Vodafone Response to Ofcom's Consultation:

Annual Licence Fees for 900 MHz and 1800 MHz frequency bands

0. Executive Summary

Vodafone welcomes the opportunity to comment on Ofcom's most recent consultation regarding the level of Annual Licence Fees (ALFs) for mobile spectrum. That Ofcom has issued another consultation on ALFs for the 900MHz and 1800MHz frequency bands reflects the complexity of this matter. Ofcom needs to take account of its own duties, its Strategic Review of Spectrum Pricing policy statement (SRSP), the Direction from the Secretary of State and of course now the Court of Appeal judgment on this matter. In addition, there is a bigger public policy picture: allocating spectrum to the market is but the first step in building and investing in world class mobile communications networks to provide services to consumers and it is that, rather than the allocation of spectrum, which must be recognised as the end game. It is Vodafone's view that although ALFs might ultimately reflect market value (insofar as they are compatible with Ofcom's statutory and EU law duties), those fees are in effect an overhead tax on mobile services. As such there must be questions of whether the proceeds should contribute to improving the consumer experience, for example by improving coverage.

Ofcom has erred in its approach to setting ALFs, as described in this response. Given that it is impossible to accurately determine the current market value, there is a wide range of values which could be plausibly used as an estimate of the underlying market value. Rather than taking into account its statutory duties and carrying out a proper regulatory impact assessment in line with the requirements of the Court of Appeal judgment and the SRSP to determine the ALFs which best achieve those duties, Ofcom has simply bolted on an additional step which asks if the 2015 analytical approach (which was based on a misunderstanding of the 2010 Direction) can stand without adjustment. This is incorrect, as a proper reading of Ofcom's duties and the SRSP requires Ofcom to apply its statutory duties at each step in the process of creating the ALF, instead of determining an answer and then checking if it is broadly acceptable or 'not too harmful'.

This response identifies a number of areas where, even accepting Ofcom's overall approach, there are errors in the execution. Ofcom asks itself the wrong question when applying its duties (e.g. asking whether its approach would have an 'adverse impact' on competition, not asking which approach would *best* achieve them) and Ofcom departs from the SRSP without explanation. Ofcom's impact assessment is plainly inadequate. For example, Ofcom implicitly assumes that market values in the UK have increased in line with CPI inflation: there is no discussion of whether technological and market developments mean this is the case. In another clear example, in converting estimates of lump sum market value to ALFs, Ofcom has chosen an off-the-shelf WACC estimate from another regulatory decision. This WACC estimate has not only been determined for a very different purpose to this application, but is in outright conflict with the estimated cost of debt value which is used in the ALF calculation.

These examples show that Ofcom must re-examine all the individual decisions, both explicit and implicit, that feed into the overall ALF determination and consult again before issuing regulations on such a high value matter.

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1. Introduction

Vodafone welcomes the opportunity to comment on Ofcom's July 2018 "Annual Licence Fees for 900MHz and 1800MHz frequency bands" consultation.

Ofcom recognises that mobile communications play a vital part in the UK's economic and social welfare. The success of the mobile industry in delivering good outcomes for consumers is critically dependent on good availability of spectrum, fair competition between network operators and the financial viability of operators so that they can continue to invest.

Vodafone agrees that in principle Annual Licence Fees (ALFs) for spectrum should be set to reflect market value (insofar as they are compatible with Ofcom's statutory and EU law duties), to ensure both efficient allocation of spectrum and competitive neutrality between network operators. Nonetheless, efficient spectrum allocation is but the first step in delivering world class mobile infrastructure and services and the effects of the allocation mechanism must be understood in that context. The ALFs proposed amount to an outflow from mobile services to Government of some £210M/yr. As Ofcom's analysis points to it being economically rational that this cost be passed onto consumers, it follows that this could be depicted as a "mobile communications tax". At a time when a key Government objective is improved mobile coverage, there is a strong case for at least some of this mobile communications tax to be ring-fenced to support that initiative.

Vodafone also agrees that, given asymmetry of risks and the uncertainty in deriving the market value from the evidence available to Ofcom, ALFs should be set conservatively to minimise the risk of inefficient outcomes or reduced future investment.

Notwithstanding the wider questions of public policy, the process that Ofcom has proposed to determine the appropriate value of ALF is flawed, when considered in light of its statutory duties. Rather than determining the most appropriate level of ALF from the range of possible market values taking account of its wider duties, Ofcom simply proposes to estimate the market value of ALF spectrum using the methodology set out in 2015 (which was found by the Court of Appeal to be based on a misunderstanding of the Direction) and then add a simple binary test as to whether the estimate based on the flawed 2015 methodology can stand unadjusted, as set out in Figure 3.1 of the consultation.

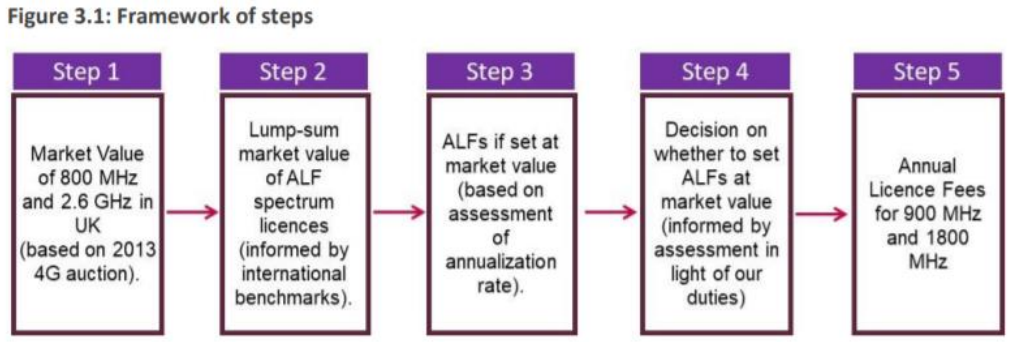

Figure 1. Ofcom's proposed approach to setting ALF

The remainder of this document comments on the flaws in Ofcom's valuation methodology and its inconsistency with Ofcom's statutory obligations.

2. Assessing Ofcom's approach to setting ALFs in light of its duties

2.1 The approach differs from that set out in the Strategic Review of Spectrum Pricing

Ofcom correctly analyses the legal framework in Section Two of the consultation document. Vodafone has no comments on that section.

Then in applying that framework, Ofcom notes at paras 3.4-3.5 that:

> *In 2015, we considered that because of the terms of the Direction [from the then Secretary of State] we had no discretion to assess whether fees at full market value would be appropriate having regard to our duties more generally. In this document, once we have considered the market value of the spectrum, we go on to consider whether in light of our statutory duties there is any reason for us to set ALFs at a level which is not full market value.*
>
> *In light of that assessment, we then reach a view of the appropriate level of ALFs.*

Ofcom justifies this approach in the following terms at para 3.6:

> *We consider that the general approach we used in 2015 to assess market value continues to be appropriate. We note that EE appealed Ofcom's 2015 decision (the **2015 Statement**), supported by the other MNOs, on two grounds: first, that Ofcom erred in law in failing to take account of its statutory duties and second, Ofcom failed to consider evidence from avoided cost modelling in determining the market value. The High Court dismissed the appeal on both grounds[7] and EE's appeal to the Court of Appeal was on the first ground only. It was refused permission to appeal by the High Court on the second ground and did not renew that application.*

Ofcom then adopts essentially the same analytical framework as it in 2015 but with a 'further step':

> *The framework we propose for deriving an appropriate level of ALF … broadly follows that in our 2015 Statement except that (a) it includes a further assessment of our duties in Step 4…*

It is clear from the Direction that Ofcom must determine full market value, in order that Ofcom can comply with the Direction to ensure the ALFs 'reflect the full market value'. But Ofcom is clear that its new '*further step*' is not an assessment of the appropriate level of spectrum licence fees, but instead an assessment of whether there is a reason for Ofcom to depart from setting ALFs at full market value in essentially the same manner it determined in 2015 – that is, whether the approach that Ofcom took in 2015, which was based on a misunderstanding of the 2010 Direction, should stand essentially without adjustment. In other words, Ofcom has decided to keep its existing analysis (prepared on its mistaken view that it could not take account of its statutory duties *at all*) and simply 'added on' an assessment of whether the results of that analysis should stand in light of its statutory duties. This is clear from the language that Ofcom uses to describe its analysis:

> *In this section we present our assessment, in light of all our statutory duties, of setting ALFs at the full market value of the spectrum.*

In the consultation, Ofcom does not do what it is required to under the provisions of the WTA2006/CA2003, and take into account those factors in determining what the ALFs should be given the inherent uncertainty in estimating the 'full market value'. Ofcom's primary objectives must guide it from the outset, that is, at the preliminary stages of the analysis, rather than being 'tacked on' at the end to validate an analysis which has not taken them into account. Instead, Ofcom asks itself a different question, which is: do these statutory factors (the interests of consumers, competition, and so on) provide a reason for deviating from setting prices that are precisely market value, rather than prices that merely *reflect* market value, in the sense that the Court of Appeal held it was meant in the 2010 Direction? This leads to a number of fundamental problems:

(a) **Ofcom's statutory duties must be taken into account *in the process of determining the full market value* – not just as a 'cross-check' after the event.**

This is clear from the Court of Appeal judgment and the Strategic Review of Spectrum Pricing (SRSP). The Court of Appeal said this about Ofcom's role:

> *An NRA like Ofcom which is charged with the function of setting licence fees in the manner envisaged by Article 13 of the Authorisation Directive is not therefore tasked with a straightforward calculation of market value based, for example, on a real auction of licences in which the various mobile operators are permitted to bid against each other for the available spectrum. Although the NRA is entitled to and will ordinarily calculate the fees on an opportunity cost rather than a cost recovery basis, it is expressly required by Article 13 to take into account the Article 8 objectives such as promoting competition and investment in new technology which may in its calculation of the licence fee require some qualification of the price. There is, of course, an argument that some of these considerations, if they call for a discount in the fee by reference to what the mobile operator would be prepared to offer for the licence, are likely to have been factored into any actual bid for the licence and do not therefore call for further adjustment of the fee by the regulator. But these are matters for the expert judgment of Ofcom and the other regulators and questions of methodology lie outside the scope of this appeal.*

The Court precisely describes what Ofcom must not do ('*a straightforward calculation of market value based, for example, on a real auction of licences*' without taking into account its wider duties in that '*calculation*'). This is exactly what Ofcom considered wrongly that the Direction required it to do, and hence what Ofcom did in 2015. However, contrary to the Court's judgment, Ofcom proposes to import this flawed analysis (which assumes market value can be determined without reference to statutory duties) from its 2015 decision without amendment.

Ofcom's own SRSP could not be clearer on this point:

> *AIP principle 7: use of market valuations*
>
> *We will take account of observed market valuations from auctions and trading alongside other evidence where available when setting reference rates and AIP fee levels. However, such market valuations will be interpreted with care and not applied mechanically to set reference rates and AIP fees.*

This is also clear in the ALF consultation. At paras 5.18–5.23, Ofcom explains that in its 2015 statement, after examining its issues relevant to its statutory duties (e.g. competition, consumer welfare, investment and optimal use of spectrum) it decided that there were greater risks in setting ALFs too high than too low, but that now (para 5.20):

> *In our assessment below, we are considering whether we should set ALFs at, or below, market value. This is different from the question we were considering in our 2015 Statement (i.e. whether or not, when setting ALFs at market value, we should adopt a conservative approach when interpreting the evidence about market value).*

Ofcom has recognised that determining market value is not a mechanical exercise, and that Ofcom must weigh competing evidence and exercise its discretion in determining market value. In undertaking these activities, its statutory duties inevitably come into play. In Section Three of this response, we raise a number of areas where Ofcom has had to exercise regulatory judgement in carrying out the analysis, for example in deciding on the relevant level of WACC and deciding on a consensus value of international benchmarks. In a proper analysis, Ofcom would have made these decisions taking in account its statutory duties.

These statutory duties are nowhere to be seen in Section Four of the consultation paper and it is indisputable that they were not taken into account during the process that led to the 2015 decision. Consideration of how Ofcom's statutory duties should influence how it weighs up the market (i.e. auction) evidence and the way it determines market value is entirely missing from Ofcom's analysis.

Ofcom's solution to this problem is to adopt a two-stage approach, using the 2015 analytical framework as it stands which (it is common ground) does not properly take into account Ofcom's statutory duties, and then tack on a short section at the end which concludes that the statutory duties do not justify a departure from 'market value' as derived from the flawed analysis. In doing so, Ofcom is wrong in law in its understanding of what is required under the relevant legislation, and fails to discharge its relevant statutory duties.

This should make a material difference to Ofcom's assessment, because it means that the many discretionary factors that were considered as the constituent elements to the 2015 decision are judgements that need to be revisited with Ofcom's statutory duties properly considered and applied. Ofcom's 2015 decision (and the consultations that preceded it) contain many examples of points at which Ofcom needed to exercise 'regulatory judgement'.

Consider these statements from the 2015 decision that Ofcom considers it can adopt without substantial amendment:

2.52 *Taking account of the above, we now set out our analysis of the full market value for the purpose of ALF of, first, the 800 MHz band and, thereafter, the 2.6 GHz band. We derive our estimate of market value of 800 MHz spectrum using a range of methods and evidence, and by applying our regulatory judgement...*

3.55 *When using benchmarks to inform our judgement on the lump-sum value of 900 MHz and 1800 MHz in the UK, we consider that we should place most weight on benchmarks which are in Tier 1, some weight on benchmarks in Tier 2, and that benchmarks that are in Tier 3 should be considered as having relatively little informative value for these purposes.*

5.41 *Therefore, in our view, an appropriate estimate from Tier 1 benchmarks is above the midpoint between the average and the lowest benchmark, i.e. above £15.6m per MHz. Taking this into account and looking at the Tier 1 benchmarks in the round, our judgement is that £17m or £18m per MHz could be an appropriate estimate of lump-sum value from the Tier 1 benchmarks.*

6.26 *In our February 2015 consultation, we proposed the same approach to the discount rate as in August 2014 except that we proposed to apply a 25% risk sharing adjustment because we recognised that, despite the difficulties of estimating the extent of the risk transfer, we should exercise our regulatory judgement on the risk sharing adjustment. In brief, we proposed to calculate the discount rate as the cost of debt (lower polar case) plus 25% of the difference between the cost of debt (lower polar case) and the WACC (upper polar case).*

As the section numbers in these extracts demonstrate, '*regulatory judgement*' (by name or in substance) was a significant factor in every stage of Ofcom's 2015 multi-part decision. And it is now beyond all dispute in each instance, that these individual regulatory judgements were taken without full consideration of Ofcom's statutory duties - Ofcom having misdirected itself that it was legally prevented from taking into account its various statutory duties and should only consider ALFs through the prism of what constitutes 'full market value'.

Ofcom fails to recognise that *it is precisely these regulatory judgements in the assessment of market value that engage its statutory duties*. Precisely because of the complexity of the 2015 decision, and the fact that the analysis of the market data produces a wide range of possible outcomes at each stage of the analysis, Ofcom cannot perform the same task properly by 'tacking on' those duties in a single simplistic step.

The complex nature of the assessment of market value is such that the 2015 decision must be re-assessed from the ground up. That is not a convenient answer, but it is the clear and indisputably correct consequence of the Court of Appeal judgment. We make no criticism of Ofcom for attempting in its consultation to find a different way to achieve a lawful position for its analysis, but the 2018 consultation reveals clearly that there is no 'magic bullet' to repair the damage done through the error that colours the 2015 decision.

To perform its function of setting ALFs correctly, Ofcom needs to apply and consider Ofcom's statutory duties in the process of developing its view of market value, including the discretionary choices that are set out in great detail in Ofcom's 2015 decision. Each of those choices should be weighed in light of Ofcom's duties – not merely assessed solely through the prism of 'market value' as Ofcom did in 2015.

(b) Even on its own logic, Ofcom asks itself the wrong question – even if it was right to use Ofcom's statutory duties as a 'cross-check' of full market value (which Vodafone does not accept) instead of informing the regulatory judgements involved in setting market value, Ofcom has approached the former task incorrectly. For example, Ofcom has asked whether adopting ALFs at full market value would have an adverse impact on competition, instead of asking how it should determine ALFs in a manner which *best promotes* that duty (and whether reflecting, rather than simply adopting, full market value, *best promotes* those duties). This results in Ofcom setting itself an inappropriately strong presumption that full market value must be adopted.

This incorrect approach is inherently tied up with Ofcom's refusal to consider its statutory duties when determining market value. If it were possible for Ofcom to accurately and precisely determine full market value in a mechanistic way and without any subjective judgement, then the approach of considering Ofcom's statutory duties separately may be more worthy of consideration. However, in practice Ofcom exercised judgement to determine the estimates of

market value to use when calculating ALFs and therefore its statutory duties needed to be taken into account during that process.

The result is that, when it comes to addressing the 'additional step' in the analysis, Ofcom conflates the theoretical arguments for setting ALFs based on the exact market value with its proposed approach for the determination of ALFs based on uncertain estimates of market value which it has already made. It cannot compare and contrast different estimates of market value within a range of plausible estimates, and assess which of these is most apt to achieve its statutory duties. It can only answer the incorrectly framed question of whether there would be an 'adverse impact' on its duties by adopting the approach it has already decided upon. If Ofcom asked itself the right question and then decided the 2015 approach did not best promote its statutory duties, it is unclear what Ofcom would then do – since it has done no work to identify any alternative approach. It is convenient and therefore hardly surprising that Ofcom ends up deciding that its statutory duties have no impact on its approach.

(c) **Ofcom departs from key elements of the SRSP without notice or consulting on this approach**. The SRSP is Ofcom's standing policy statement on spectrum pricing. It is common ground that the SRSP applies in this case (and indeed Ofcom purports to adopt it and refers to it at various points in the consultation document). Stakeholders have a legitimate expectation that Ofcom will comply with the SRSP unless Ofcom has advised stakeholders and consulted on its intention to depart from it.

Despite this, the consultation reveals a willful disregard of many considerations in the SRSP without notice or explanation. For example, market value is determined without any reference to the statutory duties, contrary to the SRSP's statement that auction data must not be applied 'mechanically'. Furthermore, while Ofcom adopts some of the general principles in the SRSP (such as that market value generally promotes competition), Ofcom fails to conduct any of the case-by-case assessments which the SRSP commits Ofcom to undertake to examine whether there should be a departure from the general rules. Again, this appears to be the result of having no other reference point: Section Five of the consultation paper deals with 'market value' only in generalities and at the level of economic principle, without admitting any of discretion which was exercised by Ofcom (and which should have been exercised in accordance with its statutory duties).

(d) **Ofcom seeks to adopt its 2015 (and even earlier) work without recognising the transformation that has changed the way in which competition, consumers, innovation and investment operate in the UK mobile market**. As we set out in Section Three of this response, each of these key areas requires proper examination for Ofcom to discharge its statutory obligations.

It is not an impossible or even particularly complex task for Ofcom to do what it ought to do – that is, to set out from the start with its statutory duties in mind and apply the SRSP. As the Court of Appeal pointed out,

Ofcom has already determined the correct approach to this issue in the SRSP. In the SRSP, Ofcom described its task in the following terms:

> *We will take account of observed market valuations from auctions and trading alongside other evidence where available when setting reference rates and AIP fee levels. However, such market valuations will be interpreted with care and not applied mechanically to set reference rates and AIP fees.*

What Ofcom is required to do in assessing ALFs is, in summary, to apply its own SRSP framework to the question of what ALFs should be for 900 and 1800 MHz spectrum. It has failed to do that, asking itself a different question, which appears to be aimed at protecting to the greatest extent possible the analysis that was done in 2015 from having to be revisited.

We now turn to explain how some of these problems play out in relation to some of Ofcom's key duties – in respect of competition and consumers.

2.2 Consideration of competition duties

Ofcom's discussion on competition includes the following extracts:

> *5.104* *We do not consider that ALFs at market value would be likely to have an adverse impact on competition, and there is some risk that setting ALFs below market value would have such an adverse impact. Overall, we consider that ALFs at market value are consistent with promoting competition.*
>
> *5.105* *The UK benefits from network-based competition among the four mobile network operators. We want the UK to continue to enjoy effective competition between four national network providers, and a range of other retail competitors (such as MVNOs and resellers).*
>
> *5.106* *In general, we consider that ALFs at market values would tend to be pro-competitive. Operators have a mix of ALF spectrum and spectrum acquired in auctions. Giving firms an incentive to relinquish spectrum for which they are not the highest-value users could help to* relieve spectrum scarcity and enable market entry or expansion by *smaller providers.*

It is clear from the above that Ofcom has asked itself the wrong question. It has asked itself '*would ALFs at market value be likely to have an adverse impact on competition?*' instead of asking how it should determine annual licence fees in a manner which *best promotes* competition (and which *reflects* market value) taking into account the uncertainty in estimating market value.

This is unsurprising. Because Ofcom has already determined market value, it is only in a position to ask itself a binary question as to whether its approach is the right one. It cannot, at this stage, compare approaches to determining market value, or to different approaches to setting the right ALFs. Given the question Ofcom has posed to itself, it is unsurprising that Ofcom decides that market value is the right choice ('*Overall, we consider that ALFs at market value are consistent with promoting competition*').

Furthermore, Ofcom's analysis in the consultation could be equally applied to any assessment of AIP. That is not what Ofcom is required to do when taking account of, for example, issues concerning competition when

setting these specific spectrum licence fees. It is a misreading of the statutory duties imposed on Ofcom and it represents a failure to apply the pre-existing framework that Ofcom has determined to use and has in fact used in all other cases where it has had to set AIP.

The assessment of competition also suffers from departing from the SRSP without clearly explaining that this is what Ofcom is proposing to do. The SRSP at paras 5.166–5.167 states that:

> *We discussed in the consultation document whether it would potentially be appropriate to use AIP to promote competition more generally, or to address existing competition problems in downstream markets. We considered for example, whether AIP should be reduced selectively for certain licences in order to encourage entry into a downstream market, or to offset the competitive advantages of a dominant firm.*
>
> *We remain of the view that, depending on the circumstances of the case, pursuing such an objective could, in principle, be consistent with our duties to promote competition where appropriate.*

And yet in this case, Ofcom provides no real explanation specific to the circumstances of this case, as to whether it could be appropriate to reduce AIP pricing in relation to competition concerns. Ofcom's only thinking on this point amounts to barely half a page (paras 5.108–5.109) and relies on its October 2013 consultation. That document is now nearly five years old, during which time new technologies have been developed and deployed, significant new spectrum has been made available, and major transactions in the sector have reshaped the market. In such a fast moving mobile market, an analysis that is five years old cannot serve as a proper basis for Ofcom to make decisions about the state of competition and the likely impact of various approaches to ALF pricing on competition. We explain in section 3.4 below the extent to which new information has become available which requires Ofcom to rethink its assumptions and methodology. Ofcom needs to prepare a proper, up-to-date analysis of the competitive situation that exists today, as envisaged by the SRSP.

2.3 Consideration of duties to consumers

Ofcom's discussion on competition includes the following extracts:

> *5.68* *It is possible that setting ALFs at market value would lead to higher consumer prices than would prevail than if ALFs were set at a discount to market value. However, we generally consider that retail prices should reflect the input cost of the spectrum, and this does not reflect a market failure, or markets failing to work in the interests of consumers.*
>
> *5.69* *In our August 2014 consultation we set out the view that:*
>
> *a) "In an efficient market, consumer prices will reflect the resource costs of inputs to supply goods and services, and to the extent that consumer demand reflects those prices, it will appropriately reflect the cost of supply.*
>
> *b) The level of ALFs could have an effect on downstream consumer prices for mobile services, and there is a risk of inefficiency from setting ALFs either above or below market value.*

i) If ALFs were set above market value, and if operators could pass on this cost through inflated consumer prices, the result of these inflated prices could be to artificially depress the growth in mobile traffic.

ii) If, as described above, operators are not fully responsive to the opportunity cost of spectrum, then, with ALFs set below market value, operators may tend to set consumer prices which do not reflect the full resource cost of providing their services. If instead prices already reflected the opportunity cost of holding spectrum, then setting ALF below market value would not lead to inefficiency, and the only risk to inefficiency of this kind would be in setting ALFs above market value.

c) However, the responses to the October 2013 consultation indicate that operators' prices are not independent of the level of ALF when fees are below market value (as they are currently). On balance, therefore, we consider the risk to efficiency through the effects on consumer prices if ALF is set too low or too high to be broadly symmetric."

It is clear here that – despite sitting under the heading "Impact on consumers"–Ofcom's assessment on the impact of consumers is in fact an assessment of the impact on efficiency. Extraordinarily, Ofcom admits as much at para 5.70:

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

And Ofcom goes on to merely conclude (without any additional evidence or consideration) at para 5.72 that it would not be appropriate to keep ALF spectrum below market value to suppress consumer prices.

The failure to address the interests of consumers here is clear:

(a) The SRSP provides at para 4.235 that "*when considering the impact of fees in a specific fee review, we will carefully consider any potential impact on wider social policies in our decisions on whether and how to apply AIP in individual sectors*". Ofcom has not even attempted to comply with this provision by considering whether ALFs at market value will impact any social policies or have any social impact, beyond a generalised concern with "efficiency"; and

(b) The Administrative Court in the ALF case said about Ofcom's duties in relation to consumers that:

> *In performing the duty of furthering the interests of consumers, Ofcom is required to have regard, in particular, to the interests of consumers in respect of choice, price, quality of service and value for money.*

Yet there is no reference in Ofcom's thinking to choice, quality of service or value for money. These issues have been entirely forgotten in favour of a mechanical and blinkered attention to "efficiency".

As we note in section 3.1 below, Ofcom's approach means that operators will face an ever increasing burden of spectrum costs while revenue growth has flat-lined (or even decreased in real terms). Ofcom has made no effort to understand the consequences of this – for example, in terms of decreased levels of investment in mobile networks (and consequent reductions to quality of service) or increased prices.

Ofcom's lack of regard to the social consequences if consumer prices increase as a direct result of setting ALFs at the full market value is wrong in law. There is no consideration of the impacts this may have, for example, on vulnerable customers. Ofcom have simply failed to assess the impact on consumers at all. The analysis which purports to relate to consumers is simply a generalised explanation of Ofcom's view that market value promotes efficiency.

2.4 There is still no impact assessment

Strikingly, Ofcom still does not undertake any meaningful impact assessment in relation to its ALF proposals. This is particularly disappointing for Vodafone, since Ofcom's refusal to undertake an impact assessment was inherently related to Ofcom's view that it had not discretion to take its duties into account.[1] This refusal brought Vodafone and Ofcom to the brink of litigation in 2014, and Vodafone would have hoped that the concerns that it raised then – which were entirely vindicated by the outcome of EE's judicial review – would have been taken into account.

Ofcom's approach essentially repeats the mistake it made in the 2015 decision, which is to treat the determination of 'full market value' as being a distinct and separate exercise from the consideration of Ofcom's statutory duties. One aspect of this is the failure by Ofcom to consider the impact of its proposals in an impact assessment, in a way that is robust, fulfils Ofcom's duty under section 7 CA03, and follows the guidelines established by Ofcom and Government, and widely-recognised principles of best practice.

Here is what Ofcom said on this subject, in the SRSP:

> *We agree that impact assessments are a critical part of any fee review and we will endeavour to provide clear explanations of all the considerations we think relevant*
>
> *5.149* *We agree that Impact Assessments (IAs) are a key part of best practice policy making, as highlighted in our Better Policy Making guidelines[47]. They should show how a regulatory decision is designed to fulfil our statutory duties, bearing in mind that our principal duty is to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate by promoting competition[48].*
>
> *5.150* *IAs provide a framework for evaluating different regulatory options, including de-regulation. In carrying out IAs we will be guided by the principle of proportionality. This means that a decision which is likely to have a wide-ranging impact and/or impose substantial costs on stakeholders will have a more comprehensive IA than a decision which will have a less significant impact.*
>
> *5.151* *We agree with stakeholders that IAs can have a significant role to play in setting fee levels and in decisions on the need for phasing, as discussed in our*

[1] 2015 ALF Statement, para 1.22.

> *consultation document. We also agree that they should attempt to identify possible material impacts and the scope for unintended consequences that our proposals could have on the relevant stakeholders, consumers and citizens.*

In the consultation, Ofcom does not assess the impact of its proposals. Instead, Ofcom assesses the impact of market prices as a general proposition. Consider this reasoning from the 2018 ALF consultation:

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

There are substantial problems with this approach:

(a) Reliance on the 2015 decision. Ofcom relies on analysis that was carried out under the wrong legal framework and without taking into account obligatory statutory duties.

(b) Mis-match between old analysis and the new task. Annex 9 of the 2013 consultation was not concerned with '*potential impacts on competition of setting ALFs above market value*': it focused on two questions, neither of which is the question that Ofcom now claims for it. It considered submissions by MNOs that setting ALFs above market value could, in their view, lead to inefficient use of spectrum, and the issue of whether there is any asymmetry of risk associated with the possible outcomes of setting ALFs leading to prices above or below market value. It was not an impact assessment as is described in Ofcom's guidelines,

(c) Reliance on out-of-date analysis that is based on today's market. Having taken the wrong approach, Ofcom fails to address the logical problems that flow from that decision. For example, Ofcom in 2018 holds out a 2013 analysis to serve as an impact assessment to support Ofcom's ratifying proposals that were not even determined until 2015, by which time that analysis was based on facts that were already two old.

(d) Missing the point. Ofcom focuses on a new question, ungrounded in any statutory test: is there any reason to think that market value in general is likely to affect competition in general? In doing so, Ofcom also fails to comply with the SRSP which commits to giving consideration of competition impacts on a case-by-case basis.

(e) Assessing a very narrow theory of harm. Ofcom appears to solely assess whether Ofcom setting ALFs to accurately reflect market value would lead to any operator relinquishing spectrum such that they would no longer be "credible". However, Ofcom do not consider other potential adverse competition effects, such as an operator not being able to effectively

compete for a particular segment of customers or use case due to relinquishing spectrum required to deliver a specialised service.

(f) **Losing the chance to get the right question answered.** As a result, Ofcom fails to engage in any meaningful way with the true question, which is a fact-specific issue: what would be the impact of Ofcom's specific proposed ALFs on competition in 2018 and on a forward-looking basis, in markets that are likely to be affected by them?

By abandoning the tried and test framework set out under the SRSP in this way, and without alerting stakeholders to this proposed departure of providing any justification for it, Ofcom has adopted an approach which is wrong in law and open to legal challenge.

3. Is Ofcom's approach economically correct?

3.1 Summary

It is clear Ofcom cannot precisely and accurately determine the true market value on the evidence it has available and as such there are a range of potential values consistent with a market value estimated conservatively. By determining a market value and then applying an independent binary test of whether 'market value' is the right level of ALF in the light to Ofcom's duties, Ofcom has provided no assurance that the value determined from among the range of possible values of market value is the optimal value, in terms of achieving Ofcom's statutory duties and balancing upside and downside risks.

In order to set the value of ALF at a conservative market value Ofcom must take account of the range of plausible market values and its wider duties when determining the appropriate value, taking into account the likelihood that the true market value is above or below the determined value, by how much the true value may differ and the risks associated with setting the value above or below the true value. Given the asymmetry of risks, the only reasonable interpretation of setting the value conservatively is that Ofcom should determine a value such that the probability of the true value being lower than the determined value is materially less than the probability of the true value being greater than the determined value, i.e. the determined value should be significantly below a central estimate.

Ofcom proposes a value which is below a central estimate, principally by using a value from the benchmark data which is below the mean value of the benchmark sample. However, the approach used to determine the value used from the benchmark data is to a large degree arbitrary. In particular, Ofcom has not paid due regard to the degree of uncertainty in the benchmark evidence, for example with only three countries providing 'tier 1' evidence on the relative values of 800 and 900 MHz spectrum, and these three countries showing large variation in relative values. While some degree of regulatory judgement is inevitable in determining the appropriate level of fees, Ofcom needs to clearly guard against placing too much weight on individual benchmark data points given the limited data it has available.

Ofcom does not take account of the uncertainty introduced by setting forward looking ALFs in 2018 based on UK auction results from 2013, instead simply applying an inflation adjustment factor. There is clear

evidence that the market value of spectrum can change significantly over time in response to new information; for example, one of the bidders in the 2000 3G auction wrote down more than half of the amount paid within 3 years of the auction. Conversely the value of L-band spectrum increased significantly between it being auctioned by Ofcom and it being acquired by Vodafone and Three. Section 3.4 below sets out a review of the new information that has become available since the 2013 auction, suggesting that there are a number of factors which will have depressed the market value of the 900 and 1800 spectrum since the auction, which Ofcom should take account of. In some cases, these are UK-specific so would not be reflected in international benchmarking. The sporadic nature of international auction data, with only one new data point since 2015, does not provide robust information to determine movements in UK market values over time.

Ofcom's approach to converting lump sum values to an equivalent annual charge is reasonable (although the calculations used are unnecessarily complex). However, as we set out in Section 3.5 below Ofcom does not appear to have fully considered the appropriate discount rate to use in this calculation. In particular, the estimate of cost of capital used in determining the discount rate was not determined for the purpose of setting ALF, but drawn from a decision on charge controls for mobile call termination, which in turn relied on a key input from the 2018 decision on BT's Wholesale Local Access charge controls. A review of the cost of capital and the rationale for the determination of parameters in these decisions clearly shows that it is not appropriate as an input to the ALF calculation. In particular, the cost of debt used in the WACC calculation used for charge controls reflects a long term average of the risk free rate over the last 10 to 15 years, rather than a true current or forward looking estimate of MNOs' cost of debt now. While such an approach may be appropriate for use in an economic depreciation calculation as used in the MCT charge control, it is inappropriate for decomposing a single licence payment now into an equivalent series of future annual payments as the risk free rate in 2003 will have no impact on future discount rates. The inappropriateness of this assumption is made clear by the fact that the cost of debt implicit in the cost of capital calculation is clearly different from the cost of debt used separately as an input to the annualisation method, which is based on data from the last 12 months. No rationale is given for this clear contradiction in approach and result.

The risks resulting from this lack of rigor in determining ALFs on a conservative basis have not been fully assessed by Ofcom. Ofcom has not attempted to conduct an impact assessment of the proposed level of ALFs, instead relying on theoretical models which suggest that under specific conditions,

pricing and investors' behaviour would not be affected by the level of ALFs. Given the complexity of the mobile market, the assumptions underlying classical micro-economic models may not adequately reflect that actual pricing and investment decisions. As such there is a risk of increases in the cost to operators of spectrum feeding through into higher prices and lower investment, reducing the benefits to the wider UK of mobile communications. Ofcom has accepted that there is empirical evidence that budget constraints have an impact on operators' behaviour in auctions. There is no reason to believe that similar budget constraints will apply in the case of investment when operators face a series of annual payments.

Ofcom's approach means that operators will face an ever increasing burden of spectrum costs, both through one off auction payments and ALFs, as more spectrum becomes allocated to mobile services. Given the overall lack of revenue growth in the industry it will not be sustainable for the operators to increase investment in the network, for example to deliver 5G services and enhanced mobile coverage, while at the same time paying an increasing proportion of revenues on spectrum costs.

3.2 Overall approach to setting ALF

With perfect information, frictionless transfer of spectrum and if spectrum values were stable over time setting ALFs to accurately reflect the market value (the opportunity cost to the highest value excluded user) would lead to efficient allocation of spectrum as inefficient users would have the incentive to divest spectrum to more efficient users (although, even then, Ofcom's other statutory duties would also need to be taken into account). However, Ofcom does not have perfect information with which to set ALF.

Ofcom has set out a three stage process to determine ALFs based on market value:

1 Determine the lump sum unit market value of 800 and 2600 MHz spectrum from the 2013 UK auctions;
2 Convert this into 900 and 1800 MHz lump sum values using relative valuations from auctions in other EU countries; and
3 Turn this into an equivalent annual charge using an annualisation methodology.

Ofcom recognises that there is insufficient information to accurately assess the market value of spectrum (although appears to understate the degree of uncertainty in its estimates) due to a number of factors:

- The only direct source of UK market values are past spectrum auctions which cannot be used directly as:
    - The spectrum auctioned is not a direct substitute for spectrum for which ALFs need to be calculated, for example the auctioned 800 MHz band is generally used for 4G technology which the 900 MHz band for which ALFs are estimated is used for 2G and 3G technology;
    - The most relevant auction, in 2013, used a combinatorial approach which doesn't allow the value of individual or marginal blocks to be determined with certainty; and
    - Spectrum auctions happen infrequently, requiring extrapolation of values from this base year to the period over which ALFs will be applied.
- In order to estimate the market value of ALF spectrum, Ofcom uses benchmark data from EU countries. However, there are a number of limitations in this data:
    - Only countries which have relatively recently auctioned both 900 MHz and/or 1800 MHz spectrum and 800 MHz and/or 2600 MHz spectrum can be used;
    - Of the sample of countries which have auctions which meet this condition, Ofcom recognises that a large number are influenced by factors which are likely to lead to the relationship between auction results not being a good indicator of relative market values in the UK; and

- The remaining data points show wide variation between then, implying that the results for the UK could fall in a wide range as there is no reason to believe *a priori* that the UK results would fall towards the middle of the range shown by the sample.

In addition, there are a range of potential values when estimating the parameters that input into the annualisation approach adopted by Ofcom, in particular the cost of capital, where Ofcom's approach appears to be flawed (as discussed below).

3.3 Deriving lump sum values from the UK auctions

The methodology for deriving the 2013 market value of 800 MHz and 2600 MHz spectrum was the subject of a large number of submissions in the process leading up to the 2015 statement. We do not propose to re-open this debate but note that the fact that there was significant discussion, with different methods producing a relatively wide range of values for 800 MHz spectrum, reinforces the fact that there is some uncertainty over the appropriate value of this parameter, and that regulatory judgements need to be made before a value can be determined.

In order to estimate 2018 lump sum market values, Ofcom simply projects its estimates of the 2013 values to 2018 using CPI. When converting lump sum values to annual equivalents, an assumption that market values in the future should increase in line with inflation appears to be reasonable for the purposes of the annualisation assumption as it provides predictability in absence of other evidence. However, applying a similar assumption to the past, where there is evidence on factors which will have changed the valuation of spectrum between the 2013 auction and the current day, means that Ofcom estimates will be less accurate than they could be. Section 3.4 examines the evidence on factors which could have influenced market values since 2013.

3.4 Factors that may influence spectrum valuation over time

Operators will value spectrum by determining changes in the cash flows generated by the business with and without the spectrum. These cash flows will change due to both demand side or supply side effects. On the supply side, operators will seek to offset reduced network capacity, capability and coverage due to reduced spectrum with other inputs, i.e. equipment and sites. However, there will be a trade-off between the cost of compensating for the reduced spectrum and the lost margin from not fully offsetting the impact of lost spectrum. As such there will be a demand side effect.

When considering the likely changes in spectrum over time, Ofcom should assess how parameters which may feed into the cash flow calculation may have changed and (at least directionally) how this may have impacted on relevant spectrum values. Key parameters in the cash flow forecast will be:

- Expected forward demand, both in terms of prices/ARPUs and usage and hence the potential opportunity cost of reduced capacity/QoS;
- The unit cost of partial substitutes for spectrum such as additional sites or equipment;

- The current and expected future availability of spectrum; and
- Technological developments, such as increased spectral efficiency which will change the relationship between other network inputs such as sites and equipment and spectrum.

All of these factors will be changing over time (for example data volumes are consistently growing) and this will be internalised in spectrum valuations at any given point in time. So for example the fact that traffic has grown in recent years will not necessarily alter the value of spectrum as this would have been expected and factored into past spectrum valuations. In order to assess whether the market value of spectrum will have changed since the 2013 auction valuations, we need to compare forward looking expectations in 2013 with the out-turn since 2013, i.e. new information that has become available since the 2013 auction, and assess how this may have affected market valuations between 2013 and 2018.

It is clear that the value of spectrum can change relatively rapidly over time as new information becomes available. For example O_2 wrote down more than 50% of the value of the 3G licence it acquired in 2000 by 2003[2]. As such it is not appropriate to simply assume spectrum values have been stable over time without a thorough review of the evidence.

We review the evidence of new information since 2013 below.

[2] Mmo2 results for year to 31 March 2003

3.4.1 Traffic growth

The UK mobile voice and broadband market is saturated and as such there is likely to be little new information which will affect expectations of take up.

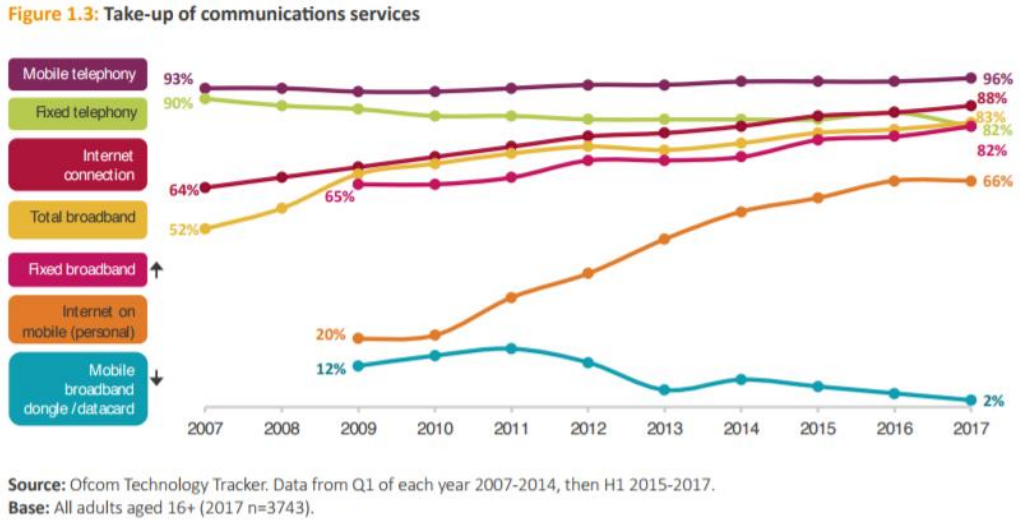

Figure 2. Take up of mobile services[3]

When considering traffic, expectation of traffic growth appears to be similar in 2013 to 2018. For example in 2012 Cisco forecast that the global level of mobile traffic would be 7.4 Eb by 2016[4] from a level of 0.9 Eb in 2012, a CAGR of 66%. The out-turn in 2016 was 7.2 Eb[5], i.e. on a global basis the rate of growth was remarkably close to that predicted.

[3] Ofcom 2017 CMR
[4] https://www.gsma.com/spectrum/wp-content/uploads/2013/03/Cisco_VNI-global-mobile-data-traffic-forecast-update.pdf
[5] https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf

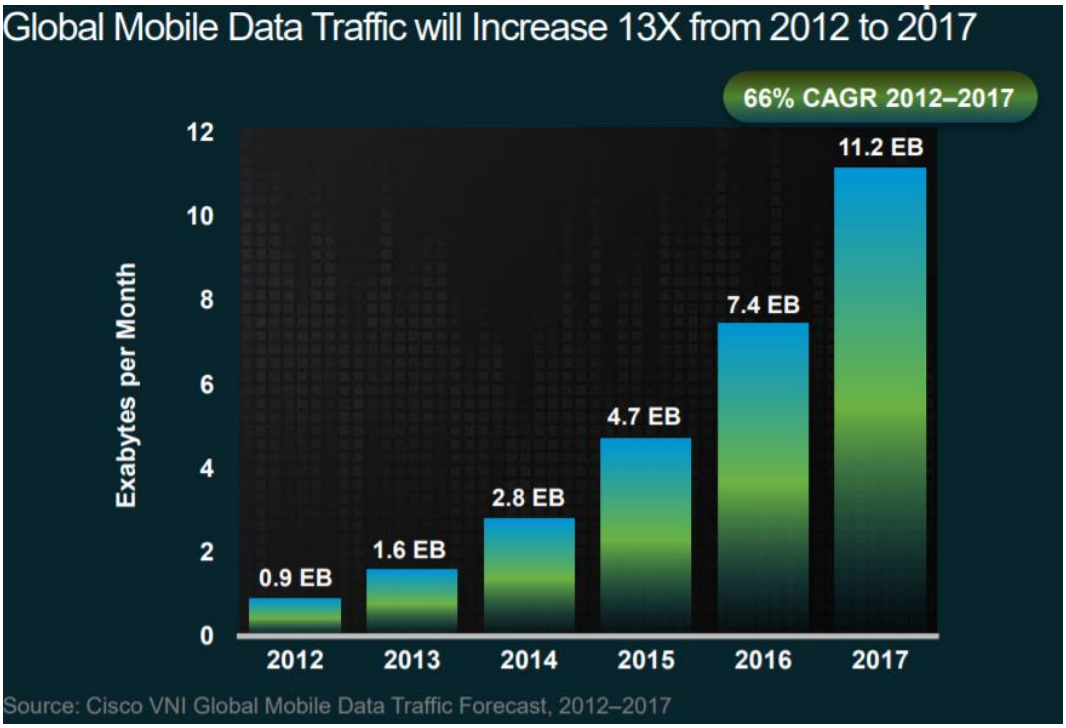

Figure 3. Estimated global traffic growth

Thus, while there has been a high level of traffic growth in the UK, this in itself does not indicate that this had led to an increase in spectrum values, as to a large degree this magnitude of growth was expected.

3.4.2 Prices and revenues

There was an expectation when 4G was introduced that operators would be able to charge a premium for 4G services which would be expected to increase ARPUs. For example, EE, who launched 4G prior to the UK auction said:

> *"We are seeing solid early 4G momentum migrating Orange and T-Mobile customers to higher value EE 4G price plans in areas where 4G coverage is available. Early Orange and T-Mobile customers migrating to 4G on EE are showing increases of approximately 10% in ARPU, demonstrating data monetisation."*[6]

An increase in the ARPU and hence future value of customers would be expected to increase the value of spectrum (even that used for 2G and 3G services as 4G subscribers would use and be influenced by the quality of service on non-4G networks).

[6] https://explore.ee.co.uk/our-company/newsroom/ee-results-for-the-year-ended-31-december-2012

However, the evidence shows spend on mobile services has slightly declined over the period 2013-2018. This new information suggests that the opportunity cost of having less spectrum, in terms of customer lost, will be less than expected in 2013 and hence the value of spectrum will tend to be lower for both 900 and 1800 MHz spectrum.

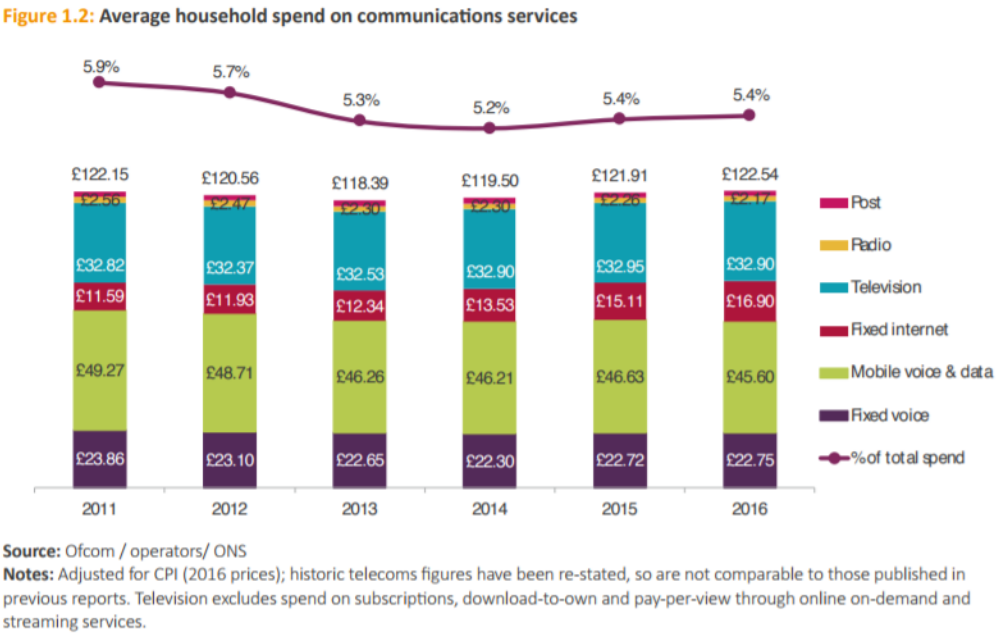

Figure 4. Spend on mobile services[7]

3.4.3 Unit cost of other inputs

The cost of telecoms equipment adjusted for quality/capability continues to fall. However, this alone does not necessarily lead to a reduction in the value of spectrum over time as demand is also growing.

The other key input to mobile networks are infrastructure costs. The UK government passed a series of measures in 2016 and 2017 to reduce the cost to mobile operators of acquiring and operating sites for mobile masts. This includes changes to planning regulations which will reduce the cost of roll out in rural areas and changes to the Electronic Communications Code, which could reduce the cost of building and operating infrastructure across the UK.

This will, all else being equal, reduce the value of spectrum, as it will reduce the cost of densifying the network as alternative to acquiring additional spectrum.

This is effectively new information which suggests that the value of spectrum will have fallen. If effective, the easing of planning regulations could have a particular impact on the value of low frequency spectrum such

[7] Ofcom CMR 2017

as 900 MHz spectrum as it reduces the cost of building more rural base stations, which is an alternative to deploying low frequency spectrum in rural areas.

3.4.4 Availability of spectrum

In broad terms the timeline for release of spectrum for mobile communications is planned well in advance and communicated to the industry by Ofcom. On the whole, the bands to be made available for mobile networks operators and the timescales over which the spectrum will be made available have not altered significantly. However, there is evidence that more spectrum has become available earlier than foreseen in 2013:

- The sale[8] of 40 MHz of L-band spectrum to Vodafone and Three following standardisation of this spectrum for mobile services[9];
- Clarity that the 700 MHz spectrum is expected to be available from mid-2020 rather than a forecast of early 2022 previously; and
- Increased clarity that 3.6 GHz spectrum will be available in a timely fashion

This additional supply should reduce the value of current spectrum holdings including 900 MHz and 1800 MHz.

The delay in the date of the auction of 2.3 GHz and 3.4 GHz spectrum may have increased the value of other spectrum prior to the auction in 2018. However, on a forward looking basis this past delay should not affect the forward looking value of other spectrum now that it is available.

3.4.5 Technology

Improvements in technology, in particular technology that increases spectral efficiency, would be expected to reduce the marginal value of spectrum all else being equal, as a given level of demand can be met with a reduced amount of spectrum.

While continued technological developments are expected, in the period since the 2013 auction a number of developments have occurred which were not expected:

- Development and standardisation of a new air interface for 5G;
- Widespread uptake of TDD; and
- Development and standardisation of "massive" MIMO.

We describe each of these below.

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[8] https://www.ofcom.org.uk/__data/assets/pdf_file/0035/58778/qualcomm.pdf

[9] On 8th November 2013, the European Conference of Postal and Telecommunications Administrations (CEPT) approved ECC Decision (13)03 on "the harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink.

5G air interface

While the development of a set of technologies labelled 5G was foreseen, the precise nature of the technologies considered was unclear in 2013, including whether a new air interface would be included:

> *Whether a new air interface is necessary is arguably more of a question of whether one can be invented that significantly improves mobile networks, rather than on a race to the arbitrary deadline of 2020.*[10]

However, a new air interface has been standardised in 2018 and will ultimately be standardised for (almost) all of the bands currently allocated to mobile services. 5G NR will offer an improvement in spectral efficiency compared to LTE, and will also inter-operate with 4G, removing the need to clear spectrum from 4G technology prior to re-farming, further increasing effective spectral efficiency.

This should reduce the value of all spectrum for a given demand scenario.

Uptake of TDD

The potential for using unpaired TDD spectrum rather than paired FDD spectrum has been known for a considerable length of time with the 2000 '3G' auction including a small element of TDD spectrum in addition to FDD spectrum. However, the utility of this spectrum was limited because of limited device/standards support.

3GPP release 12 supported carrier aggregation between TDD and FDD carriers which has increased the utility of TDD spectrum. This can be seen in the price paid by Telefonica for 2.3 GHz spectrum in the 2018 auction compared to unpaired 2.6 GHz spectrum in the 2013 auction[11].

The ability to use TDD spectrum to effectively deliver incremental capacity could serve to reduce the value of both 900 MHz and 1800 MHz (FDD) spectrum

Massive MIMO

Massive MIMO technology offers a significant increase in spectral efficiency compared to lower order MIMO technologies currently used (with Vodafone suggesting a 4 fold increase in efficiency[12]). In 2013 while the potential of mMIMO was understood, the significant technical issues to be overcome made it less clear when it would be commercialised. However, mMIMO has been included in LTE specification rom Release 13 and will be included in NR from Release 15.

mMIMO will only be practical for higher frequency spectrum (>3GHz). Beam forming will also provide increased in coverage for this higher frequency spectrum meaning that this higher frequency spectrum will

[10] https://www.gsmaintelligence.com/research/?file=141208-5g.pdf&download

[11] This also appears to reflect the relatively low amount of 4G ready spectrum held by Three and O2 following the 2013 auction leading to a potential short term capacity squeeze for them.

[12] https://www.vodafone.com/content/dam/vodafone/investors/financial_results_feeds/year-ended-31-march-2018/FY_2018_Presentation_DOWNLOAD.pdf

be a better substitute for other spectrum such as 1800 MHz, while also reducing the capacity constraints due to much higher spectral efficiency.

This will have increased the utility of higher frequency spectrum while reducing the value of 900 MHz and 1800 MHz spectrum.

Roll out of GSM-R

One particular issue that has affected the value of 900 MHz spectrum has been the roll out of GSM-R across the Network Rail network[13]. Whilst the need to undertake coordination measures was understood in 2013, in the interim the interaction between refarming 900 MHz spectrum for 3G/UMTS and 4G/LTE usage and the poor performing radios installed in train cabs has become clearer. The consequence has been O_2 and Vodafone networks requiring reduced power transmission from hundreds of sites, which by definition would be serving high traffic transport corridors. This will have limited the value of 900 MHz spectrum compared to other spectrum such as 800 MHz on these sites, reducing the overall value of 900 MHz spectrum. Critically, the poor performance of GSM-R cab radios appears to be a matter specific to UK rail infrastructure, meaning that the relationship between 800 MHz and 900 MHz pricing in EU benchmarks may not be a fair comparison, as 900 MHz usage is not compromised in this way in other countries.

[13] https://cdn.networkrail.co.uk/wp-content/uploads/2017/06/Network-Rail-Telecoms-briefing-pack.pdf

3.4.6 Overall conclusion on trends since 2013

The new information that will affect the valuation of spectrum that has become available since 2013 is summarised in the table below.

Table 1 Summary of new information since 2013 and likely affect

Parameter	New information	Impact on spectrum value
Data growth	No material new information	No material impact
ARPU growth	Continued decline in ARPU post 4G launch	Reduce value
Cost of partial substitutes	New Electronic Communication code	Reduce value
	Improved planning	Reduce value of coverage spectrum
Spectrum availability	L-band available for mobile	Reduce value
	700 MHz available from mid-2020	Reduce value
	3.6 GHz availability	Reduce value
	Delay to 2.3 GHz and 24.GHz auction	No material forward looking impact
Technology	Standardisation of NR	Reduce value
	Uptake of TDD	Reduce value of FDD spectrum
	Massive MIMO standardised	Reduce value of capacity spectrum
	Issues following roll out of GSM-R	Reduce value of 900MHz

The new information appears to suggest that the value of spectrum will have fallen since 2013 although the magnitude of the fall is difficult to assess without detailed modelling. Ofcom should take account of these factors when setting forward looking ALFs both in terms of the likely level of market values and also the uncertainty in setting forward looking ALFs based on evidence from 5 years ago.

3.5 Benchmark data

With no direct information on which to base lump sum valuations of 900 MHz and 1800 MHz spectrum in the UK, Ofcom has used an approach which uses information on the value of 800 MHz and 2600 MHz spectrum in the UK and the relationship between this spectrum and 900 MHz and 1800 MHz spectrum from other jurisdictions.

Ofcom's approach to this data can be broadly summarised as follows:

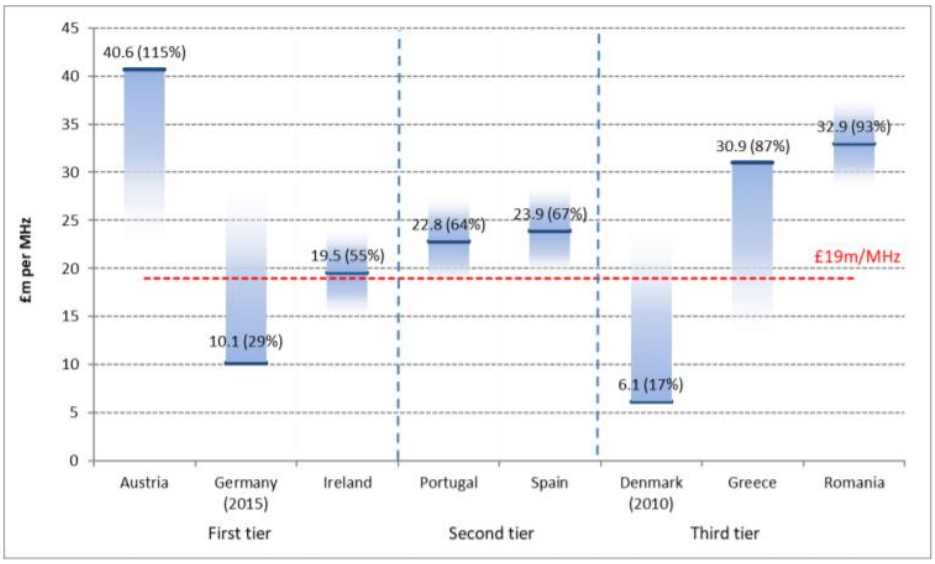
- Determining whether data for given auctions is likely to by reasonable estimated of market values and assigning the values into one of three groups according to the quality of information provided (tiers 1, 2 and 3 respectively);

- Normalising auction values to make them comparable across countries, e.g. by adjusting for population size and differences in the timing of auctions;
- Calculating 900 MHz and 1800 MHz UK equivalent values of spectrum from the available auction benchmarks relying on relative valuations[14] and using absolute values as cross checks; and
- Estimating full market value of UK 900 MHz and 1800 MHz spectrum based on a combination of weighted averages of the data from the benchmark data and the lowest value in the range, i.e. selecting a point between the sample average the lowest value of the benchmarks considered as informative[15].

These steps were discussed in some depth in the consultation process leading up to the 2015 Statement. We do not propose to submit further evidence on the benchmarks available at this point. Since 2015 there has been one auction in Denmark which Ofcom considers provides new information on the relative value of 1800 MHz spectrum.

As Ofcom's own charts illustrate, the benchmark data has a high degree of variability.

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



Source: Ofcom

Figure 5. Illustration of variability in benchmark data

[14] 900/800 ratio for 900 MHz spectrum and '800-2600 distance ratio' for 1800 MHz spectrum
[15] Tiers 1 and 2 evidence for 900 MHz spectrum and Tier 1 evidence for 1800 MHz spectrum

Even taking the tier 1 data, based on those auctions which are deemed to provide the most robust information on values in the UK, the 900/800 relative range for the ratios for 900 MHz spectrum is between 115% and 29%. The true value for the UK could reasonable fall anywhere within this range or even outside this range, as there is no reason to assume the value for the UK is more likely to be the middle of the range than other countries.

Given the change in Ofcom's approach to setting the ALF to take explicit account of Ofcom's duties it is reasonable to re-examine the appropriateness of the final step where Ofcom determines a single point estimate of the ratio to estimate the market value.

Ofcom takes no explicit account in the uncertainty underlying this point estimate, nor the implications of its wider duties. It is clear that the international benchmarks are relatively few and highly variable, particularly for the 900 MHz band. It is therefore incumbent upon Ofcom to take a conservative approach in choosing a consensus value.

3.6 Approach to deriving annualised figures from lump sum estimates

Spectrum licence valuations derived from auctions consist of a single up-front payment for the right to use the spectrum for a 20-year period, after which there will be an expectation that the current licence holder will have the option to continue subject to the payment of ALFs. This indicates that the up-front 'lump sum' payment is effectively a pre-payment for 20 years.

Ofcom then needs to estimate the level of annual payments which would be equivalent to this upfront payment, taking account of the time value of money. To take account of the time value of money Ofcom uses a discount rate.

In annualising lump sum payments, Ofcom assumes that the value of spectrum is equally distributed over the 20-year period, i.e. that the equivalent annual cost increases in line with inflation. This is a reasonable neutral assumption on a forward looking basis on the assumption that the value of spectrum also increases in line with inflation. However, as noted above, it is clear that the actual value of spectrum may fluctuate over time reflecting changes in the market and as new information becomes available and that Ofcom cannot simply assume that in the past spectrum valuations moved in line with inflation.

Ofcom applies a simple annuity formula to convert the lump sum payment to an equivalent annual charge, using a real post-tax discount rate.

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

However, because Ofcom uses a post-tax discount rate a separate adjustment needs to be applied to reflect the differences in the tax effect of a series of amortisation charges (which sum to the lump sum value) compared to a series of ALFs (which when discounted sum to the lump sum value).[16]

For the discount rate Ofcom has used a weighted average of estimates of the cost of debt and the cost of capital for mobile network operators, weighted 75:25, to reflect risk sharing.

Overall the approach adopted by Ofcom appears reasonable. However, when determining the discount rate, and in particular the cost of capital component, Ofcom has not taken account of its duties when determining the most appropriate value within the range of possible values. In particular, there are certain parameters, such as the equity market risk premium, for which estimates are inherently uncertain. A number of parameters will vary depending on the company for which the cost of capital is estimated. Other parameters, such as the cost of debt, can be estimated with a high degree of certainty but are relatively volatile. As such, Ofcom needs to make judgements in three areas:

- For parameters which are fundamentally uncertain, where in the range of plausible values Ofcom should determine the parameter;
- For company-specific parameters, the appropriate company or sample of companies to use to estimate the parameters; and
- For volatile parameters, whether a current, forward looking or backward looking estimate should be used and the 'window' over which the parameter should be estimated.

In other regulatory decisions requiring cost of capital estimates such as the setting of charge controls, Ofcom explicitly addresses these issues in the context of these particular decisions and Ofcom's corresponding

[16] This results in a circularity in the Cal caution as the TAF is both an input to the annualisation rate as well as a function of the annualisation rate. Ofcom could equivalently simply use a pre-tax cost of capital in the annualisation calculation to remove this circularity.

duties. However, the judgements made are necessarily specific to the corresponding decision, and cannot be simply transposed to a different regulatory matters.

For the purposes of setting ALF and in the light of the appeal, Ofcom must explicitly determine the appropriate cost of capital for this purpose, re-examining all of the components.

3.6.1 Ofcom's approach to estimating the discount rate

Cost of Debt in the discount rate

The cost of debt (yield to maturity – YTM) for an individual debt instrument can be calculated directly from the market price of the instrument. When assessing the appropriate cost of debt Ofcom then has to make three decisions:

- The appropriate term;
- Which issuers of debt to use; and
- The timing over which the cost of debt will be measured.

Ofcom has chosen to use a term of approximately 10 years, with some flexibility to take into account that bonds issued by the MNOs do not have maturity of precisely 10 years. This appears reasonable reflecting the fact that spectrum is a long lived asset and that MNOs' debt finance is largely of similar term.

Ofcom has used the following sources of data when determining the cost of debt:

- Sterling issued debt of the parent groups of the MNOs; and
- An index of 10 year BBB rated sterling denominated bonds.

Once again, this approach seems reasonable. The three groups for which debt yields are available have ratings between BBB- and BBB+. A key question is the whether the risk attached to the UK mobile operations on a standalone basis is higher or lower risk than the overall groups. A neutral assumption is that they are not (in the absence of any evidence one way or the other) and that an index of BBB bonds is appropriate.

While the current spot price should be the best forward indicator of the cost of debt, the spot price could be affected by short term technical factors and as such it is reasonable to look at prices over a longer window, but not such a long window that the result may be biased due to not fully including the latest information priced into the market. In terms of time period, Ofcom looks at information on yield over the last 12 months, which appears broadly reasonable.

The information then used by Ofcom to determine the cost of debt component is shown below.

Table 2 YTM on sterling debt with maturities of around 10 years, May 2018

	Credit rating	Debt maturity	Years to maturity	12 month average yield	12 month minimum yield	12 month maximum yield	Average (May 2018)
Vodafone	BBB+	2025	7	2.3%	2%	2.7%	2.5%
		2032	15	3.3%	3.1%	3.5%	3.3%
Telefónica	BBB-	2026	8	2.6%	2.2%	2.9%	2.7%
		2029	11	2.9%	2.5%	3.2%	3%
BT	BBB	2028	11	2.7%	2.2%	3.2%	3%
		2031	14	3.1%	2.9%	3.5%	3.3%
10 year BBB rated bonds		2028	10	2.6%	2.3%	2.9%	2.7%

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

Ofcom considers the appropriate YTM estimate to be within the range of 2.5% to 3.0%. The regulator then uses a value around the midpoint, 2.7%, as the pre-tax nominal cost of debt.

Accounting for the inflation risk premium and the estimated average corporate tax rate for the next 20 years, Ofcom gets a post-tax nominal cost of debt of 2.2%. From the CPI assumption, it then gets a post-tax real cost of debt of 0.2%. We do not question this approach.

The cost of capital component

Unlike the cost of debt, the cost of capital cannot be directly calculated from market prices. As such there is a greater degree of uncertainty around the cost of capital, and the choice of the cost of capital from within the range of potential values will need to take account of how the cost of capital is being used.

Ofcom has not carried out primary analysis to estimate the cost of capital but has instead used a cost of capital determined for a hypothetical MNO for another regulatory decision, the determination of mobile call termination charges. This raises three issues:

- Ofcom has not, and has not attempted, to show that the appropriate cost of capital used for a decision on setting mobile call termination charges is appropriate for the purposes of setting ALFs but simply refers to the 2015 Statement;
- The approach adopted in the MCT decision places greater weight on historical data than the approach used to calculate the cost of debt; and
- This difference in approach leads to a clear inconsistency between the cost of debt implicit in the cost of capital estimate and the cost debt used directly as one component of the discount rate.

Reliance on 2015 Statement for the use of the cost of capital determined for MCT

The 2015 Statement did examine the appropriate benchmark company to use for determining the cost of capital and determined that a hypothetical averagely efficient operator was the correct benchmark, which coincidentally is the approach used in the cost modelling underlying the setting of mobile call termination

charges. However, the statement did not further discuss the appropriate approach to determining the cost of capital for such a hypothetical operators or indeed whether the approach adopted for the then current MCT decision was appropriate from the purposes of determining ALF.

Given the uncertainty in estimating the cost of capital, the different use the cost of capital is put to (in the MCT case the cost of capital is used in an economic depreciation calculation in a cost model that is used to set a glide path for a charge controlled service) and the different powers and duties under which Ofcom regulated MCT and determines ALFs there is little reason to presume that the same point estimate of the cost of capital is appropriate for both purposes. Ofcom must provide greater justification for simply choosing a convenient value, particularly when that value was partially derived from BT's cost of capital for a quite different application.

Greater weight given to historical data in setting the cost of capital

When determining the appropriate cost of debt for the discount rate, Ofcom has used a 12-month window to determine the range of yields and then taken a central estimate.

When determining the cost of capital Ofcom has relied on much longer time series. In part this reflects that the data used to determine certain parameters such as the equity risk premium, are highly volatile while it is assumed that the underlying parameter is relatively stable over time. In this case a long window provides a more robust estimate of the underlying parameter than using a shorter time period.

However, Ofcom uses a long time series to estimate the real risk free rate (RFR) in the MCT decision. The reason for this approach is not explicitly stated in the MCT decision as Ofcom has simply taken the estimate from the March 2018 WLA decision.

Ofcom determined the appropriate level of RFR to be 0.0%. As Ofcom shows in its own analysis, the spot price RFR has been consistently negative since the end of 2011, with the current yield on index linked gilts around -2.0% at the time of the WLA decision.

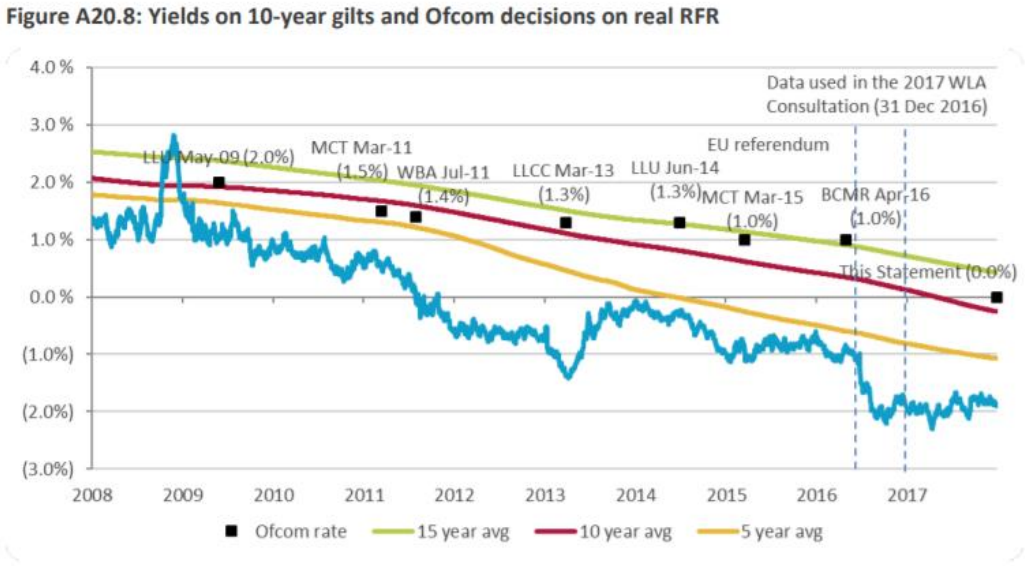


Figure 6. Time series of RFR[17]

In annex 20 of the WLA decision, Ofcom explains that its approach attempts to smooth the cost of debt for the purposes of setting charge controls and refers to values used by other UK regulators for the purposes of setting charge controls.

While this approach appears to contradict Ofcom's statement that they are attempting to set the cost of capital on a forward looking basis, the arguments Ofcom uses do not have a direct read across when determining the appropriate discount rate for setting ALF.

3.6.2 Inconsistency between components of the discount rate

The difference in approach between the estimate of the appropriate cost of debt to include in the discount rate, based on a 12-month window, and the cost of debt included in the (weighted average) cost of capital used in the MCT decision.

The cost of debt in the MCT decision is in a range between 4.3% and 4.8%, with the derivation shown below.

[17] Ofcom WLA Statement March 2018

Table 3 Consultation proposals on average efficient mobile operator

Component	Source	Value Low	Value High
Real Risk free rate	March 2018 WLA Statement	0.0%	0.0%
RPI forecast	Ofcom MCT Statement	3.3%	3.3%
Debt premia	Ofcom MCT Statement	1.0%	1.5%
Pre-tax nominal cost of debt		4.3%	4.8%

This is far higher than the actual cost of debt of between 2.5% and 3.0% used for the first component. The difference almost entirely reflects the use of a long term historical average for the RFR.

Ofcom neither identifies nor provides any explicit or implicit justification for deriving two very different ranges for the same parameter used as an input to the same discount rate. However, the fact that Ofcom explicitly used a 12-month window when setting the cost of debt rather than simply relying on other decision as it does with the cost of debt, this would seem to be the correct approach. Substituting this cost of debt into the WACC calculation, with the other parameters unchanged from the 2018 MCT decision reduces the discount rate and hence the estimated ALF.

3.6.3 Conclusion on annualisation

Ofcom's overall approach to converting lump sum valuations derived from auction data into a series of annual payments is reasonable. However, in determining the discount rate used from the range of potential values Ofcom does not appear to have taken into account its wider duties.

This is particularly apparent in Ofcom's use of a cost of capital determined in another decision, the 2018 MCT Statement, which itself relies on a determination of a risk free rate from a third decision, the 2018 WLA Decision. Ofcom's rationale for the choice of this risk free rate, and in particular the time period over which this is calculated, reflects the circumstances relevant to setting charge controls for BT's fixed services in the WLA market, not those relevant when determining the suitable level of ALF.

Reliance on determinations of the cost of capital for other purposes leads to internal inconsistency in the cost of debt used, with Ofcom proposing a value of 2.7% while at the same time using a cost of capital with an implicit range of the cost of debt from 4.3% to 4.8%.

3.7 Conclusions on economic analysis

Ofcom's approach to assessing the lump sum valuation of the 900 MHz and 1800 MHz bands suffers from significant limitations, and Ofcom does not appear to have fully appreciated this, and has certainly not consulted adequately on those assumptions and limitations. The benchmarks, particularly in the case of 900 MHz, are limited in number and extremely variable. Ofcom is wrong to have simply assumed an increase in value in line with CPI: it could well be that after looking at the drivers of spectrum value between 2013 and the present, Ofcom concludes that CPI is a prudent value. However, this analysis is seemingly absent from the consultation.

In turning these lump sum values into an ALF, Ofcom's approach is on the whole correct, but it is absolutely inappropriate to then use a discount factor using an off-the-shelf WACC from an earlier analysis, without any justification of why this estimate is appropriate. This lack of rigour is laid bare in the fact that two values of operator debt are ultimately used in deriving the discount factor. Ofcom must address these issues, given the high value of money at stake (£4Bn over 20 years).

4. Draft regulations

Vodafone has reviewed the draft Regulations in Annex 6 to the consultation and considers they align with Ofcom's intent.