Three's response to Ofcom's Review of Annual License Fees.

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Executive Summary.

Three welcomes Ofcom's Review of Annual Licence Fees (ALFs). MNOs currently pay £320m per year for ALF spectrum (900MHz, 1800MHz and 2100 MHz) to His Majesty's Treasury. The mobile industry has long felt that the current level of fees is excessive, so Ofcom's proposal to review them is both appropriate and timely.

We reiterate that ALFs have no role to play in mobile and should be abolished, as we invited Ofcom to do in 2018. Professor Martin Cave (the original proponent of ALFs) has now withdrawn his support. Spectrum trading already ensures that spectrum will find its way to the highest-value users without the need for ALFs.

If ALFs continue to be levied, they should be set conservatively and should not need to be reviewed often. Back in 2018, Three flagged that fundamental trends in data traffic, an increased supply of spectrum, falling industry returns and technological developments were actively at work in reducing the value of ALF spectrum over time.

It is now clear that these were not transitory but rather long-run industry trends. A fee review is urgently needed because, as other operators have pointed out, Ofcom's approach to setting ALFs appears to overestimate the value of spectrum in an environment of falling spectrum prices:

- Benchmarking is inherently backward-looking. Current ALFs are still based on older high-price benchmarks from UK auctions of the previous decade – which overstate forward-looking market values today; and

- Ofcom has increased historical auction benchmarks and the resulting ALFs by inflation – on the assumption that the real value of ALF spectrum remains constant over time, despite clear evidence to the contrary.

Several anomalies now exist involving both absolute and relative fee levels. Three pays more for its 1800MHz spectrum than it did to acquire much more valuable 700MHz spectrum in 2021 (£17.8m vs £17.2m per MHz in Sep 2024 prices). Similarly, our Oct 2024 ALF bill for 1800MHz (£30.8m) was 52% higher than our Jan 2025 2100MHz bill (£20.3m), despite the bands being largely equivalent today.

We strongly support Ofcom's attempt to update fees to reflect current market values and broadly agree with the proposed methodology. In our view, a couple of areas need revisiting to avoid the need for further reviews in the future.

First, Ofcom's proposal aligns only the 900MHz value with the latest evidence from the UK 2021 auction (i.e. the 700MHz price). The proposed 1800MHz and 2100MHz values continue to rely on the older, higher price benchmarks from the UK 2.3GHz and 3.4GHz 2018 auction, in addition to the latest evidence. This overstates the relative value of 1800MHz and 2100MHz compared to 900MHz. The 2021 UK auction prices are better indicators of today's spectrum values and should be consistently preferred.

More importantly, Ofcom's assumption that the value of spectrum has remained constant in real terms since the 2018 and 2021 UK auctions appears problematic. As far as we can see, a fee review is needed because supply and demand conditions have changed since 2018 and 2021, when Ofcom set the ALFs. Spectrum values have reduced in real terms, and relative values have also changed.

Hence, the 2018 and 2021 UK auctions took place in different market conditions – which were reflected by Ofcom when it set ALFs at market value at the time – so that both the ALFs and the 2018 and 2021 auction values overstate spectrum values in real terms today. If market conditions and the real value of spectrum have stayed the same, the implication would be that Ofcom "messed up" by setting excessive fees above market value in 2018 and 2021 which it needs to correct now.

More generally, with long-run industry trends driving down spectrum values in real terms, Ofcom's application of CPI to the UK 2018 and 2021 auction benchmarks drives a growing wedge between spectrum values and ALFs over time. We invite Ofcom to drop the assumption that the real value of ALF spectrum remains constant over time. Market evidence shows clearly that this is not the case.

Absent evidence about the right level of discount to be applied to historic UK auction benchmarks, and of the actual trajectory followed by spectrum values in the UK since 2021, however, we agree with submissions by other MNOs that the best approach is to use nominal UK auction values (not adjusted by inflation) and to keep ALFs constant in nominal terms in this fee review. Otherwise fees would be overstated again, creating another gap between values and fees and triggering the need for further ALF revisions in the future.

In summary, we broadly agree with Ofcom's proposals but suggest several revisions in line with submissions by other operators:

- Aligning the 900MHz LSV with the latest market evidence by setting it equal to the UK 2021 700MHz price, as Ofcom

proposes – this recognizes that the bands are now closely substitutable.

- Aligning the 1800MHz and 2100MHz LSVs (not just the 900MHz) with the latest values from the UK 2021 auction – i.e. using the UK 2021 700MHz and 3.6GHz prices (not the UK 2018 values) as upper and lower bounds for the LSVs, to avoid overvaluing those bands relative to 900MHz.

- Assessing the 1800MHz and 2100MHz bands together and setting a common LSV for both – to reflect that these bands are now largely interchangeable.

- Using nominal auction values from the UK 2021 auction – not inflation-adjusted prices – and keeping ALFs constant in nominal terms to avoid new misalignments in the future, as other operators have requested.

- Using the annualisation rate estimated in 2021 for ALF purposes, as suggested by Vodafone – updating the rate to today's market conditions but leaving historic UK benchmarks unchanged inflates the annual value of spectrum. If the cost of debt had been at today's levels in 2018/21, the auctions would have finished at lower prices; and

- Revisiting this approach in due course – particularly if evidence suggests that spectrum values start trending up.

In our view, this approach is better aligned with the downward trajectory of spectrum values. ALFs would be set more conservatively (reducing without eliminating the risk of overstating fees) and constant fee revisions would not be required, consistent with Ofcom's current fee policies. Our proposed LSVs are as follows:

- **900MHz LSV**: £14m per MHz (i.e. the 2021 UK 700MHz price in nominal terms)

- **1800MHz and 2100MHz LSVs**: £9.1m per MHz, representing the average of eight recent Tier 1 benchmarks in Ofcom's sample (in nominal terms). These LSVs would sit half-way between the 700MHz/900MHz LSVs (£14m per MHz) and the 3.6GHz LSV (£4.2m per MHz).

Contents.

1. ALFs play no role in ensuring optimal use of tradable spectrum licences and can be detrimental.

ALFs should no longer be part of Ofcom's market-based approach to managing mobile spectrum

Ofcom's traditional approach to spectrum management has been to use market mechanisms where possible to secure the optimal use of spectrum. These include i) allocating spectrum through auctions; ii) trading and liberalization of frequencies; and iii) applying spectrum pricing (ALFs).

Ofcom embraced a market-based approach in its 2005 Spectrum Framework Review. This followed the 2002 recommendation by Professor Martin Cave in his Review of Radio Spectrum Management (the "Cave Report"), which proposed auctions, trading and spectrum pricing to manage scarce radio spectrum. The underlying philosophy was that firms know their preferences best and have a strong incentive to respond to market signals and put spectrum to the best social uses.

With few exceptions,[1] the use of spectrum auctions, trading and liberalization has never been seriously contested, at least in the UK. The same has not been true, however, of spectrum fees. In a joint 2024 report with Analysys Mason, Professor Cave has now withdrawn his support, concluding that ALFs are no longer required to promote efficient use of tradable mobile spectrum,[2] and recommending mobile licences with an indefinite term and no ALF attached in the future.[3]

ALFs has no useful role to play in respect of tradable mobile licences

The rationale for ALFs is to incentivise licensees to hold licences only if they are the highest-value users of the spectrum. An operator who is not willing to pay the current market price has an incentive to return it to Ofcom or sell it to a more efficient user (i.e. via spectrum trading), ensuring efficient use.

We recognise that ALFs can promote optimal use when licences are not tradable. It is well-established that, if a user does not face opportunity cost in the price it pays for spectrum, it will have less of an

[1] See Professors Temple and Webb, "Emperor Ofcom's new clothes. How the market approach to radio spectrum failed the country's mobile infrastructure and how to turn it around" (2024)
[2] Mechanisms for licensed mobile spectrum in the UK could be improved
[3] Analysys-Mason-FINAL-report-on-the-review-of-market-mechanisms-v10-3 (3).pdf

incentive to use spectrum efficiently and relinquish it to higher value users.

Ofcom has never satisfactorily explained, however, why ALFs are needed for ALF spectrum to find its way to the highest value users, given that those licences are tradable and can be freely exchanged since 2011. In its 2024 review of spectrum management, Ofcom has revisited this question, explaining why it continues to set ALFs on tradable mobile licences: [4]

- No liquid spectrum market has emerged for MNOs to observe the prevailing market price and make optimal decisions involving spectrum;

- MNOs may also have weak incentives to relinquish their spectrum or trade it to a competitor – due to i) a high option value of retaining or trading the spectrum in the future; or ii) strategic reasons, such as unwillingness to increase the capability of a direct competitor by relinquishing spectrum to them.

These reasons do not justify the imposition of ALFs on tradable mobile spectrum. Ofcom introduced a market-based approach precisely to allow spectrum users to decide on the best use without the need for intervention. Standard economics shows that, if the rights to use spectrum can be bought and sold, they will be acquired by those for whom they are most valuable (provided that transaction costs, such as those of finding a trading partner, agreeing terms and monitoring performance of the contract, are small enough not to prevent trades).[5]

In short, the potential for trading can be expected to lead to an efficient use of spectrum without the need for ALFs, regardless of which party has those rights at any moment. Even without ALFs, tradable spectrum will find its way to the highest-value users and will be used in the most valuable way:

- With only four MNOs in the UK market (soon to be three following Three's merger with VUK), it cannot be reasonably argued that transaction costs are high, that a liquid market is needed to allow price discovery or that Ofcom must remind

[4] Review of Ofcom's market-based approach to mobile spectrum management, para 2.9
[5] Coase, Ronald. The Problem of Social Cost. The Journal of Law and Economics (October 1960). If transaction costs are significant – which, with only four MNOs in the UK, is unlikely to be the case – trading will still occur provided the cost of the transaction is less than the increase in value which results from the trade.

MNOs of how much money they are missing out by continuing to hold on to their spectrum;

- ALFs cannot incentivise MNOs with a high strategic or option value to relinquish or trade their spectrum either – those values would also be present if ALFs are set at market value, so ALFs cannot correct this problem. To encourage trades the ALF would need to be set above the private value of the MNO holding the spectrum (including any option and/or strategic value), which will exceed the value to any potential buyer (since the spectrum is not being traded in the first place).

If an MNO chooses not to trade, it is either because it already is the highest value user for the spectrum (e.g. because the cost of deploying the spectrum across many sites is now sunk) or due to other reasons (e.g. a significant option value or strategic reasons not to trade with direct rivals) which ALFs cannot help resolve.

For the reasons set out above, Three reiterates that ALFs have no role to play in encouraging efficient use of tradable mobile spectrum and should be abolished.

If ALFs continue to be levied, they should be set conservatively and should not need to be reviewed often. Ofcom has long recognised that the risk of ALFs exceeding market value is more damaging than that of setting ALFs below market value. Accordingly, its long-standing policy has been to set ALFs conservatively – i.e. lower than its central estimate of the spectrum's value. We discuss in the next section the reasons why this has not been in fact the case.

2. Why a material misalignment has arisen between the current level of ALFs and spectrum values.

Ofcom is having to review ALFs now because its traditional approach to ALFs tends to overvalue spectrum in an environment of falling prices:

- **The value of mobile spectrum in the UK has significantly decreased over time** (in nominal and real terms) – reflecting large increases in the supply of mobile spectrum, slower growth in data demand, diminished profit expectations within the industry and increasing substitutability between bands, all of which have significantly reduced MNOs' demand for spectrum.

- **Ofcom's current approach to setting ALFs overvalues spectrum in this environment** – Ofcom continues to rely on higher price benchmarks from the previous decade to set ALFs, which tend to overstate forward-looking market values when prices are declining; and

- **Ofcom has also increased historical benchmarks and the resulting ALFs by CPI inflation** – on the assumption that the real value of spectrum remains constant over time despite clear evidence to the contrary.

We believe that Ofcom's current approach to setting ALFs, while broadly reasonable, needs revision to address these issues. At present, this approach does not appear consistent with Ofcom's policy of setting ALFs conservatively and not revising them in the first five years.

Mobile spectrum values in the UK have significantly declined over time (in nominal and real terms)

The consultation includes pricing evidence from the three auctions of mobile spectrum held in the UK since 2010: a) the 2013 award of 800MHz and 2.6GHz spectrum; b) the 2018 award of 2.3GHz and 3.4GHz spectrum; and c) the 2021 award of 700MHz and 3.6GHz spectrum.

Ofcom's evidence unambiguously shows that the value of mobile spectrum in the UK has significantly reduced (in both real and nominal terms) over time.

Table 1: Spectrum value in the UK has significantly reduced[6]

Group	Band	Date	Price per MHz (Sep 2024 prices)	Price per MHz (nominal)
Low band	800MHz	Mar 2013	£45.1m	£33.0m
	700MHz	Apr 2021	£17.2m	£14.0m
Mid band	2.1GHz	Apr 2000	n/a	£200.2m
	2.6GHz	Mar 2013	£7.5m	£5.5m
	2.3GHz	Apr 2018	£6.6m	£5.1m
5G band	3.4GHz	Apr 2018	£9.6m	£7.6m
	3.6GHz	Apr 2021	£5.2m	£4.2m

Source: Consultation, Table 4.5. 2.1GHz value from NAO report on 3G auction [7]

In Table 1 similar bands are grouped into three categories: i) a low band category including 700MHz and 800MHz; ii) a mid-band grouping with 2.1GHz, 2.3GHz and 2.6GHz; and iii) a separate 5G band category for 3.4-3.8GHz, the primary 5G band in Europe. The value of spectrum within each group has clearly reduced over time:

- In 2021, 700MHz spectrum sold for £17.2m per MHz (in Sep 2024 prices) compared with Ofcom's 800MHz estimate of £45.1m per MHz earlier in 2013 – i.e. about a third of the price per MHz achieved in 2013, even though the bands are now largely interchangeable;

- In 2018 and 2013, 2.6GHz and 2.3GHz sold for a tiny fraction of what the 2.1GHz achieved in the 2000 3G auction (£200m per MHz in 2000 vs £5.5m in 2013 and £5.1m in 2018 in nominal terms) – which is obviously related to diminished profit expectations within the industry in the intervening period;

- In 2021 the 5G auction price of 3.6GHz (£5.2m per MHz in Sep 2024 prices) was roughly half of what 3.4GHz sold for only three years earlier (£9.6m per MHz), despite those frequencies being equivalent and part of the same band.

[6] To complete the picture, we have added the nominal price achieved in the UK's 2000 3G auction.
[7] NAO report (HC 233 2001-2002): Auction of Radio Spectrum for the Third Generation of Mobile Telephones (Executive Summary)

Three discussed the key factors driving a reduction in UK mobile spectrum values extensively in its response to Ofcom's 2018 consultation on 900MHz and 1800MHz ALFs.[8] We noted the importance of trends in data traffic, the (unanticipated) increase in the supply of spectrum, falling industry revenues and technological developments in reducing the forward-looking value of ALF spectrum.

Ofcom considered that these factors did not provide clear evidence of a reduction in spectrum values, with two exceptions (greater certainty over future spectrum supply in the 3.6-3.8GHz band and technological developments) that resulted in minimal adjustments to its estimated values.[9]

It is now clear that this reduction in spectrum values does not reflect transitory factors but rather long-run industry trends actively at work in reducing the value of ALF spectrum. They include large increases in the supply of mobile spectrum over the last decade, slower growth in data demand in recent years, diminished profit expectations within the industry and the increasing substitutability between bands, all of which have significantly reduced MNOs' demand for spectrum, impacting both absolute and relative spectrum values.

We explain these market trends in turn, picking up the discussion where we left it in 2018.

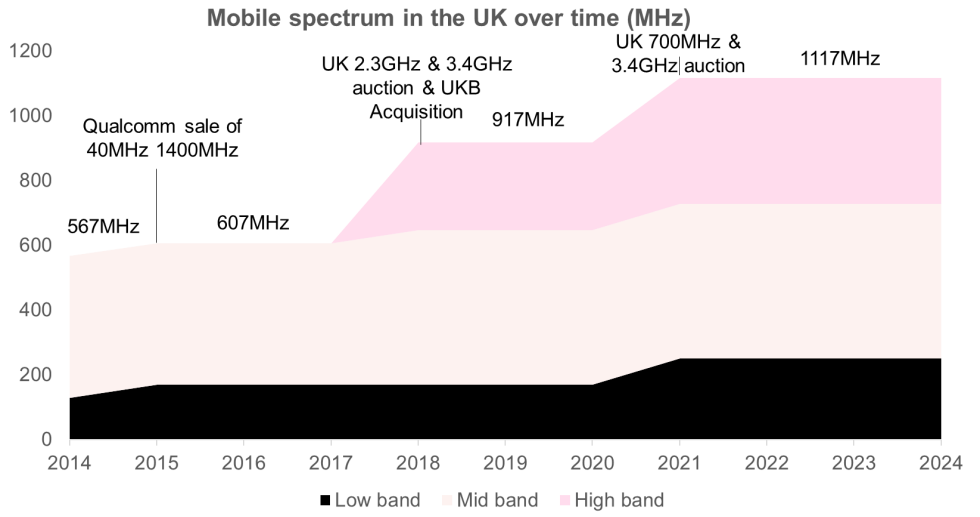
Large increases in the supply of mobile spectrum

Spectrum prices are determined by supply and demand. The downward evolution of mobile spectrum prices in the UK ultimately reflects a reduction in spectrum scarcity.

On the supply side, Ofcom has released vast quantities of mobile spectrum over the last decade. As shown in Figure 1, the supply of mobile spectrum has nearly doubled. MNOs had access to 567MHz after the 2013 4G auction. Today, MNOs can use 1,117MHz since the 2021 5G auction.

[8] Response to Ofcom's consultation: Annual Licence Fees for 900 MHz and 1800 MHz frequency bands
[9] statement-annual-licence-fees-900-mhz-and-1800-mhz.pdf, para. 4.64

Figure 1: The supply of mobile spectrum has nearly doubled since 2013



Source: Three

On the demand side, an MNO's demand price for additional frequencies decreases with the amount of spectrum it already has. The near doubling of the spectrum supply over the last decade has given MNOs access to much larger spectrum portfolios, significantly reducing their value for additional spectrum blocks. This has been an important driver of the continuous reduction in the market value of UK mobile spectrum depicted in Figure 1.

Slower growth in data demand

As Ofcom has noted, spectrum is an input in the provision of mobile services. An MNO's demand price for spectrum is directly related to the value of the end-product (i.e. mobile services) to the production of which it contributes. In turn, this reflects expectations about growth in demand for mobile, and about the profits the MNO expects to earn by servicing that growth.

One of the most important industry developments over the past decade is the explosive growth in mobile data traffic. Alarming growth rates triggered concerns within the industry about an impending "data crunch". Three was most concerned – in 2015, we carried nearly 40% of the industry's traffic on only 12% of the industry's spectrum.

More recently, however, the rate of growth in UK mobile data traffic appears to be slowing. Ofcom's yearly Connected Nations reports indicate that:

- Over the period 2013 to 2015, mobile data volumes in the UK grew by between 53% and 64% year-on-year;[10]

- Between 2016 and 2021, mobile data traffic grew at an average of 40% year-on-year. Consistent with this, Ofcom's medium growth scenario in its 2022 Mobile Strategy Review also assumed a sustained 40% annual increase to 2035;

- The rate of growth has slowed since 2022 – traffic volumes grew by 26.4% in 2022, 24.1% in 2023 and only 18% in 2024. Ofcom has highlighted that these growth rates align with the decline in global mobile traffic growth in recent years.[11]

This development is very recent and is entirely unexpected. As Ofcom highlighted in its auction statement at the time, the broad consensus around the time of the 2018 UK auction was that mobile data consumption would increase sharply over the coming decade – potentially by a factor of 10 to 100. Ofcom reported the market expectation that mobile traffic would continue to grow at a cumulative annual rate of more than 50%.[12]

Subsequently, expectations at the time of the 2021 award were similarly positive, with annual data growth of 37% expected, as Ofcom reported at the time of the auction.[13] In its Mobile Strategy Review of 2022, Ofcom reflected the industry view, explaining that mobile traffic continued to grow at an average of 40% year-on-year and adopted that as its medium growth scenario.

Mobile data volumes continue to increase but [✂]

[10] [ARCHIVED CONTENT] Infrastructure Report 2014 - Ofcom
[11] Connected Nations 2023 - UK report
[12] statement-award-of-the-2.3-and-3.4-ghz-spectrum-bands-competition-issues-and-auction-regulations (3).pdf, para. 1.5
[13] Statement: Award of the 700 MHz and 3.6-3.8 GHz spectrum bands, para. 4.24

Figure 2: Mobile traffic over Three's network (GB / month)

Source: Three

Falling industry expectations about mobile profitability and returns

As discussed above, an MNOs's demand price for spectrum is directly related to the value of the end-product (i.e. mobile services), which in turn reflects expectations about the profits the MNO expects to earn from it. The more valuable the end-product, the greater the MNO's demand price for spectrum.

It is now widely recognised that the mobile industry has disappointed profit expectations. The expectation that 3G first, then 4G and now 5G would generate large profit pools and new revenue streams for the industry never really materialised:

- In 2000, MNOs expected to own the mobile internet with 3G, including not only the provision of connectivity but also the apps, content and services that would be provided over their physical networks. Like other MNOs, Three launched in 2003 with that aim in mind, paying £4.4bn for its 2100MHz 3G licence back in 2000 ([✂]) and venturing into adjacent markets (content, etc) before retreating back to its traditional connectivity role;

- Today, MNOs have lost the battle against Big Tech and the 'over the top' US giants. An MNO's role is now limited to providing raw connectivity and mobile has become commoditised. The industry does not generate adequate

returns and capital stopped flowing years ago. If MNOs are unable to monetise their spectrum investments, their value for spectrum is correspondingly reduced.

The impact of reduced profit expectations on spectrum prices can be illustrated by simply comparing the results of the UK 2000 3G auction against those of the UK 2018 and 2021 5G awards in Table 1:

- The 2000 3G award raised £200m per MHz (in nominal terms) and a total of £22.5bn (45 times the reserve price) for 120MHz of 2100MHz 3G spectrum – the highest price ever achieved in any UK auction in both absolute and per MHz terms. It is widely acknowledged that this was the result of unrealistic profit expectations, positive sentiment towards mobile in global financial markets, a ready supply of capital to finance the new 3G networks and an all-time peak in the value of telecom shares, all of which inflated spectrum valuations beyond reasonable levels.[14]

- By contrast, at the time of the 2018 and 2021 auctions profit expectations had been deflated and sentiment was no longer positive. Investors were looking to get out, not to invest more money in mobile. MNOs have found it difficult to attract capital to fund their 5G rollouts. Although the auctions released the pioneer 5G band at 3.4-3.8GHz and prime low-band spectrum at 700MHz, they achieved much lower per MHz prices and raised much less (e.g. the 2021 award raised £1.36bn, only 1.25 times the reserve price, for the Exchequer).

Increasing substitutability between bands

Finally, an MNO's demand price for spectrum in any given band generally decreases with the availability of closely substitutable bands. Technological developments have vastly increased the substitutability of different bands, which effectively amounts to an increase in the supply of spectrum.

Traditionally, each technology was deployed on dedicated spectrum blocks. MNOs have had to repurpose ('re-farm') their existing spectrum to deliver a new technology. This requires clearing a block of spectrum of existing users, usually by incentivising them to migrate to the new technology so the blocks can be repurposed. This is a costly and complex exercise that can typically take years.

[14] NAO report (HC 233 2001-2002): Auction of Radio Spectrum for the Third Generation of Mobile Telephones

Today, Dynamic Spectrum Sharing (DSS) has made spectrum technology-agnostic. DSS allows MNOs to use existing 4G spectrum for 5G with a software upgrade, avoiding the need to buy new 5G spectrum. Spectrum is no longer technology-specific – i.e. there is no '4G' or '5G spectrum'.

With larger spectrum portfolios, the emergence and increased adoption over time of DSS, massive MIMO, beamforming and similar technologies, and a steady decline in the price of those technologies, MNOs now have access to many more closely substitutable bands than before.

Previously non-substitutable bands have become part of a common pool of largely interchangeable frequencies, impacting relative spectrum values and eroding the value premiums that previously attached to certain bands (e.g. 800MHz, 3.4GHz) due to the lack of effective substitutes. This can be seen by comparing Ofcom's value estimates in Table 1 above:

- As Ofcom has noted, the 2013 800MHz auction price was much higher than the 2021 700MHz price despite the bands having similar propagation characteristics. In 2013, 800MHz was the only available sub-1GHz band to deploy the new 4G technology.[15] In 2021, DSS allowed MNOs to use their existing 4G spectrum for 5G, avoiding the need to buy new spectrum. For instance, in 2021 Vodafone decided not to buy 700MHz at auction, refarming instead its 900MHz for 5G using DSS.[16]

- Similarly, the 3.4-3.8GHz price was significantly higher in 2018 than in 2021 despite the spectrum being essentially the same. Acquiring 3.4GHz at the 2018 auction was then an MNO's only route to launching 5G. When Ofcom subsequently awarded 3.6GHz in 2021, all MNOs had already launched 5G and had other options to expand their 5G service (e.g. re-farming 2100MHz to 5G via DSS). [✂].

- The emergence and increased adoption of massive MIMO and beamforming, and large reductions in the price of these technologies, have also made 3.4-3.8GHz a closer substitute for 1800MHz and 2100MHz. Initially, the higher frequency of 3.4-3.8GHz resulted in a much smaller coverage footprint but

[15] Consultation, para 4.9
[16] Preliminary Winners of Ofcom's UK 5G Mobile Auction Revealed - ISPreview UK

these technologies have allowed 3.4-3.8GHz to provide broadly similar coverage to 1800MHz and 2100MHz.

- MNOs have also a much better understanding today of the impact of massive MIMO on spectrum efficiency. In 2018, the technology was expensive, untested and the projected extent of deployment was uncertain. Since then, massive MIMO antennas have been widely adopted due to several factors, including equipment cost reductions ([✂]). These factors have made 3.4-3.8GHz a closer substitute for more traditional spectrum, reducing the value premium attached to 1800MHz and 2100MHz over time.

- Finally, 1800MHz and 2100MHz are now closely substitutable – they are both deployed using the same radio equipment. 2100MHz has slightly shorter propagation but this does not make a material difference in practice so that, in practice, both bands are equivalently used.

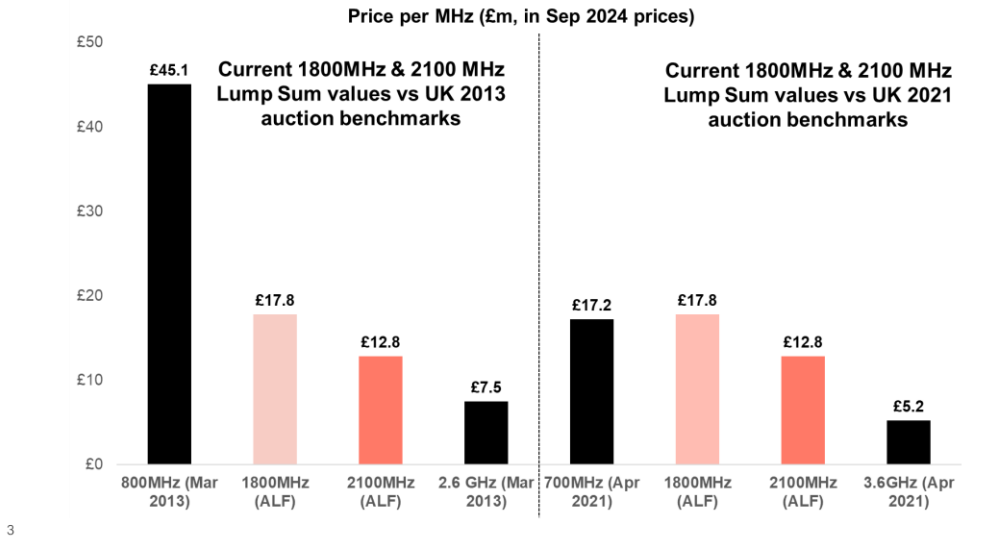
In summary, the combined impact of an enlarged spectrum supply, slower growth in data traffic, falling profit expectations and increased substitutability between bands have substantially reduced MNOs' value for additional spectrum, leading to a sustained decline in spectrum values over time and impacting relative values between bands too.

Ofcom's current approach to setting ALFs tends to overstate the value of spectrum

Ofcom needs to review ALFs now because a material misalignment between fees and market value has arisen over time. The main reason is that spectrum values have trended downwards (in real and nominal terms), unlike ALFs which have remained constant in real terms.

This has created many anomalies impacting both absolute and relative ALFs. The extent of the problem can be gauged by comparing the current 1800MHz and 2100MHz LSVs against two sets of polar values used by Ofcom as part of the distance method: i) the outdated 2013 800MHz and 2.6GHz auction prices (which set the upper and lower bounds for the current 1800MHz LSV); and ii) the most recent 2021 auction results for 700MHz and 3.6GHz spectrum.

Figure 2: a material misalignment has arisen between spectrum values and ALFs



Ofcom consultation, Tables 4.1 and 4.5

As seen in Figure 2:

- The current 1800MHz and 2100MHz LSVs appear broadly reasonable when compared against the outdated 2013 UK auction results to the left of the figure (except that 1800MHz is overpriced in comparison with 2100MHz). As expected, the 1800MHz and 2100MHz LSVs sit neatly between the 800MHz and 2.6GHz values and are closer to the latter than to the former;

- When the LSVs are assessed against the latest benchmarks from the UK 2021 auction to the right of the figure, however, both bands are seen to be overvalued, and relative values are clearly misaligned. The 1800MHz LSV (£17.8m per MHz) is higher than the 700MHz value (£17.2m), which contradicts the very assumption underlying Ofcom's distance method (i.e. that 1800MHz must be less valuable than 700MHz).

- In addition, the 1800MHz LSV is 39% higher than the 2100MHz LSVs despite the bands being largely equivalent. Both the 1800MHz and the 2100MHz LSVs now sit closer to the 700MHz than to the 3.6GHz value, despite the bands being closer substitutes for 3.6GHz than for 700MHz.

What has created the current misalignment? Two main features of Ofcom's current ALF approach appear to overvalue spectrum:

- **Reliance on older spectrum auctions** – in an environment of falling spectrum prices, historical benchmarks will overstate market value. The current level of ALFs is based on older, higher price auction benchmarks from the previous decade. The 900MHz and 1800MHz LSVs are both based on outdated estimates of the UK market value of 800MHz and 2.6GHz from the UK 2013 auction. The 2100MHz LSV also relies on older benchmarks from the UK 2013 and 2018 awards in addition to the latest evidence of market values from the UK 2021 award; and

- **Adjusting auction benchmarks and ALFs by CPI inflation** – when setting ALFs Ofcom increases historic UK and international value benchmarks by inflation (a 'backward-looking' approach to inflation), and then subsequently also the resulting ALFs (a 'forward-looking' approach to inflation), on the assumption that the real value of spectrum remains constant over time and despite clear evidence to the contrary.

In short, the market trend is one of declining – not constant – real spectrum values. In this environment, Ofcom's approach has created a growing gap between spectrum values and fees over time, triggering the need for an urgent review.

For these reasons, we believe that Ofcom's current approach to setting ALFs needs to be revised – it seems inconsistent with Ofcom's policy of setting ALFs conservatively and not revising them in the first five years.

The current approach to setting ALFs seems inconsistent with Ofcom's policy of setting ALFs conservatively and not revising them in the first five years

In our view, Ofcom's current approach to ALFs is inconsistent with its long-established policy to set ALFs conservatively, not to review ALFs within the first five years and then only to review fees if a material misalignment arises.

Ofcom's policy is to set ALFs conservatively to ensure efficient spectrum use

As explained in Section 2, ALFs are intended to replicate the price signal that MNOs would receive in a well-functioning market. Ascertaining the 'true' market value of spectrum is not an exact science given the paucity of UK auction benchmarks and the fact that international benchmarks can reflect country-specific factors.

In setting fees, Ofcom must balance the risk of spectrum inefficiency from setting ALFs above market value (resulting in licensees returning their licences despite being the highest value users), with that of setting fees below market value (in which case lower value users are still incentivised to keep the spectrum).

Ofcom has recognised in all previous ALF decisions that this risk is asymmetric, such that the welfare losses from inadvertently setting ALFs "too high" are typically greater than those from setting fees "too low". This is why Ofcom's policy is to set ALFs "conservatively" – i.e. below Ofcom's central estimate of the market value of the spectrum.

There is reason to believe, however, that the current approach is inconsistent with this policy, as shown by Ofcom's proposal to reduce all LSVs.

Ofcom's policy is not to review ALFs within the first five years of their introduction and then only if a material misalignment arises

Ofcom's approach to ALFs seems inconsistent with its current policy on fee reviews too. Ofcom adopted its spectrum pricing policy in its 2010 Strategic Review of Spectrum Pricing ("SRSP"), which amongst other things, considered how often it would review spectrum fees. "*Pricing Review Principle 1*" of the SRSP stated the following:[17]

- **A minimum term**: Ofcom would specify a minimum term within which it "*would not normally expect to carry out a further review*". Fees could be assumed to be stable within that period unless or until Ofcom consults on the justification for a review;

- **No material misalignment:** "*We will propose to conduct a fee review only where the evidence suggests that a review would be justified, including evidence of a likely and sufficiently material misalignment between the current rates and the opportunity cost of the spectrum for fees based on AIP"*.

[17] SRSP: The revised Framework for Spectrum Pricing Our policy and practice of setting AIP spectrum fees (Dec 2010)

In its 2014 consultation on the 900MHz and 1800MHz ALFs, Ofcom proposed a five-year period within which fee reviews would not be expected, as "*there would be a benefit in some period of certainty for licensees"*. Beyond that period, Ofcom would review ALFs "*only if there were grounds to believe that a material misalignment had arisen between the level of these fees and the value of the spectrum, in keeping with our general policy on fee reviews as set out in the Strategic Review of Spectrum Pricing*".[18]

Ofcom's 2018 Statement on the 900MHz and 1800MHz ALFs confirmed these principles, reiterating the need for *"some certainty over what fees will be over the longer-term"* and explicitly stating that *"revisions up or down to ALFs in response to individual market events would not be conducive to providing such predictability to licensees*".[19]

Consistent with this, Ofcom decided that it would be "*unlikely to review ALFs in the next five years save in very exceptional circumstances and would also propose to retain them beyond that date unless there were grounds to believe that a material misalignment had arisen between the level of these fees and the value of the spectrum, in keeping with our general policy on fee reviews".*

In reality, however, Ofcom's current approach to ALFs has created a misalignment between ALFs and market value, forcing Ofcom to review ALFs now. Unlike Ofcom's current proposals are revised in a couple of respects, frequent fee revisions may be required for the reasons described in the next section.

[18] Consultation
[19] statement-annual-licence-fees-900-mhz-and-1800-mhz.pdf

3. Ofcom's proposed approach to updating ALFs is likely to create a new misalignment in the future.

Section 2 discussed the two key factors that have triggered the need for an urgent fee review – namely, the fact that the current ALFs are based on outdated estimates of the UK market value from the previous decade, and Ofcom's practice of keeping auction benchmarks and ALFs constant in real terms in an environment of falling real spectrum prices.

We strongly support Ofcom's attempt to update fees to reflect current market values and broadly agree with the proposed methodology. We believe however that the two problems above remain largely unaddressed:

- Unlike the 900MHz LSV, which is aligned to the latest evidence from the UK 2021 auction (i.e. the 700MHz price), the proposed 1800MHz and 2100MHz LSVs continue to be based on older, higher price benchmarks from the UK 2.3GHz and 3.4GHz 2018 auction in addition to more recent evidence. This approach overstates the relative values of 1800MHz and 2100MHz in comparison to the 900MHz.

- Keeping the UK auction benchmarks and ALFs constant in real terms in an environment of falling spectrum prices would overvalue all ALF bands – a new and growing gap between values and fees can be expected to emerge again, triggering the need for further ALF revisions down the line.

In consequence, we invite Ofcom to adopt the following approach:

- Aligning all LSVs (not just the 900MHz) with the latest available benchmarks from the UK 2021 auction – i.e. using the UK 2021 700MHz and 3.6GHz prices (not the UK 2018 values) as the upper and lower bounds for the 1800MHz and 2100MHz LSVs, to avoid overvaluing those bands relative to 900MHz.

- Assessing the 1800MHz and 2100MHz bands together and setting a common LSV for both – recognizing that these bands are now largely interchangeable.

- Using nominal auction values from the UK 2021 auction – not inflation-adjusted prices – and keeping ALFs constant in nominal terms to avoid new misalignments in the future, as other operators have requested; and

- Revisiting this approach in due course – particularly if evidence suggests that spectrum values start trending up.

We disagree with Ofcom's view that this would constitute an arbitrary real terms adjustment unlikely to reflect market developments. On the contrary, this approach is less arbitrary and more aligned with the trend of falling spectrum prices in real terms. It has the added benefit of being more consistent with Ofcom's fee policies: ALFs would be set more conservatively (reducing without eliminating the risk of overstating fees) and constant fee revisions would not be required.

Ofcom's proposed approach overstates the relative values of 1800MHz and 2100MHz compared to the 900MHz value

To produce LSVs for ALF spectrum, Ofcom proposes the following approach:

- Using the 2013, 2018 and 2021 UK auctions of mobile spectrum as relevant evidence (not the 2000 3G award) – but placing more weight on the 2018 and 2021 auction results;

- Placing more weight on international benchmarks where all the UK and international auctions are from 2015 onwards;

- Considering all post-2015 evidence in the round – e.g. placing equal weight on the UK 2018 3.4GHz and 2021 3.6GHz auctions even though they resulted in very different prices paid for equivalent spectrum.

We agree with Ofcom that determining a forward-looking estimate of market value is not an exact science but, in its practical application, the above approach does not produce sufficiently robust results in a couple of areas.

The first problem concerns the weight given to the 2018 2.3GHz and 3.4GHz auction prices and whether those benchmarks – which are now 7 years old – continue to provide good indications of market value today in an environment of falling prices.

As Ofcom notes, in the 2021 UK award 3.6GHz sold for roughly half (£5.2m per MHz in Sep 2024 prices) of what 3.4GHz sold for in 2018 (£9.6m per MHz in Sep 2024 prices), despite being essentially the same spectrum. That strongly indicates that the 2021 3.6GHz price provides the most up-to-date evidence of the forward-looking value of that spectrum.

The reason for this divergence in prices is the same Ofcom has given to explain why the 700MHz value was also much lower in 2021 than that of 800MHz in 2013 despite similar propagation.[20]

- In 2013 800MHz was the only available sub-1GHz band to deploy the new 4G technology. In 2021, MNOs had many other options and did not need 700MHz to deploy 5G.

- Likewise, as explained in Section 3, acquiring 3.4GHz in 2018 was an MNO's only route to launching new 5G services. When Ofcom subsequently awarded 3.6GHz in 2021, all MNOs were already providing 5G and had other options to expand their 5G service (e.g. re-farming 2100MHz to 5G via DSS).

Therefore, the 2021 3.6GHz price is a better indicator of today's market value for 3.4-3.8GHz than the 2018 3.4GHz price.

More generally, recent UK auctions are better indicators of today's values and should be preferred, particularly in an environment of falling spectrum prices. The older 2018 UK 2.3GHz and 3.4GHz benchmarks should play no role in the derivation of LSVs. At the moment, these prices play an important role in Ofcom's derivation of the 1800MHz and 2100MHz LSVs but not in the 900MHz LSV.

Specifically, in Ofcom's proposal, the 900MHz value is fully aligned with the latest available evidence of market value. 900MHz is assumed to have the same value as the 2021 UK value of 700MHz (£17.2m per MHz in Sep 2024 prices), so the 900MHz price is pegged to the 2021 700MHz value. International benchmarks are only used to confirm that 700MHz and 900MHz have similar values.

By contrast, the 1800MHz and 2100MHz LSVs continue to be anchored to the older, higher price benchmarks from the UK 2018 auction (in addition to the latest evidence). Ofcom's distance method uses UK auction values for sub 1GHz spectrum and high frequency spectrum as the starting point for the bounds within which the 1800MHz or 2100MHz LSVs should lie, with international benchmarks informing where exactly the LSVs should sit within those ranges.

Following this method, Ofcom's preferred post-2015 Tier 1 international benchmarks on which the LSVs are based use the 2021

[20] Consultation, para 4.9

UK 700MHz value as the upper bound. For the lower bound, however, values from the older, higher price UK 2018 auction are also used:

- The two older, higher prices from the UK 2018 2.3GHz and 3.4GHz auction (£9.6m and £6.6m per MHz respectively) contribute over half (12 out of 22) of Ofcom's post-2015 Tier 1 1800MHz and 2100MHz benchmarks;

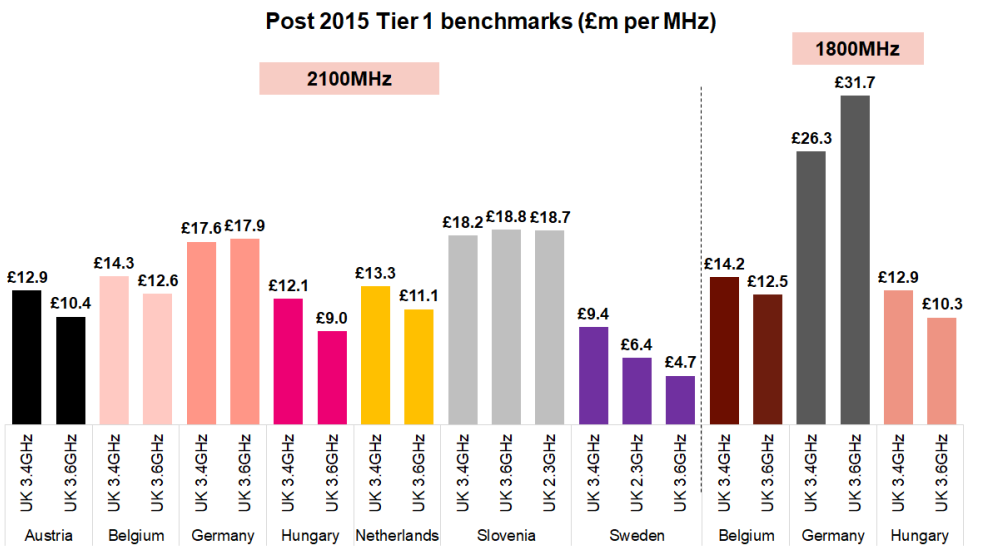
- The newer, lower price UK 2021 3.6GHz value (£5.2m per MHz) contributes the remaining benchmarks (10 out of 22).

For any given set of international values and upper bound of the distance method (the 2021 UK 700MHz value of £17.2m per MHz), the higher the UK auction value used as the lower bound, the higher the resulting benchmark. Using the two older UK 2018 2.3GHz and 3.4GHz prices as lower bounds raises the resulting Tier 1 benchmarks, as they set a higher floor for the benchmarks.[21]

As shown in Figure 3, the 1800MHz and 2100MHz benchmarks are systematically higher when the older UK 2018 3.4GHz (and 2.3GHz) prices are used as lower bounds than when the newer UK 2021 3.6GHz price is used instead.[22] The only exception is in the rare cases where 1800MHz and/or 2100MHz sold for more than 700MHz in the benchmark country (e.g. Germany and Slovenia).

Figure 3: using the UK 2018 3.4GHz & 2.3GHz values instead of the 2021 3.6GHz ones systematically produces higher 1800MHz and 2100MHz benchmarks

[21] Except in the rare cases where 1800MHz or 2100MHz sold for less than 2.3GHz, 3.4GHz or 3.6GHz in the benchmark country.
[22] The upper bound is fixed by the UK 2021 700MHz price (£17.2m per MHz), and the value relativities in benchmark countries are also given, so the only variable is the lower UK bound of the distance method. The higher it is, the higher the resulting UK benchmark. The only exception is in the few cases when 1800MHz or 2100MHz sold for the same (or more) than 700MHz in the benchmark country. In that case use of the 3.6GHz UK value produces the same or higher benchmarks than using the 3.4GHz or 2.3GHz ones.



Source: Consultation, Figures 4.2 and 4.4

For instance, when Austria is used as comparator country, the same Austrian auction data generates two benchmarks for the value of 2100MHz in the UK: £12.9m per MHz based on the older UK 2018 3.4GHz value, and £10.4m per MHz based on the newer UK 2021 3.6GHz price.

In summary, the 2018 UK auction values should be discarded for the purposes of the current ALF review. They no longer reflect current market values. Using these older values for the 1800MHz and 2100MHz LSVs but not for the 900MHz LSV overstates the value of the former bands relative to latter. Ofcom should fully align all LSVs (not just the 900MHz) with the latest available evidence from the UK 2021 auction.

Ofcom should use nominal values from the UK 2021 auction and keep ALFs constant in nominal terms for the foreseeable future

The next question concerns whether the 2021 UK 700MHz and 3.6GHz prices to be used in the derivation of the LSVs are true reflections of market value in 2025, given that those benchmarks are now 4 years old, and the market trend is one of falling spectrum prices over time.

Consistent with previous practice, Ofcom proposes to increase historic UK auction values ('backward-looking' approach), and then subsequently also the resulting ALFs ('forward-looking' approach) by

inflation, on the assumption that the real value of spectrum remains constant over time.

The question is: if the value of spectrum has remained constant in real terms since the 2018 and 2021 UK auctions, why is Ofcom proposing to reduce all LSVs now?

As we understand it, a fee review is needed because supply and demand conditions have changed since 2018 and 2021, when Ofcom set the ALFs. The long-run industry trends discussed in Section 2 have impacted absolute and relative spectrum values in real terms. Hence, the 2018 and 2021 UK auctions took place in different market conditions – which Ofcom reflected when it set ALFs at market value at the time – so that both the ALFs then set and the auction values from 2018 and 2021 overstate spectrum values in real terms today.

For instance, Ofcom's market value estimates when setting the 2100MHz ALF in 2021 – which acted as anchors for the market value of 2100MHz – reflected supply and demand conditions prevailing at the time of the 2021 UK auction. Ofcom explicitly considered those auction results together with other values when it set the 2100MHz ALF (see Table 2). If Ofcom is proposing to change these estimates now, it must be the case that market conditions have changed.

Table 2: Ofcom's 2021 estimates of market value[23]

	Band	Auction date	Price per MHz (Apr 2021 prices)
Low band	700MHz	March 2021	£14.1m
	800MHz	March 2013	£37.0m
	900MHz (ALF)	n/a	£19.8m
Mid band	1800MHz (ALF)	n/a	£14.6m
	2100MHz (ALF)	n/a	£10.5m
	2.3GHz	April 2018	£5.4m
	2.6GHz	March 2013	£6.2m
5G band	3.4GHz	April 2018	£7.9m
	3.6GHz	March 2021	£4.2m

Source: 2100MHz ALF Statement, table 4.1 and para 4.9

[23] Statement: Annual licence fees for 2100 MHz spectrum

Ofcom's response – that it has already considered developments driving down spectrum values since 2018/2021 in its interpretation of the benchmarks, and that MNOs anticipated today's market conditions and reflected them in their UK 2018 and 2021 bids – does not seem to answer the point.

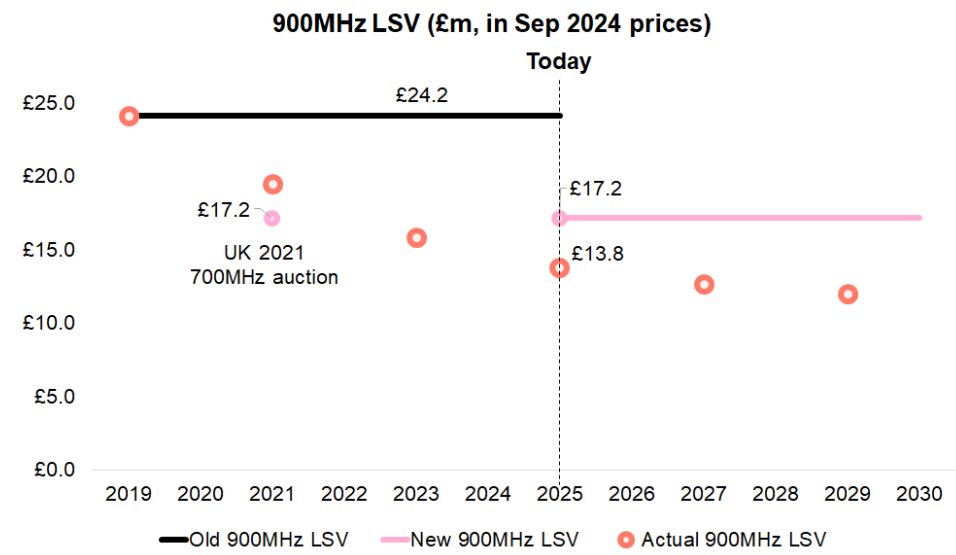
If supply and demand conditions have remained the same since 2018 and 2021, what has triggered the current misalignment between spectrum values and fees? The logical answer would then be that Ofcom "messed up" by setting excessive fees above market value in 2018 and 2021, which need to be corrected now. We don't think this is Ofcom's view.

The inescapable conclusion seems to be that the values revealed by the UK 2018 and 2021 auctions – to which both the 900MHz, 1800MHz and 2100MHz LSVs are anchored in Ofcom's proposal – overstate spectrum values (in real terms) today.

Moreover, Ofcom's application of CPI to the UK 2018 and 2021 auction benchmarks fails to account for the fact that benchmarking is inherently backward-looking. Long-run industry trends are driving down spectrum values (see Section 2), so this practice has driven a growing wedge between spectrum values and ALFs over time.

To illustrate the extent of the problem, consider the potential error in the 900MHz LSV (currently £24.2m per MHz in Sep 2024 prices) in Figure 4. Ofcom proposes to peg the 900MHz directly to the UK 2021 700MHz auction from 2025 but, rather than using the nominal 700MHz value (£14m per MHz), Ofcom applies CPI so the price is 23% higher (£17.2m in Sep 2024 prices).

Figure 4: Ofcom's approach creates a growing gap between spectrum values and fees over time



Source: Three

Suppose that the UK 900MHz value has decreased in real terms over time as shown by the dots in Figure 4, and that the 900MHz and 700MHz values converged (to £17.2m per MHz) by 2022, a year after the 2021 auction.

Unless MNOs are omniscient and fully anticipated the factors driving the long-term reduction in the value of sub 1GHz spectrum (which as discussed above cannot have been the case), Ofcom's proposal to keep LSVs constant in real terms would create two problems:

- The £17.2m value from the 2021 UK auction would already be out of date – the value of sub 1GHz in 2025 is now lower (say, £13.8m pe MHz), so the proposed new £17.2m value for 900MHz would already be an overestimate;

- Ofcom's assumption that the real value of 900MHz spectrum is likely to remain constant from 2025 would then create a new and growing wedge between ALFs and market value over time, triggering the need for further ALF revisions down the line.

To recap, spectrum prices are falling in real terms so using benchmarks from years ago will overstate spectrum values. We invite Ofcom to recognize that the values revealed by the UK 2018 and 2021 auctions overstate spectrum values (in real terms) today, and to drop the assumption that the real value of ALF spectrum remains constant over time – market evidence shows clearly that this is not the case.

Absent hard evidence about the right level of discount to be applied to the 2021 UK auction prices, and of the actual trajectory followed by spectrum values in the UK since 2021, however, we agree with submissions by other MNOs that the best approach is to use nominal UK auction values with no adjustment for inflation. This would at least reduce (without eliminating) the risk of overstating fees again, consistent with Ofcom's policy of setting ALFs conservatively.

Three's proposed LSVs

In terms of the actual LSVs, we agree with Ofcom's proposal to align the 900MHz LSV with the latest market evidence by setting it equal to the UK 2021 700MHz price. This recognizes that both bands are now closely substitutable. For the reasons explained above, we believe that this should be expressed in nominal terms (£14m per MHz).

Consistent with that approach, we propose to also align the 1800MHz and 2100MHz LSVs to the latest market evidence, recognizing their close substitutability as follows:

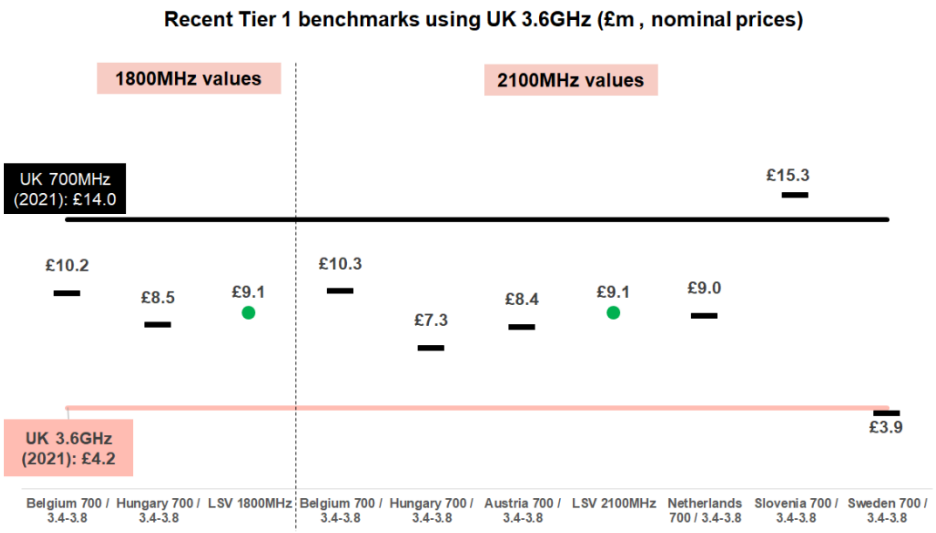
- Using the 2021 UK 700MHz and 3.6GHz nominal prices (£14m and £4.2m per MHz) exclusively as upper and lower bounds for the 1800MHz and 2100MHz LSVs, with the most recent international benchmarks (i.e. Tier 1 benchmarks since 2018) informing where those LSVs should sit between the bounds;

- Setting a common LSV for both 1800MHz and 2100MHz – considering the bands together (rather than individually, as Ofcom proposes) given their substitutability and the fact that these bands are also likely to have similar values (despite small differences in propagation).

Figure 4 summarises this approach. The 1800MHz Tier 1 benchmarks and our proposed 1800MHz LSV (in green) are to the left of the vertical dotted line, the equivalent 2100MHz values are to the right. Only Tier 1 benchmarks since 2018 are used to reflect the latest evidence.[24]

[24] This excludes only the German 2015 values from Ofcom's Tier 1 benchmarks using UK 3.6GHz. As Ofcom notes, the German 1800MHz and 2011MHz spectrum sold for more than 700MHz due to the timing of the auction (2015). when the future value of 700MHz as a 5G band may have been less clear to operators.

Figure 4: Three's proposed derivation of the 1800MHz and 2100MHz LSVs



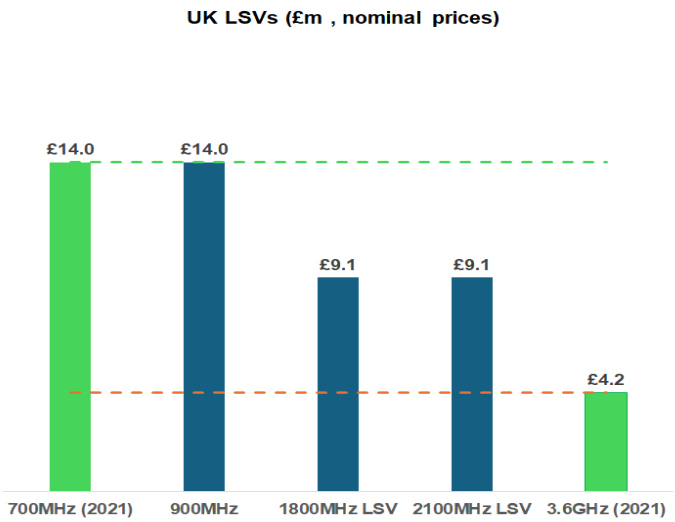
Source: Three

The 2021 UK 700MHz and 3.6GHz prices (£14m and £4.2m per MHz) act as common upper and lower bounds for both the 1800MHz and 2100MHz LSVs.

Considering 1800MHz and 2100MHz together and using only the UK 2021 auction prices as bounds in the distance method results in a very coherent set of Tier 1 estimates, with all values but two lying inside the bounds and sitting within a relatively narrow range: £7.3m to £10.3m per MHz (in nominal prices). This confirms that, when the latest evidence is consistently used and the bands are assessed together, 1800MHz and 2100MHz are closely substitutable and should be equally valued.

Based on this assessment, we propose a common LSV for both 1800MHz and 2100MHz equal to £9.1m per MHz, representing the average of the eight Tier 1 benchmarks in the above sample. As shown in Figure 5, the 1800MHz and 2100MHz LSVs would then sit exactly half-way between the 700MHz/900MHz LSVs (£14m per MHz) and the 3.6GHz LSV (£4.2m per MHz).

Figure 5: Three's proposed LSVs (£m, nominal prices)



Source: Three

4. Ofcom should not update the annualisation rate used to convert LSVs into an annual fee.

Ofcom proposes to use the same approach to annualisation as in recent years. Essentially, Ofcom estimates ALFs as an annuity over 20 years, the present value of which is equivalent to the LSV. The annualisation rate is a function of the real discount rate and a tax adjustment factor, with the former sitting somewhere between the cost of debt and the weighted average cost of capital (i.e. WACC).

Ofcom has rejected Vodafone's suggestion of maintaining the annualisation rate used to set the 2100MHz ALF in 2021, on the basis that the rate does not reflect market conditions today. Ofcom proposes to increase the rate from 5.34% in 2021 to 6.38% now leading to higher fees (all else the same).

The key driver for this change is the increase in the cost of debt in recent years, which has led (unexpectedly) to the ALF for 2100MHz increasing rather than decreasing (even though the 2100MHz LSV itself has decreased).

The main problem is that Ofcom updates the annualisation rates to reflect market conditions today, but not the UK 2018 and 2021 auction prices used to determine the LSV to which the annualisation rate is applied. The prices remain based on the market conditions that existed at the time, so there is an inconsistency that overstates the (annual) value of the spectrum.

The cost of debt was materially lower at the time of the 2018 and 2021 auctions. If it had been at today's levels, the two auctions would have finished at lower prices. MNO's WACCs would have been higher, leading to lower spectrum valuations and the auctions clearing at lower prices.

In other words, if the annualisation rate is updated to reflect current market conditions—such as rising interest rates or increased borrowing costs—the implied NPV of past auction prices decreases. The higher costs of capital reduce the discounted value of future cash flows, thereby lowering the value of spectrum in earlier auctions.

For example, consider the 2018 auction prices for 3.4GHz. At the time, annualisation rates reflected lower interest rates and borrowing costs, which were factored into MNOs' bids. If these same 2018 prices are now used as benchmarks for the 1800MHz and 2100MHz LSVs while applying today's higher annualisation rates—driven by increased debt

costs and inflation—then the resulting ALFs will overstate the true economic value of the spectrum.

In principle, two potential approaches may solve this problem:

- Use the previous annualisation rate and leave auction benchmarks the same, as suggested by Vodafone – this maintains consistency by aligning cost of capital assumptions with the economic conditions under which auction bids were made. It ensures that ALFs accurately reflect the financial context of past transactions without inflating the fees;

- Apply the proposed annualisation rate with adjusted historic auction prices: if the new rate is used to reflect current conditions in the financial market, Ofcom should also revise historic auction prices down to account for the higher cost of capital.

In practice, the former approach is much simpler as Ofcom has already estimated the 2021 annualisation rate and requires no adjustment to historic auction benchmarks, so it is our recommended approach.