risk of a significant negative impact from 2100 MHz ALFs, and in particular, harm to investment and consumer benefits.

Investment in new and more efficient mobile network technology, including 5G, is the primary means by which unit costs, and prices, are reduced over time. Investment is therefore critical not just to mobile markets but also to the wider economy due to multiplier effects on GDP and where it brings digitalisation of the economy. It is likely that connectivity will be exponentially more important to economic growth in the future than it has been in the past. This is because future productivity improvements will be enabled by connectivity across a much wider range of sectors and activities within them than ever before. In addition, accelerating digitalisation across all sectors which has been fuelled by the pandemic, is likely to increase the share of productivity improvements attributable to telecommunications services even further.

We therefore do not agree that setting annual fees based on Ofcom's estimates of full market value of 2100 MHz is the most appropriate solution when considering the full range of Ofcom's statutory duties, in particular the requirement to encourage investment and promote consumer benefits in relevant markets. For the unpaired 2100 MHz spectrum, we consider that fees should be based on administrative and not opportunity cost given the lack of current and expected future excess demand (as explained above).

Ofcom's 2010 Strategic Review of Spectrum Pricing (SRSP) and the Government's 2010 Directions to Ofcom in relation to annual fees for 900/1800/2100 MHz spectrum licences are now long overdue for review and revision. New and competing policy objectives place greater focus on extended mobile coverage and spectrum access for new users. Combined with changes in technology and market conditions (greater network and spectrum sharing, evidence of spectrum trading, changes in spectrum shares following auctions of new spectrum bands) the efficiency case for ALFs is considerably weaker. We consider that new policy objectives and changes in technology and market conditions justify a new approach to setting spectrum fees.

In light of this, we do not regard the application of ALFs in relation 2100 MHz as justified against Ofcom's statutory duties. If, however, Ofcom is minded to proceed with setting ALFs for 2100 MHz, then we urge Ofcom to take a far more conservative approach in setting these, based on our proposals set out in Sections 3.2, 3.3 and 3.4.

Below we set out BT's evidence and reasoning for why Ofcom's 2100 MHz ALF proposals are unlikely to promote Ofcom's statutory duties and may be harmful to investment and consumer interests.

In particular, we explain the following:

- ALFs do not promote the optimal use of spectrum use (and may be a barrier to trading)
    - MNOs already face the forward-looking opportunity cost of spectrum in own use and other users (hence ALFs set at full market value will have a neutral impact)
    - ALFs set below full market value therefore do not represent a subsidy to mobile operators (so there is no downside risk of setting ALFs below full market value)
    - Our analysis shows Ofcom's 2100 MHz ALFs proposals are likely to be above full market value and may act as a barrier to future trading thereby reducing efficiency
    - New policy objectives and changes in technology and market conditions make the efficiency case for ALFs significantly weaker

- ALFs may not be expected to promote Ofcom's other statutory duties at full market value:
    - ALFs set up to full market value will not promote, and may harm, investment and consumer benefits
    - ALFs set up to full market value will not promote competition (a neutral impact)
    - Since our analysis shows that Ofcom's 2100 MHz ALF proposals are likely to be set above full market value, they further raise the risk harm in relation to investment and consumer benefits.

3.5.2 Optimal use of spectrum

ALFs do not promote the optimal use of spectrum use (and may be a barrier to trading)

MNOs already face the forward-looking opportunity cost of spectrum

BT considers that there is no sound justification for applying ALFs to tradable spectrum licences held by commercial entities, as the ability to trade ensures efficiency in current and future uses (and users).[36,37] ALFs could play a role where spectrum is instead held by non-commercial entities if they are less responsive to the opportunity cost of under-utilised assets or in relation to non-traded spectrum in other sectors (and where not in its highest valued use).

Ofcom's consultation proposals argue that mobile spectrum trading alone is not sufficient to ensure 2100 MHz remains allocated efficiently over time. Specifically, Ofcom states:

> *"We recognise that operators may be incentivised to make the most efficient use possible of spectrum they currently hold, in the absence of fees set at market value. However, this does 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 use of that spectrum, they are not necessarily the most efficient user).*[38]
>
> *"Our provisional view is therefore that we cannot rely on trading alone to secure the optimal use of either the paired or unpaired 2100 MHz spectrum."*

For Ofcom's statement to be true at least one of the following conditions would need to hold:

(i) there are transaction costs to trading spectrum that outweigh the benefit of trading

(ii) there is a strategic reason for keeping spectrum unused, denying its use to others where that could cannibalise the individual MNOs revenues. For example, Ofcom has previously argued that MNOs could in theory hold onto spectrum even where a buyer offers a price that exceeds their intrinsic private value as they may perceive they are losing a strategic asset to a competitor (spectrum hoarding)

(iii) the existence of strategic behaviour by MNOs not to sell certain bands to non-MNO users (new entrants).

We disagree with Ofcom's assessment and set out the following reasoning and evidence for why Ofcom's (implicitly) assumed conditions do not hold and why MNOs face the full opportunity cost of spectrum in own use and other users.

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[36] https://newsroom.bt.com/ee-to-offer-5g-solutions-across-the-entire-uk-as-bt-group-unveil-new-mobile-and-convergence-ambitions/

[37] Furthermore, this result does not rely on observing actual spectrum trading.

[38] Ofcom consultation, para 5.6

First, Ofcom recognises that the UK mobile markets are highly competitive:

- In the competition assessment for the 2.3/3.4 GHz auction Ofcom concluded in 2014 that "the market appears to be operating well at present, with strong competition between suppliers, relatively low prices for UK consumers, and continued investment in new services."
- In Ofcom's 2015 Strategic Review of Digital Communications Consultation, it acknowledged that: "*UK consumers have benefited greatly from end-to-end competition in mobile services*."
- Ofcom's comprehensive competition assessment for the 700MHz / 3.6 GHz auction did not suggest any fundamental change from Ofcom's earlier assessments.

Ofcom's competition assessments have not referenced any strategic behaviour by the MNOs regarding trading in 2100 MHz which might give rise to competition concerns. We also note Ofcom has not previously found transaction costs to trading spectrum outweigh the benefit of trading (although ALFs set incorrectly may themselves become a barrier to trading – see discussion further below).[39] If current mobile markets are assessed to be competitive, and there is no evidence of strategic behaviour, then it follows that mobile spectrum assets will currently be assigned efficiently between operators in the market. Ofcom's own conclusions on competition indicate, therefore, that MNOs currently face the opportunity cost of spectrum in own use and other (mobile) users.

Spectrum trades would therefore not be expected where spectrum is already assigned efficiently. A lack of observed mobile spectrum trades in 2100 MHz spectrum to date therefore does not imply that the secondary trading market is not functioning properly. The significant additional spectrum released for mobile use over the past decade through primary auctions has also provided opportunities to acquire additional spectrum in line with operator demand, which may have also diminished the need for trading (including 2100 MHz).

If Ofcom believes this is not the case, it will need to adduce evidence that ALFs are needed to address an inefficient allocation of spectrum or the risk of such a position emerging without being addressed through trading. It has not yet set out this evidence; on the contrary, Ofcom's assessment is that mobile markets are competitive and working well.

Second, all MNOs face continual pressure to meet growing demand for coverage, data capacity and higher quality service (including 5G). As part of this MNOs must weigh up using existing spectrum such as 2100 MHz against investment in new sites and new spectrum. We (and other MNOs) are, therefore, commercially constrained to ensure that our 2100 MHz assignments are used optimally to deliver the highest value available. For example, in relation to network optimisation:

- All MNOs densify their networks around their (paired) 2100 MHz spectrum assignments investing significant amounts of capex into network upgrades to deliver high quality mobile network services (both coverage and capacity) to consumers.
- All MNOs use existing spectrum (via technology investments including, for example, investment in more advanced antenna technology including MIMO and generational shifts e.g., 3G to 4G and 4G to 5G).
- All MNOs seek more intensive use of existing spectrum (by adding transmitter sites that allow the same spectrum frequencies to be re-used in different areas).

Furthermore, in relation to retail markets, MNOs will price downstream services as if they were already paying an ALF set at full market value because MNOs already face the full opportunity cost of not exploiting the full market value of the spectrum.

- For example, if BT/EE were to set consumer prices lower to win additional customers or grow traffic, we would want to ensure that our prices e.g., 24-month PAYM plans, covered the costs of supply including any additional spectrum needed. If retail revenues did not recover the

[39] We note transactions costs are low and are unlikely to prevent trading.

expected value, we could otherwise monetise from selling spectrum assets, we would trade the spectrum (as we did for 2.6GHz TDD).

- Ultimately, BT/EE would look to make reasonable returns on all our investments and spectrum assets as we densify networks around our spectrum assets and set retail prices to reflect these costs.

These factors show that MNOs make the most of their spectrum assets and are not engaging in spectrum hoarding with paired 2100 MHz.

In addition, BT/EE has not been approached by non-MNO entrants seeking to enter into a trade for 2100 MHz spectrum. If Ofcom believed that non-MNO players have been unable to trade with any MNO for 2100 MHz because of strategic behaviour, it would need to provide evidence in order to support any such implied 'theory of harm' (ToH).

We therefore consider that ALFs are unnecessary because they will not encourage trading where 2100 MHz is already assigned efficiently (i.e., in the highest value use, mobile) and highest valued user (mobile operator) and where trading ensures that allocations will remain efficient over time.

Third, there is new evidence of mobile spectrum trading, where ALFs do not apply, in the nearby 2.6 GHz TDD band, between EE and O2. This demonstrates that the UK mobile spectrum trading regulations support a fully effective spectrum trading regime (i.e., they are not simply an abstract legal framework). This trade also supports our view that if market conditions were to change in the future (e.g., changes in operators share of market demand), leading to differences in user valuations of 2100 MHz, then trading alone could reasonably be expected to ensure spectrum assignments remain efficient over time without the need for ALFs. Key details of the 2.6 GHz trade include the following:

- On 5 December 2020, Ofcom approved a trade of unpaired 2.6 GHz spectrum (25 MHz) from EE to O2 after a short consultation period. Ofcom's initial view was that any risk to competition would be low, which would seem to be supported by the lack of concern from interested parties. EE explained the trade as follows: "This spectrum is less optimal for use given our other spectrum holdings." EE also explained it wanted to prioritise network investment in other spectrum bands "as these provided a better option to deliver the capacity that's required in our network". This suggests MNOs are willing and able to trade to optimise their spectrum portfolios to meet their changing requirements and enabling spectrum to be transferred to its most highly valued use.
- We note that the voluntary trade between EE and O2 relates to the 2.6 GHz band that was acquired by EE in the 2013 4G auction and where ALFs do not apply until 2033. In contrast to Ofcom's claims this trade shows that ALFs are not needed to ensure spectrum trading.
- The sale by Qualcomm of its 1.4 GHz spectrum to Three and Vodafone in 2015 is another example where trading has achieved optimal and efficient use of mobile spectrum without ALFs reflecting full market value being in place.
- Economic efficiency includes both allocative and dynamic efficiency concepts and Ofcom is required to promote current and future optimal use of spectrum. For example, in relation to dynamic efficiency Ofcom states that the aim of ALFs is "to give [them] incentives to use it in a way that maximises benefits for society over time". We consider that spectrum trading alone ensures that Ofcom meets both allocative and dynamic efficiency as evidenced by the recent trade in non-ALF spectrum.

Fourth, we further note that the UK approach of attempting to set annual fees at full market value is unique. In contrast, in the USA, where market-based spectrum policy has been applied for decades, indefinite licences for spectrum placed in the market by auction do not have licence fees attached and there is a functioning spectrum trading market.

Fifth, if the 2100 MHz spectrum is currently assigned efficiently, and the ability to trade ensures assignments remain efficient over time, then ALFs are unlikely to incentivise behavioural changes in the

market leading to any incremental trades. This suggests that Ofcom's stated policy objective to promote the optimal use of spectrum by MNOs is not realistic.

- Ofcom has presented no evidence of high transactions costs, spectrum hoarding limiting trades between MNOs, or strategic behaviour among MNOs to limit trades to non-MNO entrants. On the contrary ALFs are unlikely to be net beneficial in terms of Ofcom's duties (when considered against the efficiency criteria as set out above) and rather, and more likely to be net costly (in terms of reduced ability/incentives to invest and negatively impacting consumer benefits).
- It also demonstrates that rather than incentivising behavioural changes, ALFs will effectively become akin to a tax on the mobile sector. When considered in this way the benefits of ALFs appear remote compared to the risk of significant negative impacts on investments and consumers which is tangible.

In summary, all MNOs face an ongoing trade-off in meeting growing demand for coverage, data capacity and higher quality service (including 5G) including between the efficiency of use of existing spectrum such as 2.1GHz and investment in new sites and new spectrum. Since MNOs already face the opportunity costs in own use and that of other users, 2100 MHz, and trading ensures this remains so, ALFs are therefore unlikely to promote the optimal use of spectrum by MNOs.

ALFs set below full market value do not represent a subsidy to mobile operators

In relation to unpaired 2100 MHz spectrum, there is no current or expected future use for the spectrum such that there is no expectation of excess demand in any use, and therefore we consider that administrative and not opportunity cost-based fees should apply. ALFs are in any event unnecessary to incentivise innovation because we bear a (commercial) opportunity cost of leaving unpaired 2100MHz unused if there is a realistic prospect of deriving value through innovation.

In relation to paired 2100 MHz spectrum, there are only two scenarios where Ofcom's assessment would be accurate, i.e., that ALFs set below full market value represent a subsidy:

- ALFs could play a role where spectrum is instead held by non-commercial entities if they are less responsive to the opportunity cost of under-utilised assets (e.g., spectrum held by government departments or non-profit organisations).
- ALFs could be effective in relation to non-tradeable spectrum licences in spectrum bands that are adjacent (and substitutable) to mobile bands. For example, spectrum currently in use in the aeronautical, maritime and broadcasting sectors. In these bands, spectrum fees based on the opportunity cost (of depriving mobile operators use) would encourage release to the higher valued use which Ofcom has explicitly identified as mobile. Setting fees for spectrum in lower value use to reflect opportunity cost in higher value mobile use ensures, as Ofcom suggests, that resources are not being diverted away from mobile to other sectors in subsidised (and substitutable) spectrum bands. It ensures that operators in these sectors do not over invest or use an inefficient mix of inputs (e.g., inefficient over-use of spectrum assets). In the case of potentially substitutable non-tradeable spectrum (e.g., broadcasting) ALFs set below full market value could, as Ofcom suggests, represent a subsidy to operators (e.g., broadcasters).

Since MNOs already face the forward-looking opportunity cost of spectrum (due to competitive commercial drivers) BT/EE considers that ALFs set below full market value do not represent a subsidy to mobile operators.

In relation to investment, we therefore disagree with Ofcom's assessment that 2100 MHz ALFs set below full market value represent a subsidy leading to inefficient over- investment. Specifically, Ofcom states:

> *"We recognise that setting ALFs at market value may in some cases disincentivise existing licence-holders from making investments which they would otherwise have made. However, we*

consider that outcome is likely to be efficient because the licence-holder will either pursue alternative, more efficient solutions (taking account of the true cost of all inputs) or will choose not to invest (thereby avoiding over-investment in spectrum-based solutions)."[40]

"Our provisional view is that ALFs for the paired and unpaired 2100 MHz spectrum which are based on market value will not necessarily lead to lower investment levels. On the contrary, ALFs set at market value could encourage MNOs to innovate and utilise existing assets such as the unpaired 2100 MHz spectrum that is currently unused. Furthermore, even if lower ALFs freed up internal funding for additional investment, which would not be available were ALFs set at market value, our provisional view is that this would not be a sufficient reason to set ALFs below market value and provide an unconditional subsidy for operators holding such spectrum."[41] *Para 5.27*

As explained earlier, since MNOs' spectrum assignments are efficient, and can be expected to remain so in the future given commercial and competitive pressures as well as the ability to trade, it is unlikely that setting fees below full market value (including a zero value) will lead to over investments or investments that are not efficient.

In relation to competition, we similarly disagree with Ofcom's assessment that ALFs set below full market value represent a subsidy nor that this would result in a distortion to competition between holders of ALF and non-ALF spectrum. Specifically, Ofcom states:

"We are mindful of the fact that the existing 2100 MHz spectrum licence holders (the MNOs) hold a variety of mobile spectrum; some of that spectrum will have been won in auctions and (where it is in its initial term) will not be subject to ALFs, whilst the remainder of that spectrum will be subject to ALFs. The MNOs relative holdings of ALF and non-ALF spectrum are different, and we consider that subsidising ALF spectrum (by setting it below market value) could risk distorting competition on the basis that it would be giving a different level of subsidy to different MNOs."[42]

As explained earlier, since spectrum assignments are currently efficient and can be expected to remain so in the future given the ability to trade, setting fees below full market value (including a zero value) will not lead to a distortion in competition between MNO holders of ALF and non-ALF spectrum.

In relation to consumer benefits, we also disagree with Ofcom that 2100 MHz ALFs set below full market value would maintain the price of 2100 MHz below its market value in order to artificially suppress consumer prices through a spectrum subsidy. Specifically, Ofcom states:

"In general, and consistent with our wider policy on spectrum fees, we consider that retail prices should reflect the input cost of spectrum, and this does not reflect a market failure, or markets failing to work in the interests of consumers. As such, we do not consider that it would be appropriate to maintain the price of the paired or unpaired 2100 MHz spectrum below its market value in order to artificially suppress consumer prices through a spectrum subsidy (discussed in previous decisions)."[43]

As explained earlier, since spectrum assignments are efficient and can be expected to remain so in the future given the ability to trade, setting fees below full market value (including a zero value) will not artificially suppress consumer prices through a spectrum subsidy. In summary it is therefore incorrect for Ofcom to argue that setting 2100 MHz ALFs below full market value is a subsidy as resources (e.g., capital) are not transferred away from higher valued use (or users) into mobile/mobile users.

[40] Ofcom consultation, para 5.26.
[41] Ofcom consultation, para 5.27.
[42] Ofcom consultation, para 5.29
[43] Ofcom consultation, para 5.21.

Ofcom's 2100 MHz ALFs are likely to be above full market value and may act as a barrier to trading, thereby reducing efficiency

Conceptually, ALFs which are set up to, but not exceeding, full market value will not promote efficiency which is one of Ofcom's key statutory duties. ALFs that exceed full market value are, however, likely to harm efficiency.

We have reviewed Ofcom's consultation proposals in detail, and we consider that the level of the 2100 MHz ALFs is likely to be set above full market value. We consider that ALFs are therefore likely to reduce economic efficiency as fees will exceed forward looking opportunity cost and will distort incentives for MNOs to hand back spectrum to Ofcom. Ofcom should revise its analysis to reflect BT/EE's response and, in doing so, take a more conservative approach when setting ALFs due to the asymmetric risk of setting fees too high (and where setting fees below ALFs has no downside).

Uncertainty about the level of ALFs and misalignment of these with market values is a key barrier to trades to further defragment the 3.4 - 3.8 GHz band. The material misalignment of current ALFs with the recent auction prices is obvious and the consequences of this for spectrum trading has been illustrated in a recent report by Enders Analysis[44] , who observe that:

> *"The Annual Licence Fees (ALFs) attached to H3G's spectrum are the crucial stumbling block in spectrum trading negotiations, creating a level of uncertainty which is not conducive to striking a sensible deal"*
>
> *"Ofcom has not signalled its intentions with regard to the process or timing of a review of H3G's ALFs and does not appear to be in any hurry to respond to the operators' queries on the issue. There is also a strong case for the ALFs payable on other spectrum bands—the 900MHz band is based on a price of £19m per MHz, higher than the £14m per MHz payable for the 700MHz in the most recent auction. There is also likely to be an impact on future ALFs on spectrum bands such as 800MHz which will come into force in the 2030s."*

In relation to 2100 MHz, we observe that 2100 MHz ALFs set above full market value may similarly act as a barrier to trading in secondary markets, especially where fees approach or exceed a potential buyers' private value and therefore ALFs set at estimated market value are at least as likely to harm as they are to assist the efficient reallocation of spectrum in the future. The damage caused by ALFs based on over-estimated market value is significant, whereas if ALFs are based on an under-estimate there is no downside risk.

New policy objectives and changes in technology and market conditions makes the efficiency case for ALFs significantly weaker

Ofcom's 2010 SRSP and the Government's 2010 Directions to Ofcom in relation to annual fees for 900/1800/2100 MHz spectrum licences are now long overdue for review and revision. New and competing policy objectives place greater policy focus on extended mobile coverage and spectrum access for new users.

Ofcom's approach in the SRSP never envisaged these new policy objectives and there are growing tensions between the historic objectives of the SRSP and Direction and more recent policy goals. For instance, new coverage obligations on spectrum licences – including in relation to ALF spectrum - require investment in areas where there are no commensurate revenues and where costs of extending the network may not always be reflect in the level of the ALF. In addition, MNOs continue to face full ALFs even where new users have access to their ALF spectrum.

Combined with changes in technology and market conditions (i.e., greater network / spectrum sharing, trading, auctions) new policy objectives make the efficiency case for ALFs significantly weaker. We consider that these factors at least mitigate if not remove the efficiency case for setting ALFs.

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[44] https://www.endersanalysis.com/reports/spectrum-trading-thwarted-5g-stumbling-blocks-endure (subscription required to access)

In summary, we have explained why ALFs will not promote the optimal use of spectrum (and hence why ALFs set below full market value do not represent a subsidy to mobile operators). We have also explained why ALFs set above full market value introduce potential distortions to efficiency in the form of barriers to trading. We have also identified new policy objectives and changes in technology and market conditions that makes the efficiency case for ALFs significantly weaker than when envisaged in the development of the 2010 SRSP and 2010 Direction.

3.5.3 Investment, competition and consumer benefits

We now consider the potentially harmful effect of ALFs set at full market value (including the risk that Ofcom's 2100 MHz proposals may overstate full market value) in relation to Ofcom's remaining statutory duties. We discuss the effects on investment, competition and consumer benefits below.

Investment

Ofcom argues that ALFs are required to promote the optimal use of spectrum by MNOs. However, ALFs will clearly be harmful in relation to delivery against other statutory duties including negatively impacting efficient levels of investment.

Conceptually any ALF set above zero (up to, at or exceeding full market value), will not promote investment as any ALF above zero reduces profitability - a key source of financing for investment. ALFs therefore cannot be expected to promote investment, one of Ofcom's key statutory duties. Firms, including BT/EE, have a strong preference for internally financing investment from free cash flow because it is the lowest cost form of financing. For this reason, anything that impacts free cash flow such as ALFs will limit the availability of low-cost financing to fund investment.

BT has recently announced an ambitious commercial aspiration for EE to offer high performance 5G solutions across the entire UK by 2028.[45] However, where profitability is impaired by Ofcom's 2100 MHz ALF proposals, some of these investment plans and the related 5G service improvements for UK mobile consumers may be put at risk.

Investment in new and more efficient mobile network technology, including 5G, is the primary means by which unit costs, and prices, are reduced over time. Investment is therefore critical not just to mobile markets but also to the wider economy due to multiplier effects on GDP and where it brings digitisation of the economy.

For these reasons BT/EE queries whether ALFs can be justified as proportionate where they negatively impact efficient levels of investment in mobile markets and could lead to lower productivity gains for the wider economy.

The following section sets out our further reasoning and evidence for why Ofcom's proposals risk harming efficient levels of future investment.

ALFs significantly reduce profitability

In 2015 Ofcom decided to triple ALFs for 900 MHz and 1800 MHz bands. Spectrum fees for these and the 3.4 / 3.6 GHz bands have a financial impact on the mobile sector of c.£250m per year. Ofcom's proposed ALFs for the 2100 MHz spectrum band will increase this impact by a further £75m per year. ALFs therefore represent a significant financial burden on the mobile sector that negatively impacts free cash flow and profitability. This, in turn, is likely to suppress investment including in 5G deployment which will lead to customer detriment.

The significant negative financial impact of ALFs can be considered by reference to individual operators and compared to each operator's mobile CAPEX. An estimate of the impact can be obtained by comparing EE's ALF liabilities expected in 2022 (around £103m, comprising £77m for

[45] https://newsroom.ee.co.uk/ee-to-offer-5g-solutions-across-the-entire-uk-as-bt-group-unveil-new-mobile-and-convergence-ambitions/

1800MHz and £26m for 2100 MHz) against EE's mobile CAPEX {✂}
Using this approach, ALF liabilities in 2022 would represent the equivalent of approximately {✂} of EE's mobile CAPEX. The inclusion of the 2100 MHz band increases the spectrum that falls within the scope of ALFs from 2022 by c. 50%, with consequent substantial further increase in ALFs as a proportion of mobile CAPEX.

This, in turn, reduces the cheapest form of financing available for mobile network investment

BT finances itself with a combination of debt and equity finance. Using reasonable amounts of debt in our capital structure allows us to minimise our weighted average cost of capital (WACC). We will only make investments that deliver a return in excess of our WACC (including any internal hurdle rates).

Standard finance theory shows that firms have a pecking order in terms of their choice of financing for investment. The lowest cost of financing is internal i.e., free cash flows, which tends to be lower cost than external financing.[46] For example, BT manages all investment from free cash flow within a tight capex envelope – across BT Group as a whole a circa {✂} pa capex envelope. This overall capex envelope will rise to {✂} pa over the next 5 years as we plan to accelerate our FTTP rollout to 25m premises by 2026.

In the recent spectrum auction we sought to acquire spectrum to generate a return to exceed the company's WACC and therefore generate positive returns for our investors. This illustrates that where we have the available free cash flow, it is most convenient to use internal funds for such investments.

We also note that empirical studies confirm that the level of free cash flow is a significant determinant of firm investment even for firms which have access to external capital markets.[47]

External funding is available but is more costly and has limits (e.g., to maintain reasonable credit rating)

Where ALFs reduce MNO profitability through reducing free cash flow it might be argued that NPV positive investments will still go ahead because projects can be funded externally. However, this ignores the limits to financing investments from external sources. There may also be an argument that if there is an NPV positive case (given the hurdle rate in capital markets at a particular risk profile) then someone else other than BT would make the investment. However, this ignores the fact that the investment is more valuable to an MNO on an incremental basis because it already has an existing business than to an entirely independent outside entity.

External funding through higher debt levels will inevitably drive risk, measured through credit rating, as debt holders have an enforceable right to part of a company's cashflows to pay their interest and maintain a claim over the company's assets.

{✂}

ALFs risk reducing the returns we make on investments and therefore reduce the attractiveness of investment opportunities, meaning we invest less

The negative consequences of ALFs for investment can be considered as follows:

[46] Free cash flows represent a blend of debt and equity

[47] Lewellen, J. and K. Lewellen, "Investment and cash flow: new evidence", Journal of Financial and Quantitative Analysis, Vol. 51, No. 4 August 2016, pp. 1135-1164. See also L. Vartia, "How do taxes affect investment and productivity", OECD Economics Department Working Papers, No. 656, 2008, para. 10).

- If ALFs result in MNOs seeking external financing to fund investment, higher external financing costs may turn marginally NPV positive projects into NPV negative projects. These projects risk being dropped.[48]
- These investments would be unlikely to be undertaken by others. Investment is more valuable to an MNO on an incremental basis because it already has an existing business than to an entirely independent outside entity. Hence the investment will not get made if (i) external funding within an MNO likely BT/EE is not available within the capex envelope; and (ii) incremental benefits are not available to firms outside the mobile industry hence funding from this source would not be available.
- Moreover, MNOs will often only undertake higher NPV projects that meet higher IRR hurdle rates:
    - In markets where a firm is capital constrained, e.g., in the case of BT because of our pension fund constraints, the firm must be selective about only going ahead with the higher NPV projects within its capital envelope. For example, if BT/EE sought to raise additional external finance (i.e., outside the internal capex envelope), {✂}.
    - MNOs may only take on higher IRR projects and forego marginally NPV positive projects if the expected NPV of the project taking account of future regulation may be considerably lower (marginal or below zero).
        - This is particularly relevant in the case of the mobile sector where expected profitability remains weak due to an outlook that assumes any upside (revenue)[49] will be regulated away without regard to downside impacting the sector (high risk vendor ban, COVID-19 pandemic). This suggests that some otherwise efficient (marginal) investments will already be forgone.
        - ALFs in their current form may compound the risk that future efficient investment is forgone. This risk arises where new policy objectives to support greater coverage carry a cost and where spectrum access for new users impacts the use of spectrum by the MNO and where these developments are not reflected in changes to the existing level of the ALFs (or sharing of payment of ALFs with new users).

The cumulative effects of mobile regulation on incentives to invest

The cumulative impact of ALFs set too high and other regulatory costs imposed (e.g., the high-risk vendor ban) are likely to mean that investment in connectivity overall is sub-optimal (i.e., under-investment). Ofcom (and Government) should consider how to ensure all interventions imposing costs on the mobile sector are considered holistically against the need to ensure investment in connectivity can deliver its potential productivity improvements to the UK in full.

For example, the direct financial impact of the high-risk vendor ban on BT/EE is estimated to be c.£500m in the period up to 2027.[50] This suggests an annual financial impact for BT/EE of c. £70-80m per year over 7 years. In addition, our ALFs liabilities are expected to increase by £26m in 2022 in

[48] If we could not fund investment out of free cash flow and needed to go to either the debt or equity markets to raise funds our overall WACC may increase leading to all future projects requiring higher hurdle rates if debt/equity mix changes.

[49] MNOs have faced sizeable revenue cuts over recent years including consumer regulation (e.g., applied to out of bundle services), EU roaming revenues, MTRs. MNOs now anticipate that where revenue opportunities exist or arise there is a risk of these revenues being regulated away in the future.

[50] BT's reaction to revised policy on Huawei in 5G networks.

relation to 2100 MHz ALFs bringing our total annual ALF liabilities to £103m per year (including our existing ALF liabilities of £77m in relation to 1800MHz). These two regulatory interventions represent a combined direct financial impact of on average c. £180m per year or {✂} of our mobile CAPEX {✂} over the next 5 years. We note there are many other regulatory interventions not mentioned above that have resulted in a significant direct financial impact on BT/EE's including consumer regulation, roaming regulation, and MTRs which are likely to push the cumulative effects of regulation even higher.

While it may appear that incrementally each regulatory intervention is justified on the basis of net benefits, the cumulative effect may be undermining long term benefits by making the regulatory environment one that is not conducive to investment.

Ofcom should also assess whether less regulation might leave more space for demand and competition to drive optimal investment and more commercial investments to be made (e.g., 5G deployed on more sites) avoiding the need for taxpayer funding of investments.

In summary, ALFs are a significant cost to the UK operators, reducing the earnings available to fund new investment. The retention of ALFs increases the risk that operators will have to choose to limit new investment at the margin and/or raise external (costlier) funding. ALFs risk reducing the returns we make on investments and therefore reducing the attractiveness of investment opportunities, meaning we invest less. This puts the UK at risk of falling further behind operators in Asia and North America in the rollout of 5G coverage.

Competition

As set out earlier BT/EE considers that 2100 MHz ALFs set at full market value will not promote competition. Nor will ALFs likely harm competition. For these reasons we consider that ALFs will have a neutral impact on competition but are unlikely to promote competition as per Ofcom's statutory duty.

In relation to ALFs set at full market value, Ofcom states the following

> *"Our view on spectrum fees and competition, as set out in the SRSP, is that fees are unlikely to introduce distortions to competition in downstream markets when they reflect the opportunity cost of spectrum."*[51]

BT/EE broadly agrees that ALFs set at full market value are unlikely to distort competition. As argued earlier this is because MNOs already face the opportunity cost in own use and of other users, and the ability to trade ensures that allocations will remain efficient over time. Setting explicit fees up to this level therefore has no impact on competition.

Consumer benefits

A key question for Ofcom in this review should be whether 2100 MHz ALFs generate tangible benefits for consumers. We consider that ALFs are not expected to generate any benefit and there is a risk that they could harm consumers. Specifically, we consider that:

- Prices are unlikely to increase if ALFs are set up to, or at, opportunity costs
- Prices are likely to increase if ALFs are set higher than opportunity cost

If 2100 MHz ALFs are set between zero and full market value (but not above), we would not expect this to lead directly to an increase in consumer prices since MNOs already factor in the opportunity cost of spectrum in own use and of other users in their forward-looking prices and will continue to do so going forward. However, our detailed assessment shows that Ofcom's proposals are likely to exceed full market value and carry the risk that these unanticipated costs will be passed through into higher consumer prices.

[51] Ofcom consultation, para 5.28.

In the section below we provide reasoning and evidence for why 2100 MHz ALFs could be expected to indirectly and negatively impact (efficient) consumer benefits.

First, as mentioned in the section on investment, BT has recently announced an ambitious commercial aspiration for EE to offer high performance 5G solutions across the entire UK by 2028. Ofcom's proposals may put at risk our ability to fully achieve all our planned network service improvements for consumers.

Second, spectrum fees can, as set out above, lead to higher consumer prices if set above full market value.

For instance, as set out in detail in our response, there is a real risk that the level of 2100 MHz ALFs set by Ofcom is significantly higher than the true underlying opportunity cost. While Ofcom argues that it has taken a conservative approach to reflect the asymmetric risk of setting ALFs too high, Ofcom relies on indirect evidence and a large number of assumptions. However, we have identified key areas where Ofcom has overstated full market value (see our analysis in earlier sections on benchmarking and annualisation). By setting fees above opportunity cost Ofcom risks operators increasing consumer prices to recover these additional and unanticipated costs. It also risks incentivising operators to hand back spectrum back to Ofcom especially where fees approach or exceed a potential buyers' private value which would be a highly inefficient outcome (as this would risk disruption or even cessation of mobile services to customers).

There is also international evidence that higher spectrum costs are causally linked to higher retail mobile prices. NERA (2017) provides statistical evidence that links high spectrum costs to lower network investments and higher consumer prices, suggesting that excessive prices for spectrum licences may have an adverse impact on consumers.[52]

3.5.4 Conclusion in relation to statutory duties

In summary, ALFs serve no useful purpose in relation to commercially held spectrum for mobile services. ALFs can be expected to reduce investment at the margin and risk slowing innovation and service improvements. We do not agree that setting ALFs to reflect an annualisation of Ofcom's estimate of full market value of 2100MHz spectrum is the most appropriate solution given Ofcom's statutory duties.

3.6 Further comments on Ofcom's proposals

Question 6: Do you have further comments that you wish to make in respect of the proposals that we make in this consultation?

See also section 4 of this response where we provide our views on how Ofcom should proceed in relation to the 2100MHz fees as well as review of ALFs for other mobile spectrum bands and the overall policy for ALFs.

Comments on the draft regulations

A minor editorial comment on the draft of the proposed regulations set out in Annex 10 of the consultation document: the usual nomenclature for kiloherz is "kHz" not "KHz".

We note that the regulations could be a barrier to spectrum trading on a geographic basis in that if a licensee were to trade its frequencies to another party for a specific geographic area and the resulting licences were both still categorised as Spectrum Access 2100 MHz licences but were not concurrent, then both parties would presumably under the wording of the regulations each be obliged to pay the full fee? We wonder whether it would be appropriate to specify that the regulations apply to Spectrum Access 2100 MHz licences authorising coverage throughout the whole

[52] https://www.nera.com/content/dam/nera/publications/2017/PUB_High_Spectrum_Costs_0517.pdf

United Kingdom, or to clarify in the Statement that partial (geographic) trades would not be in scope of this fee regulation but would be determined by Ofcom on a similar basis and apportioned appropriately?

4 Proposed next steps

We have addressed Ofcom's consultation proposals in relation to the 2100 MHz spectrum licences but consider it also important that Ofcom reviews its spectrum pricing framework that was set back in 2010 and reconsiders its position on setting mobile spectrum fees to reflect full market value. It is also important that Ofcom addresses the material misalignment that now exists between existing ALFs for 900 MHz, 1800 MHz and 3.4/3.6 GHz bands in light of the 700 MHz and 3.6 GHz auction results earlier this year. We therefore propose the following next steps.

Setting the 2100MHz licence fees

If Ofcom does proceed with its proposals to set 2100MHz fees at estimated full market value, then it should:

a) Adjust the fees for 2100MHz paired spectrum downwards in light of the arguments and evidence that we have provided in relation to the reduced UK lump sum values and annualisation rate:

- Our proposed UK LSV for 2100MHz paired spectrum of **£8.0m/MHz** combined with our proposed annualisation rate of **4.55%** results in an ALF of **0.364m/MHz**.
- Our proposal would be 36% lower than (or 64% of) the ALF of 0.567m/MHz proposed by Ofcom that assumed a UK LSV for 2100 MHz paired spectrum of £10.5m/MHz combined with an annualisation rate of 5.4%.

b) Determine the true opportunity cost of the unpaired 2100 MHz spectrum based on the next alternative use, which cannot be assumed to be high-power mobile networks. Ofcom should first consult on proposals to make the unpaired 2100 MHz licences technology neutral and determine workable technical conditions that would enable the spectrum to be used in future for high power mobile use in the form it envisages to be possible. Until this has been done and the true opportunity cost of the present use of the spectrum is confirmed, an administrative-cost based-fee approach is appropriate for the unpaired part of the 2100 MHz spectrum licences.

Reduction of existing mobile spectrum licence fees

The recent UK 700 MHz and 3.6 GHz auction prices were far lower than seen in previous UK auctions, including those that are over 8 years old and were used to set 900 MHz and 1800 MHz fees. The recent 3.6GHz auction values were also much lower than the 2018 3.4 GHz auction values that were used to set current 3.4 / 3.6 GHz licence fees. In view of the apparent material misalignment in existing spectrum fees with recent UK auction prices we believe Ofcom should revise existing 900 MHz, 1800 MHz and 3.4 / 3.6 GHz fees downwards.

The review of existing fees, which is clearly justified based on the lower value of spectrum observed in recent auctions, should also use the latest annualisation rate that Ofcom derives based on current values of the relevant parameters that determine this rate. This annualization rate calculation method should also reflect the modifications we have proposed in relation to its application to 2100MHz fees.

The review of existing fees should be initiated urgently and consulted on early in FY2022/23.

Review of spectrum pricing framework

In light of evidence available now, that was not available in 2010, of working market mechanisms for management of mobile spectrum, including:

(i) Spectrum trading in bands without ALFs;

(ii) Impediments to trading because of the excessive level of ALFs; and

(iii) A more even distribution of spectrum between MNOs following numerous auctions

We believe it is necessary that Ofcom:

(a) Revisits the 2010 strategic review of spectrum pricing (SRSP), to acknowledge that ALFs set at estimated full market value are not required in mobile spectrum bands that are tradable given evidence that market mechanisms secure optimal use of the spectrum.

(b) Discusses review of the 2010 Directions to Ofcom with Government.

We would welcome the opportunity to discuss these next steps with Ofcom in more detail if that would be helpful. We suggest this review should be done in FY 2022/23.

Appendix A BT Benchmark results

Award	Ofcom's initial values	Updated World Bank data	Corrected Slovenia award price	Y/X ratio capped at 1	Updated tiering for Germany and Slovenia	Inclusion of Netherlands as Tier 1	Disregarded 3.4GHz price
Slovenia (700MHz-2.3GHz)	15.48	15.48	15.26	14.09	14.09	14.09	14.09
Austria (700MHz-2.6GHz)	10.14	10.13	10.13	10.13	10.13	10.13	10.13
Germany (700MHz-2.6GHz)	14.14	14.14	14.14	14.09	14.09	14.09	14.09
Austria (700MHz-3.4GHz)	10.64	10.61	10.61	10.61	10.61	10.61	10.61
Germany (700MHz-3.4GHz)	14.19	14.19	14.19	14.09	14.09	14.09	14.09
Hungary (700MHz-3.4GHz)	9.91	9.91	9.91	9.91	9.91	9.91	9.91
Slovenia (700MHz-3.4GHz)	14.99	14.99	14.84	14.09	14.09	14.09	14.09
Austria (700MHz-3.6GHz)	8.60	8.55	8.55	8.55	8.55	8.55	8.55
Germany (700MHz-3.6GHz)	14.25	14.25	14.25	14.09	14.09	14.09	14.09
Hungary (700MHz-3.6GHz)	7.43	7.43	7.43	7.43	7.43	7.43	7.43
Slovenia (700MHz-3.6GHz)	15.52	15.52	15.29	14.09	14.09	14.09	14.09
Austria (800MHz-2.6GHz)	9.73	9.59	9.59	9.59	9.59	9.59	9.59
Germany (800MHz-2.6GHz)	13.52	13.52	13.52	13.52	13.52	13.52	13.52
Austria (800MHz-3.4GHz)	10.62	10.48	10.48	10.48	10.48	10.48	10.48
Germany (800MHz-3.4GHz)	11.01	11.01	11.01	11.01	11.01	11.01	11.01
Austria (800MHz-3.6GHz)	7.29	7.13	7.13	7.13	7.13	7.13	7.13
Germany (800MHz-3.6GHz)	7.72	7.72	7.72	7.72	7.72	7.72	7.72
Netherlands (700MHz-2.3GHz (p2100 MHz))	9.22	9.22	9.22	9.22	9.22	9.22	9.22
Netherlands (700MHz-2.3GHz (p700MHz))	8.52	8.52	8.52	8.52	8.52	8.52	8.52
Netherlands (700MHz-2.6GHz (p2100 MHz))	9.96	9.96	9.96	9.96	9.96	9.96	9.96
Netherlands (700MHz-2.6GHz (p700MHz))	9.22	9.21	9.21	9.21	9.21	9.21	9.21
Netherlands (700MHz-3.4GHz (p2100 MHz))	10.38	10.37	10.37	10.37	10.37	10.37	10.37
Netherlands (700MHz-3.6GHz (p2100 MHz))	8.18	8.17	8.17	8.17	8.17	8.17	8.17
Netherlands (700MHz-3.4GHz (p700MHz))	9.80	9.79	9.79	9.79	9.79	9.79	9.79
Netherlands (700MHz-3.6GHz (p700MHz))	7.25	7.24	7.24	7.24	7.24	7.24	7.24
Minimum	**7.29**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**	**7.13**
Average	**11.48**	**11.45**	**11.42**	**11.21**	**9.64**	**9.40**	**8.95**
Midpoint of minimum and average	**9.39**	**9.29**	**9.27**	**9.17**	**8.39**	**8.27**	**8.04**


BT