Assessing Ofcom's conclusion of whether there are asymmetric risks in setting the appropriate level of ALF

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Tables & Figures

Executive summary

In its proposals Ofcom has explicitly chosen to set the ALF for 900 MHz and 1800 MHz spectrum at its "best estimate" of the market value. In doing so it has considered whether the presence of asymmetric risks from setting an ALF above the true market value would lead it to choose a "conservative" estimate of ALF below its best estimate[1]. Ofcom's preliminary conclusion[2] was that *"it is not appropriate to set ALFs either below or above the levels implied by our best estimates of market value for reasons of spectrum efficiency"*. This paper considers Ofcom's rationale and justification for its preliminary conclusion.

Ofcom recognises that there may be an asymmetric risk (i.e. the welfare losses from inadvertently setting an ALF above the market value might be greater than the losses of setting it below the market value)[3]. However, it believes the magnitude of the risk is (a) small and (b) is "*significantly mitigate*[d]"[4].

We understand Ofcom's position to be as follows:

(a) It accepts there would be large costs if spectrum were to lie fallow[5];

(b) It believes that the probability of spectrum lying fallow is, however, small because it believes that even if it set a price significantly above the market price, this would still be below the private value of spectrum holders and so would not result in the return of unused spectrum to the Government.[6]

(c) It believes that the welfare gains if ALFs set at market values were to drive the reallocation of spectrum to more efficient users could be significant.[7]

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1 The Consultation Annex 9.

2 In making its conclusions Ofcom was mindful of its objectives: "o*ur principal duty to further the interests of citizens, and the interests of consumers where appropriate by promoting competition*"; "*duties relating to the optimal use for wireless telegraphy of the electro-magnetic spectrum*"; "*the desirability of encouraging investment and innovation*"; and "*the desirability of encouraging competition, having regard to the interests of consumers in respect of choice, price, quality of service and value for money.*" Consultation paragraph 3.35.

3 The Consultation paragraph A9.30. Ofcom notes that it "*agree*[s] *that the potential for the level of ALF to lead to inefficiency in allocation is likely to be greater where ALF is (inadvertently) set too high than where it is (inadvertently) set too low".*

4 The Consultation paragraph A9.4.

5 As illustrated in the Consultation Figure A9.2.

6 The Consultation paragraph A9.30. "*We therefore consider that there is a risk that efficiency-improving re-allocation of spectrum will be foregone if ALF is set below market value.".*

7 The Consultation paragraph A9.34 to A9.38.

(d) It does not consider that setting ALFs above market value will materially impact investment incentives[8].

In this document we explain why we disagree with each of Ofcom's conclusions. In particular we consider that:

- There is a substantial cost incurred by society if spectrum that could be put to productive use is allowed to lie fallow. Ofcom's chosen approach for setting ALF is highly uncertain and therefore this risk should not be discounted, as Ofcom has chosen to do. While existing users are likely to have a higher value of spectrum than alternative users, the difference between the market price, and the existing user's private value (and hence the 'margin of error' Ofcom has, before spectrum is left fallow) is unknown and may change over time, for example when external 'shocks' mean that operators re-evaluate the value of their existing spectrum holdings. Given the uncertainty inherent in estimating ALF and uncertainty over the difference between existing users' current and future private value and the current market value there remains a risk that setting an ALF at the current best estimate of market value could lead to productive spectrum being left fallow in the future.

- The likelihood of efficiency enhancing re-allocations is small because sunk investments that existing users of spectrum will have made, mean that they will tend to value their spectrum more than alternative users. Existing users will have already invested to optimise their networks and commercial strategies to use the spectrum. To the extent that potentially welfare enhancing reallocations may be possible, spectrum trading is likely to lead to efficient outcomes without the need to set high ALF values and the risks associated with them. Ofcom's reasons for dismissing trading – that few trades have occurred and there may be 'strategic' reasons for this – simply confirm that spectrum is already in the hands of the highest private value users. Ofcom provide no evidence to suggest that trading is inefficient, or that ALF would improve matters if it were.

- Ofcom's approach will impact investment incentives. Rational investors may consider that Ofcom's objectives are to expropriate shareholder value, or at least that Ofcom is unconcerned if it does so. Contrary to Ofcom's claim, this is likely to have a significant negative impact on dynamic efficiency. If Ofcom were to take a more measured approach which still used an estimate of market value to set ALF, but recognised uncertainties in identifying the true market value and the associated risks, and so committed to set ALF conservatively, then rational investors would be reassured that there was not

8 The Consultation paragraph A9.39 to A9.40.

an upward bias or revenue maximisation bias in its approach. Any shortfall in efficient investment in the UK mobile market would both have very significant adverse consequences and would mean that Ofcom was failing to discharge their recently acquired duties[9].

- We show elsewhere that Ofcom's confidence that it could use the recent UK auction prices and benchmarking data to derive an accurate estimate of market clearing values for 900 MHz and 1800 MHz spectrum is misplaced. The possibility of material error, which Ofcom has already recognised, is in fact far greater than Ofcom has supposed. In these circumstances, Ofcom has already accepted that greater account should be taken of asymmetric risks, even if Ofcom were otherwise to adhere to its existing position on asymmetric risk. We therefore show that Ofcom should adjust its position both because its framework for analysing risk is wrong and because the possibility of error in setting ALFs turns out to be significantly greater than Ofcom supposed.

In the sections below:

- we summarise the framework that Ofcom has used to consider whether there is a significant asymmetric risk associated with setting the ALF at Ofcom's best estimate of market price;
- we next consider the likelihood of efficiency enhancing re-allocations;
- we then assess Ofcom's approach to considering the risk that spectrum is inadvertently allowed to lie fallow; and
- finally, we consider whether Ofcom's approach is likely to be perceived as having an upward bias and demonstrate how this can be expected to have a detrimental effect on dynamic efficiency.

9 See for example Section 3(4) of the Communications Act 2003.

1 Framework for assessing ALF whether there is a significant asymmetric risk

Ofcom proposes to set an ALF which it considers is consistent with its duties to promote efficient use of spectrum. We therefore begin by summarising how, when set correctly, ALFs can support economic efficiency.

1.1.1 Efficient allocation

Allocative and productive efficiency will occur when resources are allocated in such a way such that overall (static) economic welfare is maximised. An allocation is efficient if there is no other allocation which increases overall welfare. Productive efficiency is achieved where no alternative mix of inputs can produce output at lower costs. In addition, regulators should also promote dynamic efficiency, to ensure that in the long run, the industry continues to operate efficiently and promotes the rapid development of new products and services. This requires that incentives to invest are not adversely affected by regulation. There is often some element of trade-off between these objectives and regulators must balance them.

Static efficiency

Static efficiency requires that all spectrum with value be used. If valuable spectrum is not used, then this will either result in some unmet demand for that spectrum, with a consequent loss of allocative efficiency, and/or the cost of production being unnecessarily raised, resulting in a loss of productive efficiency.

In principle, allowing spectrum trading should enable the efficient allocation of spectrum, as holders of spectrum will face the full opportunity cost of holding their spectrum (the opportunity cost being the proceeds they could gain by selling it to another user who values it more highly than they do).

In the absence of spectrum trading, annual licence fees can, in principle, lead to an efficient allocation of spectrum by making it uneconomic for sub-optimal users to continue to use the spectrum, in which case they would be expected to return it to the Government.

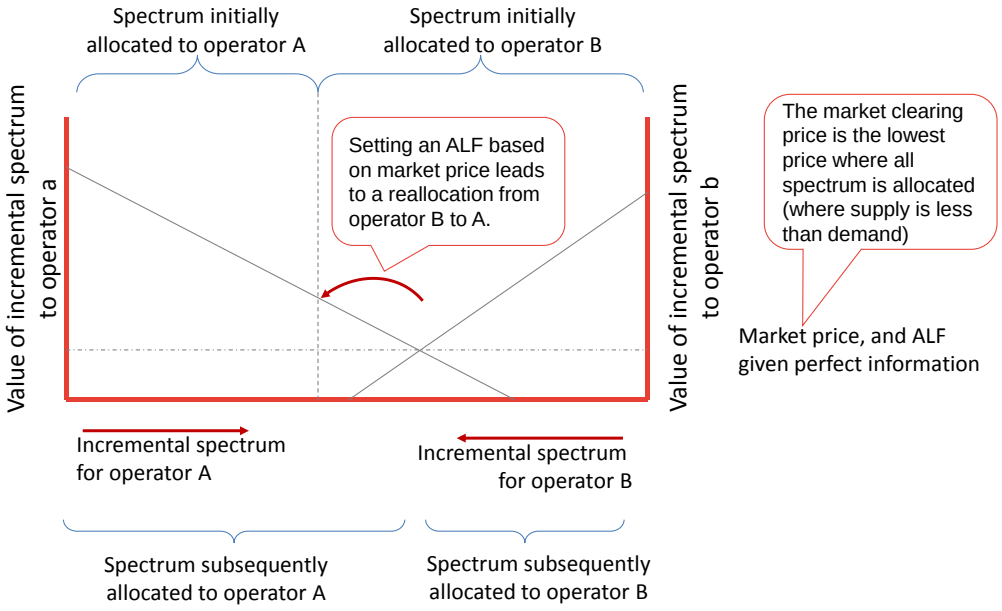
This is because when valuing spectrum, operators will take account of the ALFs associated with the spectrum, which will reduce the net value of the spectrum. The private value of a block of spectrum will be the net present value of the cash flows from using the spectrum less the net present value of the associated ALFs. If the forward-looking cost of the ALFs exceeds the value derived from using the spectrum, then the private value of the spectrum would be negative and the operator would seek to dispose of the spectrum. (We note below that as spectrum trading is permitted, operators already have the incentive to dispose of an increment of spectrum where its private value is below the market value.

Therefore, ALF set below the true market price has no impact on the efficient allocation of spectrum.)

In order to ensure that sub-optimal users vacate the spectrum, the licence fee should be set at a level that marginally exceeds the value of the spectrum to sub-optimal users. And in order to ensure that the spectrum is acquired and/or retained by the optimal users (i.e. those users that generate the most economic value), the price must be set below the marginal value for those users.

Setting the ALF to reflect the market value achieves this optimal allocation as illustrated below. In the figure, operators A and B have initial spectrum allocations. If an ALF is set to the market value of spectrum, then spectrum allocated to operator B will be released and would then be re-allocated to operator A.

Figure 1. ALFs can enable reallocation of spectrum



However, as above, this outcome can also be achieved without the introduction of ALFs, when, as is the case in the UK, spectrum trading is allowed. This is because spectrum trading will lead to operators recognising the opportunity cost of holding the marginal unit of spectrum: if another party values that marginal unit more highly, a trade would take place, so promoting an efficient allocation of spectrum.

Framework for assessing ALF whether there is a significant asymmetric risk

The impact of sunk investments

In general, a holder of spectrum, who has made previous investments in relation to the spectrum it holds, may have a higher value for the spectrum than the marginally excluded user who is not able to benefit from such investments. This will reflect the competitive advantage resulting from previous, sunk investments.

For example, once an operator has sunk investments in network equipment which is reliant on a given spectrum band, it may continue to pay ALFs even if they were raised considerably above the market value as returning the spectrum would leave the unrecovered value of the sunk assets stranded. Similarly other sunk investments, such as in brand or in the customer base, will tend to increase operators' private values.

1.1.2 Setting ALFs in the context of uncertainty

If a regulator had perfect information such that it could perfectly observe the private values of all potential holders of spectrum, it could use this information to derive the value for the marginal increment of spectrum (equivalent to the private value of the marginal excluded user). Setting prices according to this value would incentivise operators to efficiently use spectrum in the same manner as an effective trading regime.

However, Ofcom recognises that regulators do not have perfect information and that there is some margin of error around a best estimate of the market value. This means that it is likely that Ofcom's best estimate of market value will lie above or below the true market value. Indeed in the context of assessing the private values of spectrum in different bands for the purpose of setting ALFs Ofcom has heavily relied on just one data source: the 2013 auction for 800 MHz and 2.6 GHz. For the reasons set out in the Frontier UK auction report[10] the information on the market value of 800 spectrum that can be derived from the UK auction is limited. Furthermore in order to estimate the market value of 900 spectrum in the UK, Ofcom has had to rely on a small number of international benchmarks of the absolute and relative value of 900 spectrum. These benchmarks show large unexplained variability, meaning that there is a material risk that the estimates of the market value of 900 spectrum derived using these benchmarks will differ materially from the true market value.

Given this uncertainty, Ofcom accepts that it should consider whether there is an asymmetry in the risks of setting an ALF which is either above, or below the true market value. Where such an asymmetry exists in setting an ALF (i.e., where the welfare losses as a results of spectrum lying fallow or dynamic efficiency being effected are greater than the potential gains from re-allocating spectrum to a

[10] Frontier Economics: Deriving Market Clearing Prices for 800 MHz Spectrum from the UK 800MHz/2600GHz Auction, January 2014

marginally more efficient user), it is more efficient (and hence consistent with Ofcom's statutory "*duties relating to the optimal use for wireless telegraphy of the electro-magnetic spectrum*"[11]) to set an ALF based on a conservative estimate of market value rather than a central estimate of market value.

While Ofcom accepts the principle that an asymmetric risk would lead it set an ALF on a conservative basis, it does not believe, that there is a risk that its ALF will result in welfare harming outcomes. In other words, it accepts that the harm could be significant, but it believes that the probability of that harm arising is small. It therefore proposes to set ALF based on its central estimate of market value.

In assessing the potential risks, Ofcom compares the risk that it inadvertently sets ALF above and below the true unobservable market value. If it sets ALF above the market value, then it recognises that spectrum could be returned and it could take some time to reallocate it to the efficient user. In this case, society would lose the potential welfare benefits that could be enjoyed if the spectrum was put to productive use. In addition, even if spectrum is not returned, an above market value ALF (or the perception that ALF may be set above market value) could reduce investment incentives and so harm dynamic efficiency. For example Ofcom note:

> *"If the level of ALF has the effect of appropriating the legitimate return on sunk investment (whether or not ALF is so high that it also makes licence holders return their licences), then this could increase the perceived regulatory risk and dampen the level of future investment in the sector in a way that is sub-optimal."*[12]

Conversely, if Ofcom sets the ALF below the true unobservable market value then potentially efficiency enhancing reallocations could, if spectrum trading were not permitted, be foregone (though note below that as spectrum trading is permitted, this risk is unlikely to arise).

The precise balance of the costs and risks will depend on the size of welfare loss compared with the potential for incremental welfare gains through reallocation of marginal spectrum. Where spectrum is reallocated to a different user there is a welfare cost associated with clearing the band, awarding spectrum and for new users to reconfigure their network (labelled *a* in **Figure 2** below). This should be set against the stream of benefits from reallocating it to the efficient user (labelled *b* in **Figure 2** below). Such reallocations will be welfare enhancing where the value of *a* is small (for example because reallocation is quick and costless); and where the value of *b* is high (for example where there is a high probability that the alternative user is significantly more efficient).

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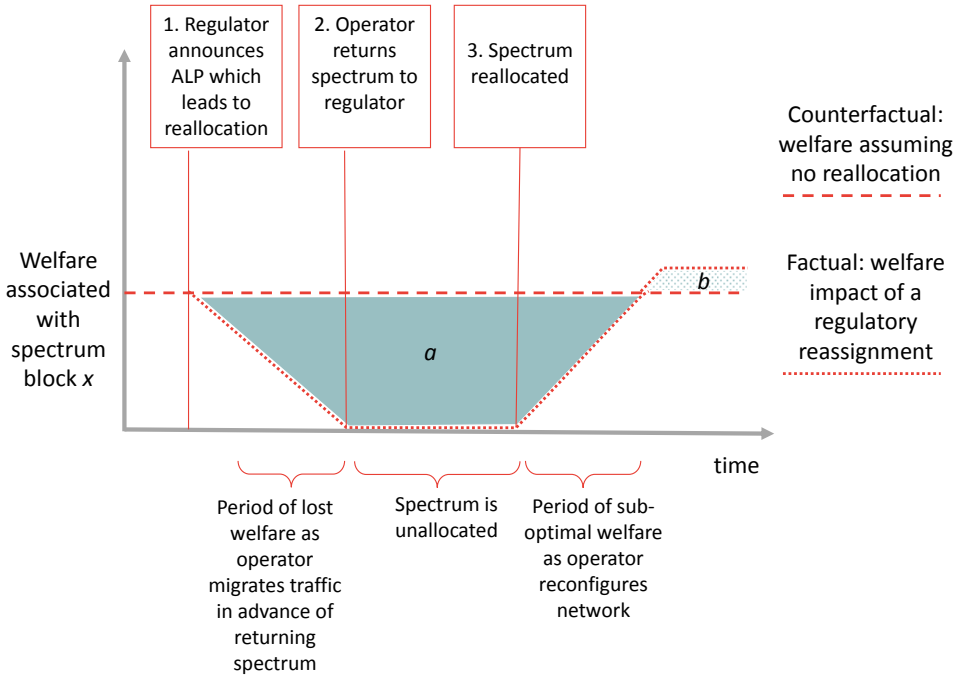
11 The Consultation paragraph 3.35.

12 Consultation paragraph A9.40.

Framework for assessing ALF whether there is a significant asymmetric risk

Figure 2. Welfare impact of reassigning spectrum to different user



The two sections below consider Ofcom's approach in assessing:

- the likelihood that reallocation could be welfare enhancing; and
- the costs that allowing spectrum to lie fallow is high and given uncertainty in Ofcom's approach the risk cannot be discounted; and explain why, in each case, we believe Ofcom has erred in its decision making.

The paper then considers the possible impact on dynamic efficiency of setting ALF above market levels.

1.2 There is a low likelihood that reallocation could be welfare enhancing

In assessing whether costs of inadvertent error are asymmetric, and hence whether it would be efficient to estimate the market value on conservative basis, it is necessary to assess the probability that an alternative user could have a higher value for the spectrum and the possibility that setting the ALF in a regime where trading exists would promote a reallocation. Where there is a low probability that spectrum could be efficiently reallocated, then the benefits of setting a price close

to the true market value are likely to be outweighed by the risks to dynamic efficiency and the costs of allowing spectrum to lie fallow if it is returned.

Even where there is a risk that an alternative user has a higher valuation than the existing user, market mechanisms such as spectrum trading are as likely to lead to an efficient result (or possibly more efficient result) than setting an ALF at the "best estimate" of market price, but without the attendant risks of inadvertently allowing productive spectrum to wastefully lie fallow.

We explain below that Ofcom's own reasoning suggests it is unlikely that an alternative user would have a higher valuation of spectrum than an existing user, and that therefore there are unlikely to be significant benefits to reallocation of spectrum. Furthermore we disagree with Ofcom's justifications for rejecting spectrum trading as a way to mitigate risk of uncertainty.

1.2.1 It is likely that that the current user is the highest value user of spectrum

Ofcom notes that where an alternative user of a marginal increment of spectrum has a higher valuation of spectrum, then reallocation could result in welfare improving benefits[13]. These welfare benefits could, in some circumstances, outweigh the costs of allowing productive spectrum to lie fallow while the spectrum is reassigned. This would be the case where the alternative user has a much higher valuation for the spectrum.

Therefore where there was a high probability that an alternative user had a much higher valuation than an existing user, then the positive benefit of reallocating spectrum could outweigh any potential costs of allowing it to lie fallow while reallocating it. However, spectrum trading (which is currently in place) would also support this efficient reallocation. Thus, where there was a low probability that an alternative user has a much higher valuation for the spectrum than an existing user, or where trading is in place, then there are unlikely to be significant incremental welfare benefits of setting the ALF close to the market value as it would be unlikely to lead to efficiency enhancing spectrum reassignment.

Ofcom accepts that the value to existing holders of their spectrum will derive from sunk costs. For example it notes that: *"If the licence holder had made sunk investments, this could lead it to have a higher valuation of the licence."* [14]

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13 The Consultation paragraph A9.34 "*However, there are also risks of inefficient use of spectrum from setting ALF too low if, as a result, the spectrum is not transferred to the highest-value user.*"

14 See the Consultation paragraph A9.35. Indeed Ofcom use the fact that existing holders of spectrum will have a higher value than alternative users to justify its approach to setting an ALF based on the market price. Ofcom reasons that it could set an ALF up to an existing user's private value of the spectrum, including any sunk investments that the existing holder has made in the spectrum.

Framework for assessing ALF whether there is a significant asymmetric risk

Furthermore a marginal increment of spectrum is of most value to holders of contiguous spectrum. This is because there are efficiency gains that can be made by using contiguous spectrum. For example, current 3G and 4G technology require that contiguous spectrum is used. This means that if one operator returned a marginal increment of spectrum (say 2*2.5MHz of 900 MHz[15]), this would only be of value to an operator with a contiguous holdings of 900 MHz spectrum. If the marginal increment of spectrum was not contiguous with another user's holdings (for example because it is next to a guard band or other unused spectrum) it is likely that it would be less valuable to an alternative party.

Therefore, based on Ofcom's reasoning on sunk costs, and the fact that the an alternative user may not have contiguous spectrum holdings to the marginal (returned) increment of spectrum, it is likely that in most cases the existing holder of spectrum will have a greater value for a marginal increment of 900 MHz or 1800 MHz spectrum than an alternative operator. This is because the alternative operator would not just have to be more efficient, or have some advantage which enables it to generate more revenues from the marginal increment of spectrum, but they would have to invest in equivalent amounts of sunk costs as the existing holder (for example in order to reconfigure their network to optimally use the incremental spectrum) **and** would have to have spectrum holdings contiguous to the marginal returned increment of spectrum.

Notwithstanding that Ofcom accepts that existing users are likely to have invested in sunk assets and are therefore likely to have a higher value for a marginal increment of spectrum such that a market value ALF is unlikely to lead to significant welfare enhancing reallocation[16], Ofcom notes that the "*identity of the most efficient user has the potential to change over time and is difficult for the regulator to accurately assess.*" While Ofcom agrees it may be *difficult* to determine with certainty the identity of the most efficient user of marginal spectrum, Ofcom should recognise that the logic of its approach implies that the there is a *high probability* that the existing user has an higher value for marginal spectrum than an alternative user.

This is confirmed by the lack of trading of mobile spectrum over time in markets around the world where such trading is allowed. Where trades have occurred, they have tended to involve spectrum which is not already being exploited by operators and is marginal to their overall activities. In this case, Ofcom is seeking to set ALFs for 900 MHz and 1800 MHz spectrum which represent core

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15 As in the example that Ofcom provide of reallocation in the 900 MHz spectrum as a result of the auction of spectrum in the Netherlands, in which KPN and Vodafone won 2x10MHz each (a reduction from their pre-auction holdings of 2x12.5MHz), while T-Mobile increased its holdings from 2x10 MHz to 2x15MHz.. Consultation paragraph A9.24.

16 Ofcom notes that "*the extent that there is some value associated with sunk investment in the existing licences, the point at which ALF would trigger a return of spectrum should be that much higher*". The Consultation paragraph A9.4.

holdings of the UK operators. We note that such a reallocation would only be welfare enhancing if (i) Ofcom were able to perfectly estimate ALF; (ii) the risk of spectrum lying fallow for a prolonged period was low; and (iii) the private value of the alternative users was significantly higher than existing users.

1.2.2 Ofcom's analysis should recognise the possibility that spectrum trading mitigates any inefficiencies associated with existing allocations

Ofcom has allowed mobile operators to trade their spectrum rights since June 2011[17]. However, Ofcom's counterfactual analysis explicitly rejects the possibility that trading can be used to improve spectrum outcomes. Ofcom recognises that where trading is possible then it can mitigate the risk that spectrum is allocated inefficiently[18]. Trading also has other advantages over an administrative reallocation processes, not least that it reduces the risk of time consuming administrative processes and allows reassignments of a number of spectrum blocks more easily.

As trading is possible, then operators have full incentives to ensure that spectrum is not allocated inefficiently as they face the full opportunity cost of holding the spectrum. Therefore ALF has no role in enabling efficient allocations and its only role is a transfer from mobile operators to government. This means Ofcom could set an ALF based on a conservative estimate of the market value and be satisfied that downside risk of inefficient allocations related to the ALF being below the true (unobservable) market value is mitigated. This alone should make it clear that there is an asymmetric risk in setting spectrum prices above and below market value. There is no risk to efficiency of setting prices below market value, as trading will anyway promote an efficient spectrum allocation. However, setting spectrum prices above market value will negatively affect dynamic efficiency and could, in certain circumstances, lead to the return of spectrum and it lying fallow – a situation which, if it occurred, would clearly reduce static efficiency.

However, in rejecting the role that trading can play to mitigate efficiencies Ofcom considers that "*efficiency-improving re-allocation of spectrum will be foregone if ALF is set below* [Ofcom's "best estimate" of] *market value*"[19]. This is because:

- *"there […] is the potential for strategic considerations to affect the efficiency of trading*; [and …]
- *To date, the only spectrum trade that has occurred has been the divestment by EE of 2x15 MHz of 1800 MHz spectrum, as a merger condition*"[20]

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17 Consultation paragraph A9.29.

18 Consultation paragraph A9.30.

19 Consultation paragraph A9.30.

Framework for assessing ALF whether there is a significant asymmetric risk

We consider that Ofcom is wrong to reject the possibility that spectrum trading enables efficient allocation. The "strategic considerations" that Ofcom refers to presumably relate to the fact that an operator whose intrinsic valuation of spectrum is below the market value of spectrum may choose not to trade spectrum where it gains additional strategic value by preventing it from being used by a competitor. However, this concern relates equally to Ofcom's other forms of market based spectrum allocation and it is not therefore a justification for rejecting the role that spectrum trading can have to enable the efficient allocation of spectrum compared to setting ALF at market value in order to promote efficient allocation. Ofcom also notes that there has only been one trade since its decision to permit trading (and this trade was a condition of the Orange T-Mobile merger). This observation is consistent with the fact that existing holders of spectrum are the most efficient holders of spectrum (which in turn is consistent with Ofcom's view that sunk investments made by existing holders of spectrum generate incremental value for operators). It is not necessarily a reason to suppose that spectrum trades cannot happen.

Therefore in assessing whether ALF should be set based on the best estimate or a conservative estimate of market value, Ofcom should give due weight to the fact that spectrum trading mitigates the risk associated with inadvertently setting ALF below the true market value.

1.3 The cost of allowing spectrum to lie fallow is high and the risk cannot be discounted

There is a substantial cost incurred by society if spectrum that could be put to productive use is allowed to lie fallow. Ofcom's chosen approach for setting ALF is highly uncertain, particularly given the reliance it places on the UK auction results in determining market values, and therefore this potential risk cannot be discounted in the way that Ofcom believes. While existing users of spectrum are likely to have a higher value of spectrum than alternative users, the difference between the market price and the existing user's private value is unknown (we note below that Ofcom is wrong to rely on the results of its recent auction to assume that there is a significant difference between private values and market price). Given the uncertainty inherent in estimating ALF and greater uncertainty over the difference between existing user's private value and the market value, there remains a risk that ALF could be set higher than existing users' private values, hence leading to spectrum lying fallow. If this were to occur it would have a significantly detrimental effect on welfare

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20 Consultation paragraph A9.29.

1.3.1 The cost of allowing productive spectrum to wastefully lie fallow is high

Ofcom provides an illustrative example[21] which highlights the key variables which will affect the costs of spectrum lying fallow on the one hand, and inefficient allocations of spectrum on the other. In Ofcom's example, an alternative user of a marginal increment of spectrum values it 20% more than an existing user, and a reallocation of spectrum means it is fallow for three years.

Ofcom's approach demonstrates that even where it has perfect information, the cost of allowing spectrum to lie fallow is high. In Ofcom's example where an illustrative increment of 2*5 MHz spectrum had a social value of £500m p/a, the cost allowing spectrum to be unused for three years was £1.4bn. Given these costs, even with perfect information, it is only under certain conditions that a reallocation to a more efficient use will be welfare improving outcome (where the re-award process is quick, where the alternative user has a significantly higher valuation than the current user). In the context of uncertainty in setting ALF, there is a risk that an inadvertently high ALF could lead to spectrum inadvertently lying fallow (in Ofcom's example a three year fallow period following the return of spectrum would incur a cost of £1.4bn with no efficiency gain).

Small increases in the time that spectrum is wastefully left fallow incur huge costs on society. Ofcom's illustrative example has assumed three years is a reasonable estimate of the fallow period that would result from spectrum being returned (one year to clear the spectrum, one year to re-award the spectrum, and one year for a new operator to reconfigure their network). This could be a low estimate (for example Ofcom's 4G auction for 800 MHz spectrum took six and half years from first consultation to the start of the auction). Regulatory processes by administrative bodies to award spectrum necessarily take time. Stakeholders are consulted, consultation responses are considered, decisions may be challenged, and judicial authorities need time to consider any legal challenges. Such administrative processes ensure that administrative authorities' decisions are properly reasoned and evidenced. But this means even small unforeseen increases the time taken to re-award spectrum increase the cost on society of wastefully allowing fallow spectrum.[22]

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21 Consultation Figure A9.2.

22 Ofcom's proposals do not discuss how it would re-award spectrum that is returned to it as a result of an ALF that is inadvertently set too high. Furthermore, if the marginal increment of spectrum is subsequently awarded at a price which is lower than the existing ALF (indicating that the existing ALF is inefficiently set above the market price for spectrum in the band), Ofcom has not specified how it would reset the level of ALFs for spectrum in the band. Given these factors Ofcom's implicit assumption that spectrum could be re-awarded quickly (for example within a year) appears also to have significant uncertainty associated with it.

Framework for assessing ALF whether there is a significant asymmetric risk

1.3.2 Ofcom's approach to estimate market value is characterised by uncertainty

Even though existing users are likely to have a higher value for spectrum than alternative users, given Ofcom's approach is characterised by uncertainty, the risk that the ALF is inadvertently set above existing user's private value cannot be discounted entirely.

Ofcom has not assessed the probability of measurement error in defining ALF. But it readily concedes that its approach is one based on judgement rather than any rigorous estimation.

Ofcom's analysis assesses the "[l]*ikelihood that ALF could be set at a level which would lead to inefficient fallow period*"[23]. Such analysis is key to understanding the nature of the risk. If there is likelihood that Ofcom inadvertently significant over-estimates the true value of spectrum then there is likely to be a proportionally greater harm as it could lead to a large amount of spectrum being returned, by a higher number of operators, across a number of bands. While existing users would be likely to have a higher value than alternative users, the scale of this difference in the case of the 900 MHz and 1800 MHz band is unknown, with Ofcom appearing to be mainly relying on one data point (its auction of 800 MHz spectrum). We show elsewhere that Ofcom's confidence that it could use the recent UK auction prices and benchmarking data to derive an ALF for 900 MHz and 1800 MHz spectrum is misplaced. Therefore, the possibility of error, which Ofcom has already recognised, is in fact far greater than Ofcom has supposed.

Ofcom has not made any assessment of the likelihood or magnitude of any potential measurement error using its proposed approach (for example by estimating confidence intervals around its point estimate of market value). We do not know how or whether Ofcom will now adjust its approach in light of the deficiencies we identify in our current submissions. Nor do we know how Ofcom might ultimately determine ALF rates as a result. But it seems clear that any approach available to Ofcom will have very significant uncertainty and risk of error associated with it. This suggests Ofcom must consider the risks of inadvertent error leading to spectrum being left fallow where it is currently in its most efficient use. Even if the likelihood of this may to some extent be limited (as existing users of spectrum are likely to have a higher value for an incremental of marginal spectrum), the costs to society would be significant if this was to occur. As such, Ofcom should take greater account of this in its analysis and determination of an appropriate ALF price. This is particularly because there are no efficiency costs from setting ALF below market value given the availability of trading.

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23 The Consultation paragraphs A9.33 to A9.38.

1.3.3 Ofcom exaggerates the scope for the costs of fallow spectrum to be mitigated

Ofcom asserts that the risk of inadvertently setting ALF too high (and hence the potential for an asymmetry in risk of setting ALF) is mitigated by two factors. First it believes that the difference in the prices paid and winning bids in the 800 MHz and 2.6 GHz auction imply that the risk that it could inadvertently set an ALF for the 900 MHz and 1800 MHz band above operator's private value is "substantially mitigated". Second, it makes a number of assertions related to the relatively low value of marginal spectrum compared with infra-marginal spectrum. We explain below why Ofcom is wrong to believe these factors mitigate the risks that associated with productive spectrum to lying fallow if ALF is inadvertently set too high.

The 4G auction results do not imply a significant difference between the private values of the marginal and marginally excluded user of 900 MHz and 1800 MHz spectrum

Conceptually, the market value of an increment of spectrum (for example 2*2.5 MHz of 900 MHz spectrum) is equivalent to the private value of the increment for the marginally excluded user. In order to assess whether Ofcom had significant latitude to set ALF above the market value without risk that spectrum could be returned and potentially lie fallow Ofcom should assess the difference between the market value and the actual user's private value of the increment of spectrum. To estimate this difference Ofcom has relied on the 2013 4G auction outcomes. Specifically it has assumed, with no justification or analysis, that the difference between operators' private value of the marginal increment of 800 MHz and 2.6 GHz spectrum, as revealed in the auction, and the prices paid (i.e. the value of the marginally excluded user of an increment of 800 MHz and 2.6 GHz spectrum), is applicable to the 900 MHz and 1800 MHz bands[24].

Ofcom is wrong to rely on the differences between the prices paid and winning bids in the 800 MHz and 2.6 GHz auction to assume that the risk that it could inadvertently set an ALF above existing user's private value is "*significantly mitigated*"[25] (it notes winning package bids in the auction were around 80% to 160% higher than package prices paid). Despite the fact that this assumption appears central to its view that the potentially significant costs associated with spectrum lying fallow are significantly mitigated, we note that Ofcom has not provided any explanation for why it believes that the relationship observed between private and market values for large packages of spectrum in the 800 MHz and 2.6 GHz auction should generally reflect the relationship between

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24 Consultation paragraphs A9.36 to 9.38.

25 Consultation paragraphs A9.34 to 9.38.

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private and market values for increments of existing 900 MHz and 1800 MHz spectrum. There are reasons to believe that the relative difference between private values and market values for incremental 900/1800 MHz spectrum will be much smaller than that observed between packages of 800 and 2.6 GHz spectrum in the auction:

- In general it would be expected the private value of spectrum will decrease with the overall size of spectrum holding with the result that the difference between private and market values for marginal spectrum will be much lower than the average for large packets of spectrum (see figure 2 Frontier Revising Annual Licence Fees December 2013);

- Both the 800 and 2600 spectrum available in the auction provided capabilities that were not previously available - the ability to roll out LTE in low frequency spectrum and the availability of large contiguous blocks of spectrum respectively. As such the packages would attract a private value premium which would not apply to 900/1800 spectrum at the margin.

- There is empirical evidence from international benchmarking that operators' private values for 1800 and 900 spectrum may be considerably lower than the private bids in the UK auction would imply. For example in Spain, in the most recent auction[26] Vodafone did not bid for incremental 900 spectrum at a reserve price considerably lower than their bids for 800 spectrum in the UK auction.

- There is empirical evidence that NRAs in other EU jurisdictions have mis-estimated operators' willingness to pay for spectrum with the result that spectrum has lain fallow for a period of time[27].

Therefore, Ofcom is wrong to assert that it can substantially mitigate the risk of spectrum lying fallow as a result of inadvertently setting ALF too high by relying on the outcome of the 800 MHz and 2.6 GHz auction, and it should therefore accordingly reassess the risk that inadvertently setting ALF high could cause spectrum to lie fallow.

Ofcom's assertions that risks about the relatively low value of marginal spectrum are unfounded

Ofcom makes a number of assertions related to the relatively low value of marginal spectrum compared with infra-marginal spectrum which it considers mitigate the risk of spectrum lying fallow:

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26 November 2011

27 For example the recent award of 1800 MHz spectrum in Ireland where no bids were made despite ComReg having recent relevant auction data,

- the value of the marginal increment of spectrum[28] is below the value of infra-marginal spectrum, therefore the cost of marginal spectrum lying fallow is relatively low[29];
- the marginal value of spectrum to an existing holder is below the market value[30] hence a reallocation would be welfare enhancing;
- the value of a marginal increment of spectrum to an alternative user is generally above the value of an existing user[31].

Ofcom's assertions are unfounded or would appear to lack logical rigour.

First, the fact that the private value of marginal spectrum is lower than the private value of infra-marginal is an uncontroversial observation. Likewise the social value of marginal spectrum is likely to be lower than the social value of infra-marginal spectrum.

However, this does not mitigate the impact of the asymmetry, which relates to the high cost of a marginal increment of spectrum lying fallow compared to the low expected welfare benefit as a result of reallocation of the marginal increment of spectrum. It does not relate to the difference between the value of marginal spectrum as opposed to infra-marginal spectrum. To the extent that the social value of spectrum can be approximated by a multiple of a user's private value of

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28 Ofcom refers to infra-marginal spectrum as spectrum required to be a "credible competitor" or spectrum to "support innovative services".

29 Ofcom note for example: "*the spectrum licences that are most at risk from being handed back in response to ALFs are those which are likely to be generating least value in their present use. Even if the typical social value of a 2x5 MHz block of spectrum were around £500 million, this might over-state the cost of a fallow period.* … [*I*]*f any spectrum is relinquished in response to ALF this is more likely to be spectrum which that operator does not require to be credible, so this return of spectrum is relatively unlikely to have a significant impact on the competitive dynamic.*"; *"an operator would be more likely to respond to ALF by handing back a spectrum licence if it did not need that particular spectrum licence in order to be a credible competitor, or to support innovative services, or as a basis for its network performance offer. However, in that case, it is less likely that a period in which that licence lay fallow, rather than continuing to be used by the incumbent operator, would have a significant impact on broader social welfare, and more likely that a change in use would improve efficiency."* Consolation paragraph A9.32.

30 Ofcom note "*a mobile operator might consider that a particular block of spectrum to which it holds a licence is under-utilised, so that it can be relinquished with less impact on network performance, and hence on competitiveness or customer experience, than other licences held by the same operator. Furthermore, in a competitive market, consumers who perceived some drop in network performance following the return of this licence could potentially switch to a different provider – so the loss of consumer value would largely be limited to those consumers who are tied in to their existing provider through long-term contracts, or who perceived the next-best provider as being substantially inferior.*" Consolation paragraph A9.32.

31 Ofcom note that: "*an operator would be more likely to respond to ALF by handing back a spectrum licence if it did not need that particular spectrum licence in order to be a credible competitor, or to support innovative services, or as a basis for its network performance offer. However, in that case, it is less likely that a period in which that licence lay fallow, rather than continuing to be used by the incumbent operator, would have a significant impact on broader social welfare****, and more likely that a change in use would improve efficiency****.*" [emphasis added] Consolation paragraph A9.32.

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spectrum, there is no reason to suppose that the relevant multiple varies depending on whether the spectrum is infra-marginal or marginal.

Therefore to the extent that Ofcom's point is that the cost of marginal spectrum lying fallow is less than the average cost of all spectrum to lie fallow, there is still a significant cost to society of allowing productive spectrum to be unused[32].

Second, Ofcom argues that existing holders could relinquish spectrum at relatively little impact on themselves or on consumers[33] (and by implication it has relatively low economic value to existing holders). This is an important issue which appears to underlie Ofcom's position that allowing productive spectrum to lie fallow would not generate significant economic costs. The private value of a marginal increment of spectrum to all operators equates to the economic value that can be generated from its use. As spectrum trading is possible, the lower bound of an existing user's private value of a marginal increment of spectrum can be approximated by the market value (which Ofcom estimated). Ofcom cannot simply assert that *in general* the private value to an existing user of a marginal increment of spectrum is lower than the market value.

Third, Ofcom's assertion that if the ALF were inadvertently set above operator's private value, then the operator would return its marginal spectrum[34], and that it is generally "*more likely that a change in use* [of a marginal increment of spectrum] *would improve efficiency*" is without basis. As Ofcom itself notes (and as described above) existing holders of spectrum who are likely to have invested in sunk costs to utilise the spectrum will generally have a higher value of spectrum. Furthermore there is some inconsistency between Ofcom's assumptions that it mitigates risk of inadvertently setting ALF above the market value as it believes:

- on the one hand, existing user's private value of a marginal increment is likely to be **above** the market value (given the value that existing holders derive from sunk costs); and,
- on the other hand, the value of marginal spectrum to existing users is **low** and that likely that a change in use would be likely to improve efficiency.

Ofcom cannot, logically, rely on *both* these mutually exclusive justifications for its assertion that the risk of inadvertently setting ALF above private value is mitigated.

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32 For example in Ofcom's example the risk of marginal spectrum wastefully lying fallow could be half the average cost of spectrum lying fallow (£700mn rather than £1.4bn) and the potential gains to reallocating would similarly be scaled down.

33 Aside from some broad assertions (that if spectrum were left fallow consumers would not notice, and if they did notice they would switch to another operator), Ofcom does not evidence its point.

34 Ofcom refers to infra-marginal spectrum as spectrum required to be a "credible competitor" or spectrum to "support innovative services".

Given the above, Ofcom cannot rely on its assertions that it can mitigate the risks of setting the ALF above operator's private value of spectrum because, generally such an outcome would lead to efficiency enhancing changes of use. Ofcom should therefore give due regard to the substantial asymmetric risks associated with allowing productive spectrum to lie fallow, and should set an ALF based on a conservative estimate of market value.

This is consistent with the approach historically used to set spectrum fees based on administrative incentive pricing (AIP):

> *"we [Ofcom] have continued a policy of setting AIP rates conservatively, below our estimates of expected opportunity costs. This is because of the risks to optimal allocation posed by sustaining AIP above opportunity costs, as well as the difficulties of estimating opportunity costs with confidence. This conservative approach inherently limits the expected benefits from AIP. However, we also recognised that by adopting a conservative approach Ofcom has sought to minimise the risks of any inefficiency and detriment to citizens and consumers arising from the application of AIP."*[35]

1.4 Ex post expropriation of the value of sunk assets significantly affects incentives to invest

1.4.1 Ofcom's approach

Ofcom notes that the private value of spectrum to existing holders will be at least partly driven by their investment in sunk assets. These could include investments not only in network equipment, but also in intangible items such as brand and customer base. From this, Ofcom concludes that it could set an ALF up to the value of existing holders' private value of spectrum *including* the value derived from previous sunk investments, without creating welfare losses resulting from static inefficiencies.

We have explained previously that Ofcom cannot know with any confidence what the private values of existing users are, particularly in view of the data which is available to it in this context when setting ALFs[36]. This explains why the risk that spectrum could be returned and lie fallow cannot be discounted.

However, even if Ofcom were to set ALF below the private values of existing holders and so avoid the costs of spectrum lying fallow, it risks another –

35 Ofcom Policy evaluation report: AIP Publication date: 3rd July 2009 paragraph 2.22

36 Frontier Economics: Deriving Market Clearing Prices for 800 MHz Spectrum from the UK 800MHz/2600GHz Auction and Critique of Ofcom's International Benchmarking Analysis ,January 2014

potentially more significant – cost by reducing incentives to invest and dynamic efficiency.

Ofcom argues that a change in policy which increases the risk that the regulator may *inadvertently* expropriate operators' value derived from previous sunk investments will not affect an operator's ex ante incentives to invest. It therefore concludes that setting an ALF at its best estimate of market value, in the context of a significant level of uncertainty, will not have a material impact on dynamic efficiency.

According to Ofcom a policy which increases risk of a regulator inadvertently expropriating value of sunk assets (ex post) is just one risk of many that operators face when considering (ex ante) whether to make investments. Ofcom argues that the risk of ALF being set above or below the true market value is symmetric. Therefore, Ofcom asserts that when assessing, ex ante, future investments, operators will discount the impact of ALF and assume that the expected ALF will not lead to windfall gains and losses and that therefore ALF will not affect operators' incentives to invest. Ofcom therefore concludes that its policy of setting ALF based on its best estimate of market value will not attract a significant risk premium.

1.4.2 Assessment of Ofcom's approach

When performing its duties Ofcom is required to have regard to a number of factors including "encouraging investment and innovation in relevant markets"[37]. It is therefore essential that Ofcom gives due weight to the impact of its proposals on investment incentives. For the reasons set out below, we disagree that Ofcom's approach will not reduce the incentives for efficient investment and therefore believe its chosen approach is not consistent with its duties.

- First, it is likely that rational investors will perceive an increase in the risk of Ofcom expropriating the return on sunk investments and hence adjust their expectations of investment returns. This will, in turn, reduce the level of investment in the sector below the optimal level and so, in the long run, harm the dynamic efficiency of the industry. These costs could be very significant. Furthermore, in effectively discounting the impact of its proposals on dynamic efficiency, Ofcom is moving away from its statutory duties and previous regulatory precedent which has attached significant weight to this factor.

- Second, Ofcom has not provided any detail on how and when it will adjust the ALF if market value changes. This creates a significant degree of

37 See Communications Act (2003) Section 3(4).

operational cash flow risk for investors for which they will need to be compensated.

- Third, in order to hedge against the risks that it holds spectrum with a negative value as a result of a demand or supply shock which negatively affects market value, operators will be incentivised to inefficiently invest in equipment.

We explore these points below.

Regulatory precedent on dynamic efficiency

All other things being equal, regulators should seek to promote dynamic efficiency. The benefits of dynamic efficiency are well know: consumers will benefit from policies which encourage investments which enable the development of innovative new goods and services or production processes. Regulated firms are incentivised to make risky and costly investments where they believe that it will enable them to differentiate their products to their customers and so earn a higher return than would be possible absent such investments.

Ofcom's decisions and publications frequently describe the benefits of dynamic efficiency and the conditions which enable:

> "*Dynamic efficiency refers to the improvements in efficiency that occur over time as innovation results in the development of new goods and services, and as technological advances and investment allow the production of current and future goods and services at lower resource cost.*"[38]

Indeed, as Ofcom notes it is required, when performing its duties, under Section 3(4) of the Communications Act 2003 to have regard to a number of factors as appropriate, including the:

> "*desirability of promoting competition, encouraging* ***investment and innovation in relevant markets****, encouraging the availability and use of high speed data transfer services throughout the UK, the different interests of persons living in rural and in urban areas and the different needs and interests of everyone who may wish to use the spectrum for wireless telegraphy.*"[39]

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38 Ofcom (2013) Dispute between TalkTalk and Openreach relating to single jumpered MPF Provisional Conclusions paragraphs 3.6-3.7. There are many other references to Ofcom's consideration of dynamic efficiencies. For example: Ofcom (2013) Fixed access market reviews: Approach to setting LLU and WLR Charge Controls paragraph 3.18. Ofcom (2011) WBA Charge Control Charge control framework for WBA Market 1 services paragraph A3.37. Cost orientation Review Paragraph 2.13. Disputes between each of Sky, TalkTalk, Virgin Media, Cable & Wireless and Verizon and BT regarding BT's charges for Ethernet services paragraph 9.91.

39 Consultation paragraph 3.23.

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Ofcom also accepts that **regulatory stability** is a necessary condition for regulated firms to make the dynamically efficient level of investments. For example Ofcom noted that "*Consistent and stable decision making by the regulator allows all industry players to plan their investments and outputs with sufficient certainty about charging or regulatory decision making (i.e. it reduces risk).*"[40]

Therefore, in the light of Ofcom's significant change in Ofcom's policy on licence fees, it should fully consider the implications that it could have on incentives to invest and whether its policies offer the regulatory stability to enable dynamic efficiency.

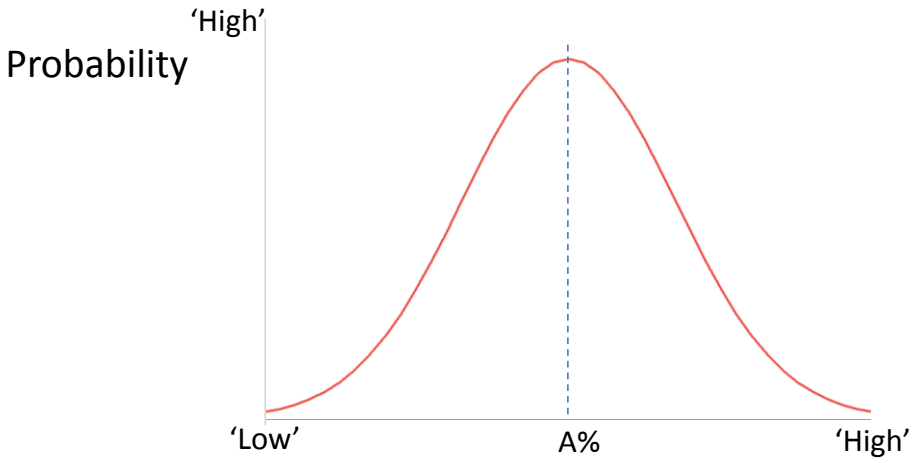
Ofcom's proposals are likely to lead to a reduction in dynamic efficiency

Firms will be less likely to make future investments where they believe at some point in the future there is a risk that the returns on those investments will be expropriated by Governments or regulators. This is because such a risk affects the returns an investor may expect from a future project.

Before investing in any project, an investor will assess the likely risk and return of that investment. The investor will not know the return with certainty, with instead there being a distribution of possible returns. For example, in the diagram below, possible returns are illustrated using a normal distribution, with some possibility that returns could either be above or below the median expectation.

40 Disputes between each of Sky, TalkTalk, Virgin Media, Cable & Wireless and Verizon and BT regarding BT's charges for Ethernet services paragraph 9.98.

Figure 3. The distribution of returns from an investment



Source: Frontier Economics

An investor will undertake a project if its expected rate of return (given the distribution of possible outcomes) is at least equal to its cost of capital. In this example, the investment will take place, therefore, if the investor's cost of capital is equal to or below a level of A%.

If the risk that a government or regulator may expropriate returns above a certain level increases, or the expectation of that risk increases, then the distribution of expected returns from the investment will change. For example, imagine the expectation is now set such that an investor believes there is a significant risk that all returns above X% will be expropriated by Government. This would change the expected distribution of returns to those shown in **Figure 4** and reduce the median expected return below A%. As a result, fewer projects will generate an expected return equal to or above the investor's cost of capital, thus leading directly to a reduction in investment.

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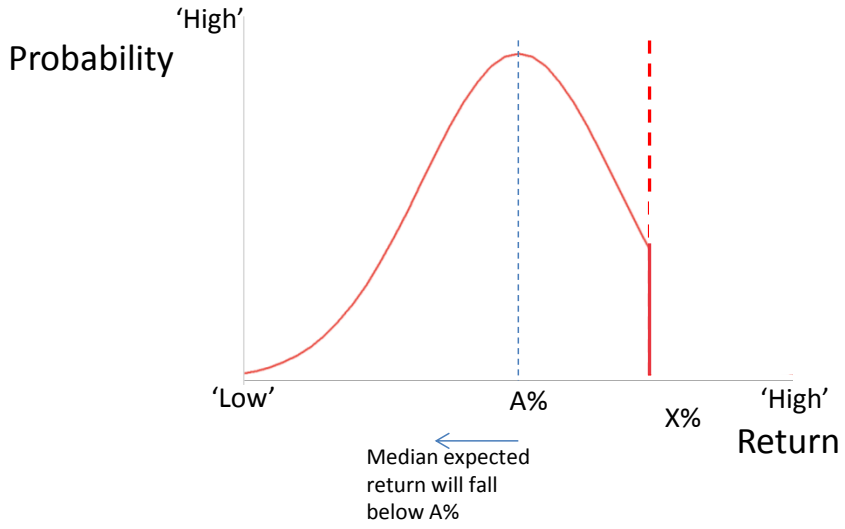
Figure 4. The distribution of returns from an investment, with increased risk of expropriation by Government



Ofcom argues that its approach to setting ALF at its best estimate of market value will not affect incentives to invest. However, whilst its consultation opines that it has determined a best estimate of market value, the commentary in Annex 9 of the consultation suggests that there is a significant risk to dynamic efficiency through the ALF reducing incentives to invest.

If market value was known with certainty and Ofcom was able to credibly commit to setting ALF at market value, it would not affect investment incentives. However, as set out above, Ofcom admits that market value is not known with certainty and rather that ALF is based on "*a limited set of evidence points with a relatively wide distribution of values, and [Ofcom] consider[s] that no specific evidence points can be relied on in a determinative way*.". We explain elsewhere in this submission that the 'limited set of evidence' on which Ofcom thinks it can rely is in fact less robust than it supposed when making this statement.

Ofcom admits that there are risks that it may set ALF at a value which is above market value and risks that it may set ALF at a value below market value. For the reasons set out above, the presence of spectrum trading mitigates any risks to efficiency from ALF being set below market value. However, in its consultation, because it wrongly believes that spectrum trading is not effective, Ofcom appears to put considerable weight on ensuring that ALF is not set below market value. In contrast, there is no market mechanism that would mitigate the risk of spectrum being left fallow if ALF is set too far above market value. Despite this, Ofcom places considerable focus in Annex 9 explaining why setting ALF above market value is unlikely to lead to inefficiencies and a reduction in welfare. The

relative balance of Ofcom's consultation, combined with the flexibility that Ofcom has to adjust ALF in the future, is likely to suggest to investors that Ofcom places a greater weight on ensuring that ALF is not set below true market levels, than it places on ensuring ALF is not set above true market levels. Put simply, when combined with the difficulty of deriving estimates of private value (and hence market value), this balance is likely to impart on investors an increased perception of the risk that Ofcom will use ALF to expropriate returns on sunk investments. This can, in turn, be reasonably expected to impact efficient levels of investment in the sector and harm dynamic efficiency.

Investors will have to be compensated for increased risk associated with licence fees

Ofcom's proposal to set the ALF at its best current estimate of market value means that the ALF becomes sensitive to changes in market value: a general decrease in the value of spectrum could lead to the value of spectrum for all potential operators falling below the ALF requiring Ofcom to revalue ALF if spectrum is not to be relinquished. However, Ofcom approach for revaluing ALF is subject to significant regulatory uncertainty. Therefore, Ofcom's proposals mean that operators would hold spectrum assets which require significant annual cash operational expenditure but where that operational expenditure, and hence cash flow, is likely to vary in an uncertain and unpredictable way. Investors will have to be compensated for the increased risks associated with holding such assets.

It is axiomatic that the market value for spectrum is highly uncertain and is likely to fluctuate over the period of the licence. Ofcom's proposed approach is to set the ALF at its best estimate of market value, recognising that there is a uncertainty about the market value[41]. Furthermore Ofcom's evidence base on which it bases market value is based on "*a limited set of evidence points with a relatively wide distribution of values*"[42] therefore each new data point which could be used to estimate value could affect the "best estimate" of the market value. Given this uncertainty, and the fact that the market value for spectrum could fluctuate it has explained how it would change ALF if the market value changes, or if more reliable information comes to light.

Ofcom stated it will:

> "*undertake a review of fees only where there is clear evidence of significant changes in long term circumstances that suggest that fees might be materially out of line with the value of this spectrum and where we believe that we will be able to derive a more*

41 Consultation paragraph 2.10.

42 The Consultation paragraph 1.10.

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reliable estimate. We would generally expect to consult on the desirability of a carrying out such a review when consulting on our Annual Plan."[43]

This proposal does not provide investors with certainty of the circumstances which trigger a review and the process of revaluing the spectrum. In particular:

- Investors will have to guess what Ofcom means by "materially out of line". A licence fee which is even a small amount above holder's private value is "materially" out of line from the operator's point of view. A moderate unforeseen supply or demand shock could lead the spectrum value to be out of line with the ALF.

- Investors will have to assess the probability that Ofcom will be minded to allocate its internal resources in order to assess increases and decreases in market value. Furthermore investors would have to come to consider the likelihood that Ofcom would **equally** minded to assess reductions in market value (which would lower licence fee revenues) and increases in market value (which would increase licence fee revenues). Any perception of asymmetry in how Ofcom would act (for example due to a perception of institutional bias towards increasing rather than reducing licence fee revenues) will increase risks for investors (for which they will have to be compensated for).

- Ofcom appears to reserve itself a considerable degree of judgement in assessing the circumstances that it will undertake a review. It appears that the scope for stakeholders to interact with Ofcom's decision process is limited to its consultation in its Annual Plan (which sets out Ofcom's strategic objectives for the coming year).

- Perhaps most importantly, Ofcom does not set out how long the administrative process for resetting ALF will take. There is potential for considerable administrative and regulatory delay given Ofcom's two stage annual review process (i.e. a consultation of whether to review, then a further consultation to review).

Operators will be unable to sell or trade the spectrum rights if the ALF is inadvertently set too high (whether due to estimation error or due to a negative demand or supply shock). This leaves investors with significant risk that mobile operators will be left holding unprofitable spectrum (i.e. spectrum where licence fee is in excess of the value). Operators will have to assess whether it would be profitable to continue to hold the spectrum with an excessive ALF for some

43 Consultation paragraph 6.22.

undefined period pending a potential ALF revaluation if Ofcom deem that its value is "*materially out of line with the value of this spectrum*".

By setting an ALF at the "best estimate" of market value rather than a conservative estimate of market value, Ofcom makes annual revaluation much more likely, as even relatively minor demand or supply shocks (or the emergence of a new relevant data point to estimate market value) could mean that AFLs are "materially" out of line with market value.

The regulatory uncertainty which is intrinsic to Ofcom's approach of setting, and revaluing ALF, will not enable dynamic efficiency. It will not allow industry players to plan their investments and outputs with sufficient certainty about charging or regulatory decision making. This regulatory uncertainty will increase operators' costs.

- Investors will have to be compensated for the additional regulatory risk that they face in investing in assets whose value is determined by an administrative regulatory process, where the scope for appeal is more restricted than for other regulatory processes (such as charge controls).
- Ofcom's approach implies that the fixed spectrum asset (the licence) will cause significant **variable** operational expenditure. This could increase the cost of capital for mobile networks.

If Ofcom were to set the value of ALFs at a conservative estimate of market value, then the risk that demand or supply shocks lead to operators holding spectrum with a negative value would be limited. It would signal to investors that the level of ALF would only need to be re-valued in exceptional circumstances, rather than as a matter of course annually as its value fluctuates with changes in supply and demand or as new data points become available.

Operator's hedging strategies will lead to inefficient investments

Operators will have to consider the risks that they are left holding spectrum with a negative value, while they await the outcome of Ofcom's uncertain revaluation process. In practice this means that in order to mitigate the risks that they are left holding unprofitable spectrum (in the event that a demand or supply shock negatively affects its value), operators will tend to minimise the use of marginal spectrum they will inefficiently invest more in network equipment using "core" spectrum. This means that they could return spectrum with negative value, while maintaining service and quality levels.

If Ofcom were to set the value of ALFs at a conservative estimate of market value, then the risk that that it would hold unproductive spectrum would be greatly diminished. Operators would therefore be less incentivised to hedge against risks of holding unproductive spectrum by making inefficient network investments.

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2 Conclusion

We conclude that Ofcom's consultation has not properly considered the significant downside risks to its approach of setting ALF according to its best estimate of a highly uncertain market value.

Ofcom ignores the fact that there is a low likelihood that alternative users could value the spectrum more than an existing user, as existing users will derive value from sunk investments in the spectrum (as Ofcom admit). There is thus likely to be a low probability that reallocation will lead to efficiency improvements. Indeed, in the presence of spectrum trading, it is not clear how setting any ALF would enhance economically efficient use of radio spectrum.

Hence Ofcom's policy of setting the ALF at its best estimate of market rate entails strong risks to both dynamic efficiency and to social welfare, in the event that spectrum was returned to government, with low likelihood of offsetting efficiency improvements.

Given the significant uncertainty in Ofcom's approach, it cannot be discounted that it could set an ALF above even existing user's private value, even though this may be above the market value. If this happens, it would impose significant costs on society. However, Ofcom relies on unfounded assertions to completely discount these risks, whilst instead it considers there are significant efficiency risks from setting prices below market value, even though, in the presence of spectrum trading, there are no such risks.

Given this bias in Ofcom's apparent thought processes, there is a risk that its approach could be seen as partial, and having an upward bias. Rational investors may not perceive this a balanced approach, and may instead consider that the approach indicates a risk that Ofcom's objectives are to expropriate shareholder value. As a result, this is likely to negatively affect investment incentives and reduce dynamic efficiency. Therefore, we believe that Ofcom's approach to setting ALF based on the "best estimate" of market value rather than a conservative estimate of market value is not consistent with Ofcom's duty to ensure spectrum efficiency and promote investment. Alternative approaches are likely to be welfare enhancing. Setting the price based on a conservative estimate of market value would mitigate the risk of wasteful fallow spectrum; efficient allocations could continue to be incentivised by spectrum trading; and it would ensure that investors do not perceive increased regulatory risk related to a bias to expropriate shareholder value related to sunk investments.

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