Annual licence fees for 900 MHz and 1800 MHz spectrum

Ofcom further consultation

September 2014

Telefonica UK Ltd response

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Contents

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Section 1

I. EXECUTIVE SUMMARY

1. Telefonica UK Ltd ("Telefonica") is grateful for the opportunity to provide comments on Ofcom's further consultation on Annual Licence Fees[1].

2. We are pleased that Ofcom has listened to some of the concerns expressed by mobile operators in response to the initial set of proposals set out in the October 2013 consultation document.

3. Ofcom now accepts that it ought to adopt a conservative approach to setting ALFs because of the asymmetric risk of the inefficient use of spectrum should Ofcom inadvertently set ALFs too high, and because of recent developments that are likely to have reduced the value of spectrum. We agree that Ofcom is right to adopt a conservative approach.

4. Ofcom's proposals to rely on the value of 900 MHz and 1800 MHz spectrum relative to 800 MHz and 2600 MHz spectrum in benchmark countries, and relegate the use of absolute values as a cross check only, avoid a variety of problems we set out in our response to the previous consultation and are to be welcomed. The adoption of the "distance method" to value 1800 MHz spectrum is also an improvement on the original proposal, and we support this.

5. Similarly, Ofcom is right to propose the use of a discount rate based on a debt rate, rather than a weighted average cost of capital (WACC).

6. However, there are a number of key problems we see in this latest set of proposals.

7. Ofcom's refusal to conduct a full impact assessment of its proposals is perplexing. Telefonica recognises that Ofcom is required to set ALFs to reflect the full market value of the spectrum, by dint of the Government's Direction. However, doing so requires Ofcom to exercise regulatory judgement, and in exercising that judgement Ofcom must have regard to the full range of its statutory duties. Telefonica simply does not understand how Ofcom can satisfy itself that it has met these duties, without availing itself of the information necessary to reach such a conclusion (i.e. without carrying out a full impact assessment). In practice, we believe

[1] Ofcom, Annual licence fees for 900 MHz and 1800 MHz spectrum, Further consultation, 1 August 2014: http://stakeholders.ofcom.org.uk/binaries/consultations/annual-licence-fees-900-MHz-1800-MHz/summary/condoc.pdf.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

that the policy implication from such an exercise would be to reinforce Ofcom's proposed conservative approach.

8. Furthermore, although Ofcom says it has adopted a conservative approach in formulating its proposals, in our view, in practice, it has often done the opposite. There are a number of clear and important instances of this.

9. Ofcom's approach to estimating the value of 800 MHz and 2600 MHz spectrum is a prime example. Although it is accepted that no one methodological approach is without problems, Ofcom is proposing to base its estimation of the value of 800 MHz on just one, the "marginal bidder" approach, effectively applying a zero weighting to all estimations derived from all other approaches (including its previous preferred option, LRP). To compound the problem, Ofcom's estimate of value for 800 MHz is ultimately based on the value difference between two specific bids EE submitted in the 2013 auction, bids that were not relevant for price determination in the auction and may have been inflated as a result of strategic bidding behaviour. Furthermore, Ofcom is extracting marginal values from the two EE bids and de facto applying them to hypothetical bids by EE that would exceed the spectrum cap. This approach results in a high risk of over-estimating market value. Ofcom's suggestion, that the selection of the lower of its two estimates[2] is evidence of a conservative approach, rings hollow.

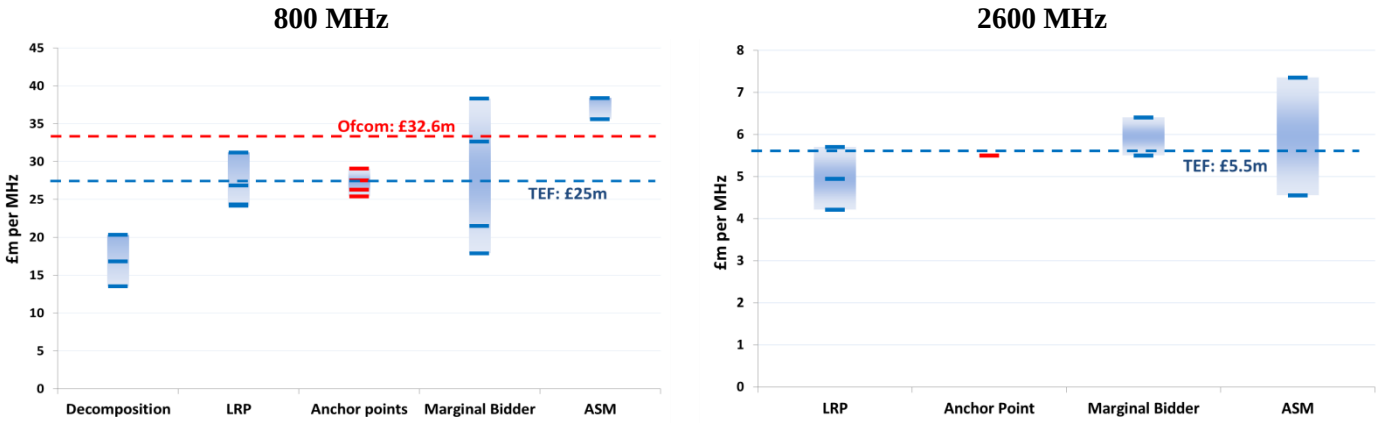
10. As we set out in this response, our approach to estimating the full market value of 800 MHz and 2600 MHz spectrum is to conduct a broad assessment of all plausible methodologies and assumptions. This results in conservative estimates of no more than £25m per MHz for 800 MHz and £4.95m per MHz for 2600 MHz spectrum, as illustrated in Figure 1.[3]

[2] The higher one being based on a different interpretation of a small subset of losing EE bids.

[3] These values and subsequent values expressed in real March 2013 prices.

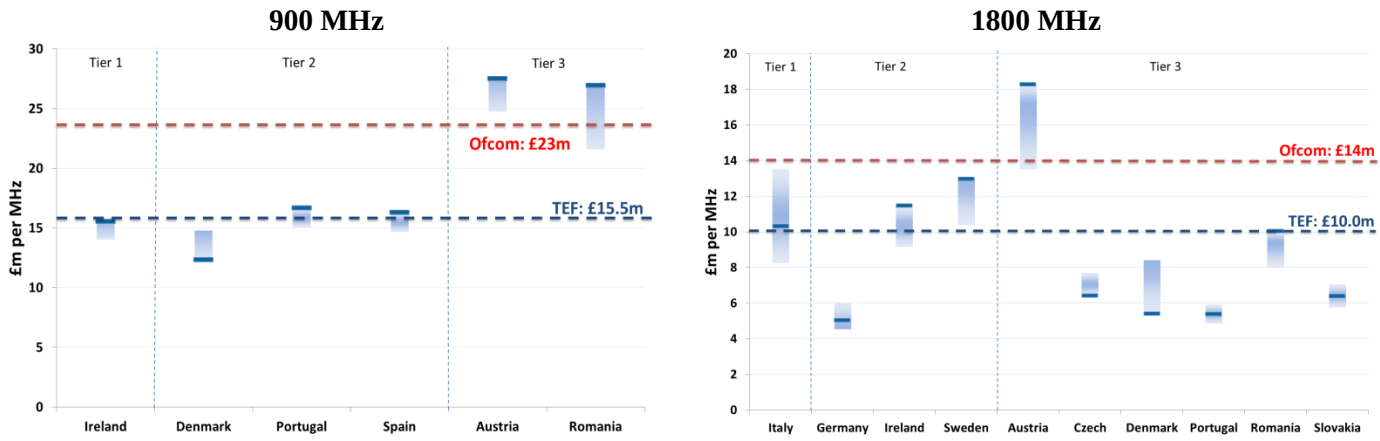
Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Figure 1: Telefonica's conservative estimate of the full market value of 800 MHz and 2600 MHz



11. Turning to the second step in Ofcom's process, assessing the lump sum values of 900 MHz and 1800 MHz spectrum, we have serious reservations about aspects of Ofcom's qualitative assessment that it uses to derive UK values from European benchmarks, in particular, the heavy weighting Ofcom is proposing to give to observations derived from the 2013 multiband auction in Austria. We have commissioned an econometric analysis from NERA (which we attach to this response) for screening country benchmarks prior to a qualitative analysis. This demonstrates that the Austrian results are obvious outliers and that, accordingly, very little weighting should be attached to them. As we set out in this response, conservative estimates of the lump sum values are no more than £15.5m per MHz for 900 MHz and £10m per MHz for 1800 MHz, as illustrated in Figure 2.

Figure 2: Telefonica's conservative estimate of the full market value of 900 MHz and 1800 MHz



Sources for Figure 1 and Figure 2: Telefonica using Telefonica and Ofcom data.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

12. Finally, in seeking to derive ALFs from lump sum values, we believe that Ofcom has made a number of errors, in particular, relating to the averaging period used to calculate the cost of debt and the components included in Ofcom's debt premium. These include a failure to adjust for liquidity risk, securitisation and inflation risk. In sum, these errors cause Ofcom to propose a discount rate (real, post tax) of 2.6%, when the correct rate should be no more than 1.3%, for the reasons described in this response. We attach, as an Annex, another NERA expert report that provides a more detailed discussion of the relevant issues.

13. Correcting for these errors, we conclude that ALFs set at no more than £0.94m/MHz per annum for 900 MHz and £0.61m/MHz per annum for 1800 MHz reflect a conservative estimate of the full market value of these spectrum bands. Using these figures result in ALFs in respect of Telefonica's spectrum holdings of no more than £39.8m per annum.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

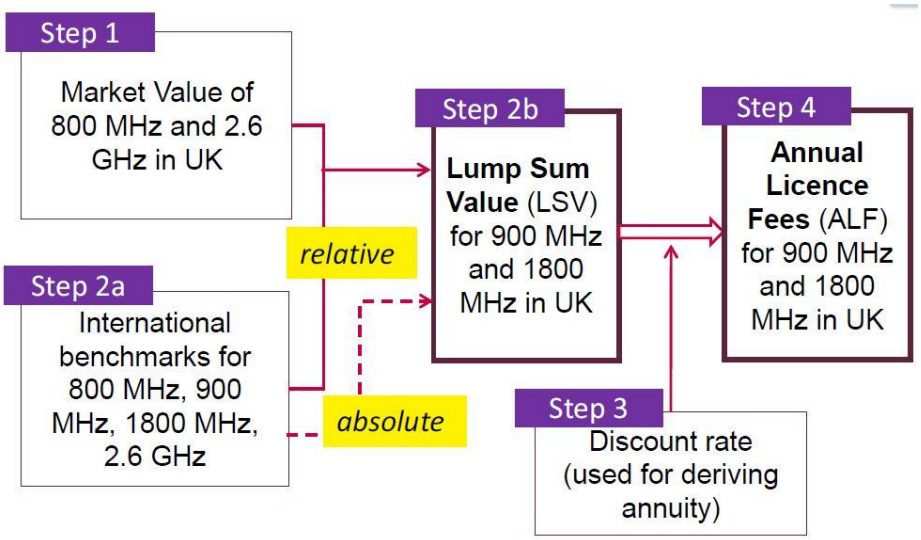
Section 2

II. INTRODUCTION

14. Telefonica UK Ltd ("Telefonica") welcomes the opportunity to comment on Ofcom's further consultation on annual licence fees ("ALFs") for 900 MHz and 1800 MHz spectrum[4]. In particular, we welcome Ofcom's decision to revise its framework and methodology for determining annual fees for 900 MHz and 1800 MHz spectrum. Ofcom's previous consultation document released in October 2013[5] contained a number of flaws in methodology, errors in interpreting data and mistakes in qualitative reasoning. The August 2014 consultation corrects for many of these problems but, unfortunately, also raises many new concerns.

15. Telefonica broadly supports Ofcom's proposed basic framework for determining ALFs, as illustrated in Figure 3. Our comments in this document concern the implementation of this framework and Ofcom's interpretation of the evidence.

Figure 3: Ofcom's framework for derivation of annual fees for 900 MHz and 1800 MHz



Source: Ofcom, August 2014 consultation, Figure 1.1, p.6.

4 Ofcom, Annual licence fees for 900 MHz and 1800 MHz spectrum, Further consultation, 1 August 2014 (hereafter "August 2014 consultation").

5 Ofcom, Annual licence fees for 900 MHz and 1800 MHz spectrum, Consultation. 10 October 2013 (hereafter "October 2013 consultation").

Telefónica UK Limited 260 Bath Road Slough Berkshire SL1 4DX T +44 (0)113 272 2000 www.telefonica.com

16. Our response is divided into five further sections:

- **Section 3: A conservative approach to setting ALF**
  We set out our position with respect to Ofcom's commitment to using a conservative approach when setting ALF. A central concern for us is that Ofcom has not properly applied its conservative approach in interpreting data and selecting its methodologies.

- **Section 4: UK market value of 800 MHz and 2600 MHz**
  We review the available methodologies for deriving estimates for the lump sum value of 800 MHz and 2600 MHz from UK auction data (Step 1 in Figure 3). Unlike Ofcom's approach, which focuses on just one approach based on many questionable assumptions, we derive lump sum values based on a broad analysis of all plausible methodologies for estimating value.

- **Section 5: Assessment of lump sum values for 900 MHz and 1800 MHz**
  We broadly support Ofcom's approach for calculating European benchmarks (Step 2 in Figure 3). However, Ofcom has made mistakes in assessing certain key evidence points, most notably grossly overstating the importance of Austria, and this means that its estimates for UK values are too high. After correcting for these errors, we determine a conservative estimate of lump sum full market value.

- **Section 6: Deriving ALFs from lump sum values**
  We review Ofcom's estimate of the appropriate discount rate to transform the lump sum values into ALFs (Step 3 in Figure 3). We support Ofcom's revised decision to use the cost of debt (instead of the WACC) for annuitisation, but identify a number of reasons why Ofcom is still over-estimating the discount rate.

- **Section 7: Telefonica's estimate of ALFs**
  We set out our calculations for each step in in Figure 3, including our own estimate of appropriate ALFs for 900 MHz and for 1800 MHz, based on a conservative estimate of the full market value (Step 4).

17. In addition, in Annex I and Annex II, we attach two expert reports undertaken by relevant subject matter experts at NERA Economic Consulting which we refer to in our submission:

- **Annex I: Review of country benchmarks used for setting lump sum values for UK 900 MHz and 1800 MHz**
  In this paper, NERA set out a "top-down" econometric approach to test for probable outliers in Ofcom's sample of European benchmarks used to value UK 900 MHz and 1800

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

MHz spectrum. They then undertake a "bottom up" qualitative analysis with particular focus on the outliers. Using this framework, NERA identify a number of errors in Ofcom's assessment of evidence and propose changes, including downgrading Austria from a Tier 1 to Tier 3 evidence point.

- **Annex II: Deriving ALFs from Lump sum Valuations**
  In this paper, NERA identify the cost of debt as the appropriate discount rate for deriving ALFs from lump sum valuations. In their analysis, they identify a number of errors in Ofcom's approach, including the use of "long-run averages", failure to account for elements of the debt premium that are irrelevant for the calculation of ALFs such as liquidity and inflation risk, and omitting benefits of securitisation. When correcting for these factors, NERA estimates the appropriate discount rate in a range of 0.9% to 1.3% (real, post-tax) instead of the 2.6% Ofcom currently uses.

18. Finally, our responses to the specific questions raised in the consultation document are provided in Annex III. These refer the reader directly back to the detailed responses in Sections 3, 4, 5 and 6 of this submission and the NERA reports in Annexes I and II.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Section 3

III. A CONSERVATIVE APPROACH TO SETTING ALF

19. At paragraph 1.34 of the consultation document, Ofcom says that it should exercise regulatory judgement by adopting a conservative approach when interpreting evidence on the basis of (a) risk asymmetry relating to spectrum inefficiency; and (b) the possibility that forward-looking market values today are lower than at the time of the auctions Ofcom is relying on. Telefonica supports the adoption of a conservative approach in setting ALFs and not solely because of the two justifications that Ofcom has offered. In our view, such an approach is best designed – and indeed necessary – to satisfy Ofcom's relevant statutory duties.

20. In this section, we set out our views on:

    1. Ofcom's position on the forward-looking market value of spectrum;
    2. Risk asymmetry in relation to spectrum efficiency;
    3. The need, in light of Ofcom's statutory duties, to carry out a full impact assessment and the implications for the exercise of Ofcom's regulatory judgement; and
    4. The extent to which Ofcom is, in fact, proposing to adopt a conservative approach.

21. A central concern for us is that Ofcom has not properly applied its conservative approach in interpreting data and selecting its methodologies. As the plethora of Ofcom consultation documents on setting ALFs amply demonstrate, there is considerable debate on methodological approaches, and the relevance and importance of various data and evidence. Accordingly, there is no single "true" or "best" estimate of full market value, but rather a large range of plausible estimates for both 900 MHz and 1800 MHz. We believe that Ofcom's statutory duties would be best served by conservatism at every stage of the analysis of methodologies and evidence, and by ultimately selecting ALFs based on the lower end of the estimates of full market value. Further, if Ofcom were to carry out a full impact assessment, we are confident that the assessment would demonstrate this. Our comments throughout this response are aimed at helping Ofcom identify the lower end of the range of reasonable estimates of full market value, which represents the lowest risk to the fulfilment of Ofcom's statutory duties.

A. Forward-looking market value of spectrum

22. We agree with Ofcom's assessment, set out in Annex 9 of the consultation document, that developments in the potential availability of further spectrum may have reduced the value of

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

spectrum used by mobile operators, including 900 MHz and 1800 MHz spectrum. In particular, since March 2013, Ofcom has provided significant impetus behind the release of the 2.3 GHz and 3.4 GHz spectrum. Prior to March 2013, responsibility for auctioning these frequencies resided with the MoD and the process and timetable for this exercise was unclear.

23. Similarly, earlier this year, Ofcom raised the prospect of the early release of 700 MHz spectrum.[6] There have also been significant developments at the EU level, aimed at promoting the release of a common 700 MHz band across Europe. There is a real likelihood that equipment and handsets using the European 700 MHz band will be available much earlier than was expected at the time of the UK auction, not least as Germany, the largest EU market, plans to award the spectrum in 2015.

24. These developments are likely to have reduced the forward-looking market value spectrum, and represent grounds for adopting a conservative approach to valuing 900 MHz and 1800 MHz spectrum.

B. Risk asymmetry in relation to spectrum efficiency

25. Telefonica welcomes Ofcom's acceptance that, on balance, the risk of inefficiency from spectrum lying fallow if ALFs are set too high may be greater than the risk that efficiency-improving changes of licensees will not occur if ALFs are set too low.[7] As we set out in our response to the October 2013 consultation, no evidence has been presented that spectrum has been used inefficiently to date, even though the charges for the relevant spectrum have been considerably lower than any proposed ALF. The possibility of spectrum lying fallow if ALFs are (inadvertently) set too high, is real and there, is, therefore, risk asymmetry.

C. The need for a full impact assessment

26. As we set out above, we agree with Ofcom that developments in the potential availability of further spectrum may have reduced the value of spectrum and that the risk of inefficiency from spectrum lying fallow if ALFs are set too high may be greater than the risk that efficiency-improving changes of licensees will not occur if ALFs are set too low. We also agree with the policy implication which flows from these findings, that Ofcom should adopt a conservative approach in setting ALFs.[8]

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6 Ofcom, Consultation on future use of the 700 MHz band - Cost-benefit analysis of changing its use to mobile services, 28 May 2014.

7 Ofcom, August 2014 consultation, Annex 5, paragraph A5.30 (c).

8 For example, see Ofcom, August 2014 consultation, paragraph 1.38.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

27. However, we remain concerned that Ofcom's analysis is too narrowly focused. We continue to believe that Ofcom is required to undertake a full impact assessment, rather than the limited one set out in Annex 5 of the consultation document, which focuses on the efficient use of spectrum only. As we explain below, Ofcom appears to have misunderstood the justification for conducting a broader impact assessment. We believe that a full impact assessment would strengthen the case for taking a conservative approach to setting ALFs.

28. Ofcom's position on this issue is set out in paragraphs 1.42-1.44 of the consultation document:

> *"1.42 In response to our October 2013 consultation, a number of stakeholders said that we should carry out a full impact assessment of our proposals for revising ALFs. In essence, their view was that we should not revise ALFs to reflect full market value unless we could demonstrate that taking this approach to setting ALFs (and the specific levels of ALF that we propose) was necessary to promote efficient use of spectrum, and that the potential benefits in terms of spectrum efficiency would outweigh any potential adverse effects on consumer prices, investment in infrastructure, innovation and competition. They considered that unless we did carry out such an impact assessment any decision we made would be unlawful.*
>
> *1.43 We do not agree with this view. We have been directed by the Government to revise ALFs to reflect full market value, and we are required to implement that direction. We do not have any discretion to decide whether or not to set ALFs at full market value. For this reason, we consider it is unnecessary for us to carry out an impact assessment of the type argued for by stakeholders (and to this extent this is a statement for the purposes of section 7(3)(b) of the Communications Act 2003).*
>
> *1.44 In implementing the Government Direction, we have considered the impact in those areas where we do have discretion and are exercising regulatory judgment in light of the evidence available to us and our statutory duties. We did conduct a focussed impact assessment in respect of these aspects in our October 2013 consultation. In particular, we assessed whether there was an asymmetric risk of inefficient use of spectrum from inadvertently setting ALFs below or above market value. This document contains our updated views, in light of responses, on certain aspects of how we intend to fulfil the requirements of the Government Direction including in particular a revised assessment of the asymmetry of risk. Our revised assessment, in light of the changes in our approach since the October 2013 consultation, is set out above and in Annex 5."*

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

29. It seems to us that Ofcom has misunderstood Telefonica's position on the issue. We do not subscribe to the view that Ofcom should not seek to realise full market value in resetting ALFs, unless it can be shown that this would be "*necessary to promote efficient use of spectrum*"; and "*the potential benefits in terms of spectrum efficiency would outweigh any potential adverse effects on consumer prices, investment in infrastructure, innovation and competition*".

30. Rather, we accept that Ofcom has been directed by the Government to set ALFs to reflect full market value, and that Ofcom is therefore required to do this. However, it is the case that deciding what should be treated as constituting "full market value" for the purpose of setting ALFs is not straight forward. As the plethora of Ofcom consultation documents on the matter amply demonstrate, there is considerable debate on methodological approaches and the relevance and importance of a large range of data and evidence. There is no clear "true" or "best" estimate of full market value. In practice, there is a range of reasonable estimates of full market value to choose from. In other words, this is a classic case where regulatory judgment needs to be exercised.

31. Telefonica believes that, in exercising its judgement to set ALFs, Ofcom must have regard to its general duties, set out in sections 3 and 4 of the Communications Act 2003, and also to its specific radio spectrum duties under section 3 of the Wireless Telegraphy Act 2006. Clearly, that includes a requirement to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum[9]. Accordingly, we agree that Ofcom is required to consider the implications of setting ALFs at a particular level on the efficient use of spectrum, and we accept that Ofcom has done this in the current consultation exercise[10]. However, we do not agree that this is the only relevant consideration; even if Ofcom's duty of regulatory consistency alone would require it to adopt a similar approach in relation to its other statutory objectives.

32. As we set out in our response to the October 2013 consultation, Ofcom is proposing to extract a significant amount of money out of the mobile sector, by increasing ALFs. This decision must be considered against a backdrop of a fiercely competitive market and an uncompromising regulatory environment, factors that have contributed to the UK being amongst least profitable mobile sectors in the EU. In this context, the implications for prices

[9] Section 3(2)(a) of the Communication Act 2003 refers; see also section 3(2)(a) of the Wireless Telegraphy Act 2006.

[10] We also agree with Ofcom's analysis that, on balance, the risk of inefficiency from spectrum lying fallow if ALFs are set too high may be greater than the risk that efficiency-improving changes of licensees will not occur if ALFs are set too low.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

and investment of an increase in ALFs are profound and would, in our view, have adverse consequences for consumers[11], the speed and extent of network infrastructure rollout (including 4G)[12], innovation[13] and competition[14].

33. We cannot see how Ofcom can discharge its duties in setting ALFs, if it does not properly consider the consequences of different fee levels (which might reasonably be said to reflect full market value) on these things. If, for example, one reasonable estimate of full market value would tend to cause serious harm to all Ofcom's regulatory objectives but another reasonable estimate represents a much lower risk, Ofcom would be duty-bound to select the latter. We believe that the only way in which such consequences could be considered is by conducting a full impact assessment and examining the results. For the avoidance of doubt, we consider that it would be an error of law for Ofcom to direct itself that it should seek to determine an estimate of full market value which is the "least likely to deviate from" a notional "true" full market value. Ofcom's regulatory judgement in selecting an estimate is not an abstract theoretical exercise; it must be guided by Ofcom's statutory duties and by the likely consequences of different possible approaches.

34. Telefonica believes that if Ofcom had considered properly the impact on prices and investment of different estimates of ALFs, which might reasonably be said to reflect full market value, it would have determined that a number at the lower end of the scale would best meet its statutory duties. In other words, a proper and full impact assessment would reinforce Ofcom's proposed "conservative" approach to setting ALFs.

D. The extent to which Ofcom is proposing to adopt a conservative approach

35. As we set out above, we agree with Ofcom that it is appropriate to adopt a conservative approach in setting ALFs, and not solely because of the two justifications that Ofcom has offered. We believe that a full impact assessment would demonstrate that Ofcom's statutory duties would be best served by selecting ALFs based on the lower end of the estimates of full market value.

36. Separately, Telefonica is concerned that Ofcom has not properly applied its conservative approach in interpreting data and selecting its methodologies. In practice, throughout the

11 Section 3(1)(b) of the Communications Act 2003 refers.

12 Sections 3(4)(d) and (e) of the Communications Act 2003 refers; see also section 3(2)(b) of the Wireless Telegraphy Act 2006.

13 Section 3(4)(d) of the Communications Act 2003 and section 3(2)(c) of the Wireless Telegraphy Act 2006 refer.

14 Section 3(4)(b) of the Communications Act 2003 and section 3(2)(d) of the Wireless Telegraphy Act 2006 refer.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

consultation document, Ofcom has *not* acted conservatively. In other words, we believe that Ofcom is not properly implementing the conservative approach which it has recognised is needed. The consequence of such failure is that Ofcom's estimates of full market value have drifted from the conservative (and lowest risk in terms of the fulfilment of Ofcom's objectives) to the aggressive and risky.

37. Our concerns are discussed in greater detail in sections 4, 5 and 6 of this response. However, in summary, these include:

- For the estimation of lump sum values for 800 MHz and 2600 MHz:
    - Undue focus on a specific interpretation of one methodology (marginal bidder analysis) and the exclusion of other relevant approaches; and
    - Undue weight on a small number of bids made by EE and failure to consider risk that these were distorted by strategic bidding behaviour.
- For the estimation of lump sum values for 900 MHz and 1800 MHz using European benchmarks:
    - Lack of a statistical test to screen for outliers;
    - Undue weight on data derived from the Austrian multiband auction, which should be at best Tier 3 observations, not Tier 1; and
    - Over-estimation of the Swedish 1800 MHz benchmark, owing to an understated proxy value for 2600 MHz and insufficient weight attached to the risk that Ofcom's estimate overstates value.
- For the estimation of the discount rate for annuitisation, failure to adjust for liquidity risk, securitisation and inflation risk.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Section 4

IV. UK MARKET VALUE OF 800 MHZ AND 2600 MHZ

38. In this section, we review Ofcom's revised approach to determining the value of 800 MHz and 2600 MHz spectrum. The section is divided into four parts:

    - Part A: We highlight the many different methodologies that have now been put forward to derive the market value of 800 MHz and 2600 MHz spectrum based on bids in the UK auction. It is apparent to us that there are many approaches, each with strengths and weaknesses, and no overwhelming reasons for Ofcom to select one over another.

    - Part B: Ofcom's consultations have raised a series of issues regarding the interpretation of UK bid data and methodological issues regarding the derivation of band specific values. Here, we set out our views on eleven issues that are directly relevant to Ofcom's decision. We think that Ofcom has made errors in its interpretation of many of these issues.

    - Part C: Ofcom's revised proposal is based on a specific interpretation of the "marginal bidder" approach, and its value estimate for 800 MHz is ultimately based on the value difference between two specific bids submitted in the auction by EE. Here, we explain why this proposal is aggressive, rather than conservative, with a high risk of over-estimating market value.

    - Part D: We out our views on the plausible range for the full UK market value of 800 MHz and 2600 MHz, and suggests an appropriate value consistent with Ofcom's commitment to a "conservative approach".

39. Overall, we think that Ofcom is mistaken in trying to identify a single methodology for determining the value of 800 MHz and 2600 MHz. There are a number of plausible methodologies, each with strengths and weaknesses, and a reasonable approach is to look at these as a whole, and make a judgement based on a weighted assessment of these approaches. Ofcom's current position, where it has jumped from backing one approach (LRP) to another (marginal bidder) lacks credibility, and this is reflected in the wild variation in its estimate of 800 MHz value between consultations. Our preferred figures, which are conservative estimates of full market value derived from a broad assessment of all plausible methodologies and assumptions, are £25m per MHz for 800 MHz and £4.95m per MHz for 2600 MHz.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

A. Potential methodologies for identifying UK market values

40. The government directive requires Ofcom to revise the level of ALFs for 900 MHz and 1800 MHz spectrum so that they reflect market value. In doing so, Ofcom "*must have particular regard to the sums bid in the UK 4G auction*."[15] Unfortunately, in the context of a multi-band CCA with package bidding, there is no definitive approach for identifying the marginal value of spectrum on a band-by-band basis. This was a known problem in advance of the auction taking place, and Ofcom has been actively working on methodologies to derive band specific prices from the UK 4G auction since at least early 2011. Notably, Ofcom consulted on the Linear Reference Price (LRP) methodology in March 2011[16], and on the Additional Spectrum Methodology (ASM) in January 2012[17]. In the October 2013 consultation, it presented values based on variations on LRP and ASM. Most recently, in the August 2014 consultation, it has put forward a new methodology, which it calls the "Marginal Bidder" approach.

41. Various stakeholders have also proposed potential methodologies for deriving UK prices from the auction results. Vodafone developed an approach which it calls "Decomposition", but this was rejected by Ofcom in its October 2013 consultation. Meanwhile, in responses to the October 2013 consultation, Vodafone and Telefonica presented a number of variants to particular methodologies, including removing the impact of reserve price bids, eliminating bids from H3G (on the grounds they were clearly driven by strategic behaviour) and treating the 800 MHz band as if it was only one category.

42. In addition, both Vodafone and a confidential respondent to the August 2014 consultation have highlighted potential "anchor points" that could be put forward as lower or upper bounds on the market value. For 800 MHz, these are: (a) the hypothetical level of a reserve price bid at which an 800 MHz lot would have gone unsold if the winner determination problem (WDP) was re-run; and (b) the actual price paid by Telefonica in the UK 4G auction. On the same basis, for 2600 MHz, we have just one anchor: we can calculate the hypothetical level of a reserve price bid at which one lot would have gone unsold, but there is no equivalent to Telefonica's winning bid at 800 MHz, as no bidder exclusively won 2600 MHz spectrum. These anchor points are not estimates of value per se, but they can be used as reference points in assessing whether value estimates are plausible.

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15 Ofcom, August 2014 consultation, Para 1.16.

16 Ofcom, *Assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues*, March 2011, §9.79.

17 Ofcom, Second consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues, January 2012, §§7.141ff.

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43. Table 1 presents a summary of the values associated with each of these approaches for 800 MHz (in some cases, a minimum and maximum value is presented, reflecting variants to the particular approach). The variation in values is enormous, from a low of £13.5m to a high of £38.4m per MHz, excluding country benchmarks. This wide range indicates the uncertainty associated with the task. The fact that Ofcom has switched methodologies and its proposed value has jumped significantly between consultations is indicative of the fact that there is no single approach that is demonstrably better than all the others.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
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Table 1: Alternative approaches for deriving the value of 800 MHz spectrum from bids in the UK auction

Method	Proposed by	MIN	MAX	Explanation of range & Source
Decomposition: H3G bids and reserve bids excluded	Vodafone	13.50	16.80	Source: Vodafone's response to Ofcom consultation, January 2014, Page 24
Decomposition: Reserve bids excluded	Vodafone	20.30		Source: Vodafone's response to Ofcom consultation, January 2014, p24
Marginal bidder: 2x5 MHz	Vodafone	17.9	21.5	Estimate depends on size of contiguity premium; Source: Vodafone's response to Ofcom consultation, January 2014, p4
LRP: Revenue constraint, no reserve bids	Telefonica	24.16	24.35	Min includes all 800 lots; Max excludes coverage lot; Source: October 2013 response to Ofcom consultation
Anchor point: Reserve price at which 800 MHz would have gone unsold	Vodafone	25.40		Source: Vodafone's response to Ofcom consultation, January 2014, p16
Anchor point: Telefonica price with no reserve bids	Telefonica	26.30		Source: Identified in this consultation response
LRP: Revenue constraint	Ofcom	26.85		Source: Ofcom, October 2013 consultation, p23
Anchor point: Telefonica price	Confidential response / Ofcom	27.50	29.05	Min is actual price per MHz; Max includes Ofcom's estimate of premium to avoid coverage obligation; Source: Confidential response highlighted in Ofcom, August 2014 consultation, p12
LRP: no revenue constraint	Ofcom	31.20		Source: Ofcom, August 2014 Consultation, p21
Marginal bidder: 2x10 MHz	Ofcom	32.63	38.30	Range reflects interpretation of different EE bids; Source: Ofcom, August 2014 consultation, p21
ASM	Ofcom	35.60	38.40	Estimate depends on whether Telefonica or Vodafone is excluded bidder; Source: Ofcom, August 2014 consultation, p21
European country benchmarks	Ofcom	1.79	72.17	Lithuania (Low) to Austria (High); Source: Ofcom, ALF 900-1800 MHz: Final benchmarking dataset

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44. Table 2 presents a summary of the values associated with each of these approaches for 2600 MHz. In this case, the number of approaches is smaller, as there were fewer comments from stakeholders, and the variation in value is smaller, from a low of £4.21m to a high of £7.35m per MHz, excluding country benchmarks.

Table 2: Alternative approaches for deriving the value of 2600 MHz spectrum from bids in the UK auction

Method	Proposed by	MIN	MAX	Explanatory of range & Source
LRP: Revenue constraint, no reserve bids	Telefonica	4.21		Source: Telefonica, October 2013 response to Ofcom consultation
LRP: Revenue constraint & reserve bids	Ofcom	4.95		Source: Ofcom, October 2013 consultation, p24
Anchor Point: Reserve price at which 2600 MHz would have gone unsold	Ofcom	5.5		This is same as Niche's incremental bid value for the last 2x5 MHz lots it won; Source: Ofcom, August 2014 consultation, p28
LRP: No revenue constraint	Telefonica / Ofcom	5.70		Source: Ofcom, August 2014 consultation, p21
Marginal bidder	Ofcom	5.50	6.40	Range reflects interpretations of marginal bids from Telefonica and Niche; Source: August 2014 consultation, p21
ASM	Ofcom	4.55	7.35	Estimate depends on whether EE, H3G, Telefonica or Vodafone is the excluded bidder; Source: August 2014 consultation, p21
European benchmarks	Ofcom	1.64	10.57	Germany (Low) to Romania (High); Source: ALF 900-1800 MHz: Final benchmarking dataset

45. In summary, there are a number of plausible methodologies and significant variation in price estimates. In this context, we note Ofcom's own views on interpreting different methodologies for deriving prices for 800 MHz and 2600 MHz, as set out in a Statement in July 2012 and published alongside the Information Memorandum for the 4G auction:

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Slough
Berkshire
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> *"We recognise that we need to consider the calculations under each methodology and their outputs with care. They have some limitations both individually and in combination. However, by using a broad set of evidence, and by using market information in particular, we believe that our approach is likely to be appropriate to the circumstances. We believe that considering these three methodologies together sufficiently addresses the risks that might be introduced by a mechanistic link between Auction prices and ALF, while still allowing us to use a range of information to estimate full market value."*[18]

46. In Telefonica's view, Ofcom's new approach to determining the value of 800 MHz and 2600 MHz is not reasonable because it fails to consider the broad set of evidence available and depends on only one methodology. While Ofcom has discussed many different approaches in its consultation documents, its current proposals ultimately rest on a narrow interpretation of one single approach (marginal bidder analysis), while other informative approaches are simply disregarded. Similarly, its previous proposals rested on a narrow interpretation of the LRP methodology. Put differently, Ofcom's approach can be characterised as follows:

    1. Identify a long list of methodologies.
    2. Compare these methodologies and select one. Disregard all other methodologies regardless of their merits (that is, apply zero weighting to the results of all other methodological approaches).
    3. Consider issues that affect the value estimate for the preferred approach. Take a position on each assumption in order to narrow the range of possible values.
    4. Pick a number in the resulting narrow range based on a "conservative" approach.

47. We do not think that such an approach is reasonable in this context, where there are many methodologies, each of which, as Ofcom says, "*have some limitations*". We believe that, instead, Ofcom should make a judgement based on surveying "*the broad set of evidence*" from all plausible methodologies. A broad-based approach would be as follows:

    1. Identify a reasonably exhaustive list of methodologies.
    2. Consider issues that affect the value estimate for these methodologies, and vary assumptions to establish a valuation range for each methodology where appropriate.
    3. Analyse each methodology, placing greater weight on those that (a) are supported by stronger qualitative evidence; and/or (b) produce results that are more plausible because they are within a reasonable range of recognised anchor points.

[18] Ofcom Statement, Assessment of future mobile competition and award of 800 MHz and 2.6 GHz, 24 July 2012, para 12.9. [emphasis added]

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4. Pick a number from the value range across the set of plausible methodologies. Here, Ofcom should have regard to: (i) qualitative evidence that may lead it to put somewhat more weight on particular value estimates than others; and (ii) its relevant statutory duties, which require Ofcom to use (as it has committed to use) a "conservative approach".

48. In parts B and C below, we provide comments respectively on: the various issues raised by Ofcom regarding analysis of UK bid data; and Ofcom's specific proposals for marginal bidder analysis. In Part D, we apply the broad-based approach described here to derive our own estimate for the full market value of 800 MHz and 2600 MHz. We take the comments from Parts B and C into consideration when determining what weight to give to particular methodologies when making a conservative estimate of full market value.

B. Analysis of UK bid data

49. Ofcom's consultations have raised a series of issues regarding the interpretation of UK bid data and methodological issues regarding the derivation of band specific values. In this subsection, we set out our views on six issues concerning the interpretation of bid data and five methodology issues that are directly relevant to Ofcom's decision. A summary of our position versus that put forward by Ofcom is presented in Table 3.

Table 3: Summary of Telefonica's response to Ofcom's views on interpretation of bid data and methodology for deriving 800 MHz and 2600 MHz values from UK auction data

	Telefonica's comments on Ofcom's position
Issues with interpretation of bid data	
1. Strategic bidding	Ofcom acknowledges the possibility that bid levels were distorted by strategic behaviour, but ignores this for the purpose of deriving value estimates. This approach is neither reasonable nor conservative. Ignoring strategic behaviour is a particular problem at 800 MHz, as Ofcom's marginal value approach relies on specific bids by EE that are particularly likely to have been inflated relative to generic value.
2. Budget constraints	It is inconsistent for Ofcom to speculate that auction prices may have been reduced by budget constraints while refusing to recognise the risk that some bid values may have been inflated by strategic bidding.
3. Incremental demand for 800 MHz blocks and the contiguity premium	Ofcom should consider the incremental value of both 2x5 MHz and 2x10 MHz. Ofcom's analysis of 800 MHz should be weighted towards 2x5 MHz, as a 2x10 MHz price cannot be reliably determined and would likely overstate value, raising a risk of 900 MHz spectrum going unused. For 2600 MHz, the case for considering 2x10 MHz is stronger.

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Telefonica's comments on Ofcom's position	
4. Coverage premium	We consider the issue of the coverage premium to be second order relative to the impact of Ofcom's failure to consider how strategic factors may have affected EE's bids.
5. Coverage obligation lot	Ofcom should consider estimates of value both with and without an adjustment for the coverage obligation. We think that greater weight should be put on methodologies that ignore this effect, given ambiguity whether it really affected UK bid values.
6. DTT co-existence	Ofcom's proposal to value DTT co-existence costs at £3m per MHz is arbitrary and excessive. Such costs should be excluded entirely from the calculation of the market value of 800 MHz.
Methodology issues	
7. Revenue constraint	Ofcom argues that the revenue constraint should be ignored. We disagree. Ofcom should consider both approaches. We think that greater weight should be attached to methodologies consistent with a revenue constraint.
8. Reserve price bids	Ofcom argues that it should ignore the impact on final prices and bidding behaviour made by government reserve prices. We disagree. Ofcom should consider approaches with and without this impact. We think that greater weight should be attached to methodologies that remove the distorting impact of reserve price bids.
9. Packing issue	Ofcom argues that there is a "packing issue" when analysing UK bid data and uses this as justification for using hypothetical bids (based on actual marginal values taken from other bids) to value 800 MHz spectrum. We disagree. The packing issue at 800 MHz is an arTelefonicaact of the high government reserve bids. We do not accept this as a reason for using non-existent bids to estimate prices.
10. Spectrum caps	Telefonica fundamentally disagrees with Ofcom's position on spectrum caps. It is highly inappropriate for Ofcom to speculate how much EE might have bid for packages of spectrum beyond this cap, given that its own analysis deemed such bids incompatible with a competitive market. It is also pure speculation on the part of Ofcom to suggest that EE had an intrinsic value for more 800 MHz spectrum in addition to the package of 800 MHz and 2600 MHz spectrum it won in the auction.
11. Low-power lots	Ofcom argues that bids containing low power lots should be ignored for purposes of inferring valuations from auction data. We support this position.

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Issues with interpreting the bid data

1. Strategic bidding

50. Ofcom accepts in principle that bidding behaviour in CCAs can be affected by strategic bidding. Its position on the UK auction, as with European auctions, is that there is a lack of evidence that such behaviour took place and that it is unclear whether such behaviour raised or lowered prices. Our impression is Ofcom is deliberately trying to duck this issue as it weakens its arguments for relying on EE's larger marginal bid values to estimate valuations for 800 MHz.

51. One indication that bids were not purely driven by standard valuations comes from the fact that EE did not bid for packages with 2x15 MHz of 800 MHz spectrum. EE only bid for packages with 2x5MHz, 2x10 MHz and 2x20 MHz. This is hard to rationalise on a stand-alone valuation basis. One interpretation of this bidding behaviour is that EE was only interested in either 2x5MHz or 2x10MHz, and that bids for 2x20 MHz were intended as price setting bids. Another is that EE attached greater value to 2x20MHz because of the potential collectively to block Vodafone and Telefonica from securing a critical mass of LTE spectrum and/or knock one of them out of the band completely.

52. We carried out an analysis of the sensitivity of the auction result with respect to large EE bids submitted in the supplementary round. We observe that although EE could have won 2x20 MHz of 800 MHz, this would have happened only if it had outbid one of Telefonica or Vodafone for the second incremental 2x10 MHz. This seems rather unlikely but, of course, if it had happened, EE would have gained a huge advantage in terms of its relative spectrum position. EE could also have won 2x15 MHz of 800 MHz if it had bid for such packages. This outcome would also have required one of Telefonica or Vodafone to bid for a package containing 2x5 MHz of 800 MHz, thus competing with their own 2x10 MHz bid. Neither Telefonica nor Vodafone made such a bid but they might have done if they had been sufficiently budget constrained and concerned about losing 800 MHz altogether. Put differently, at the time of the supplementary round, EE should have been in a position to predict that it had a greater likelihood of winning 2x15 MHz than 2x20 MHz of 800 MHz spectrum, and may be presumed to have conditioned its bids accordingly.

53. This analysis points to two conclusions. Firstly, the fact that EE did not submit any bids for 2x15 MHz implies that it did not want this spectrum at a marginal price that could been part of a winning package bid. Secondly, the implication that it has no value for packages containing 2x15 MHz suggests that EE's bids for 2x20 MHz were driven by strategic factors, such as blocking value (associated with 2x15 MHz but not 2x20 MHz) or price setting aspirations.

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While this analysis does not prove that EE's bids were strategic, it certainly implies that their bids were based on considerations other than its perception of what the spectrum was intrinsically worth.

54. The incremental values that EE placed on winning additional spectrum provides further evidence that EE's bids were inflated by strategic considerations, such as blocking value. In Figure 4 and Figure 5, we compare Vodafone and EE's incremental bid values for each additional block of 2x5 MHz of 2600 MHz in packages containing 2x10 MHz of 800 MHz. Vodafone's incremental values follow a classic profile for a high frequency LTE band, peaking at four lots and declining thereafter. In contrast, EE's incremental bids are much larger, vary greatly and typically increase for larger amounts of 2600 MHz (even though EE already owned much larger quantities of 1800 MHz spectrum than any other bidder).

Figure 4: Vodafone's incremental bid values for 2600 MHz spectrum

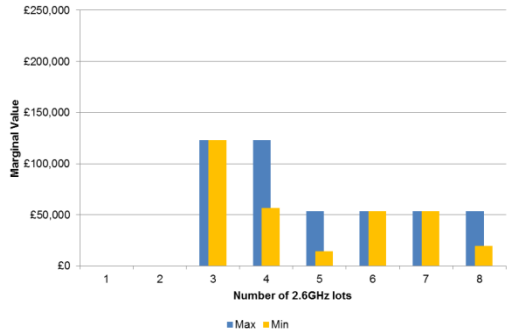
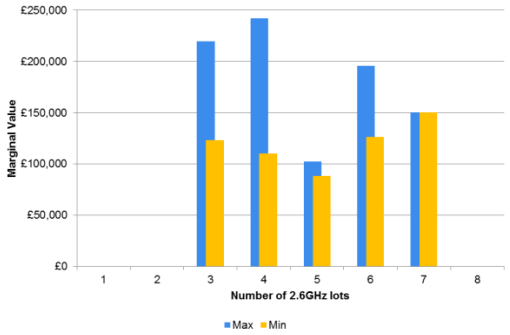


Figure 5: EE's incremental bid values for 2600 MHz spectrum



55. Another peculiar feature of EE's bids is that its value for the first lot of 800 MHz appears to jump from £23m for packages with five or less lots of 2600 MHz to £27.5m with six lots of 2600 MHz to £35.3m for seven lots of 2600 MHz. We cannot explain this in relation to the generic value of the underlying spectrum; indeed one would think that 800 MHz would, if anything, be more valuable with smaller amounts of 2600 MHz. There is, however, a possible strategic explanation: EE may have submitted a series of backstop bids for small packages that it could expect to pick up cheaply if competition in the supplementary round was unexpectedly strong, but bid for these below value to avoid competing with its preferred package. This raises the possibility that EE's bids for smaller packages understate value while its bids for larger packages of 800 MHz overstate value, meaning that Ofcom's marginal value estimates for incremental 800 MHz spectrum will also overstate value.

56. It would hardly be surprising if EE's bids were driven by strategic considerations. The emerging academic literature on CCAs recognises that "gaming" behaviour is common under

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this auction format.[19] More specifically, it is widely recognised that other bidders in the UK auction engaged in strategic bidding. [✂]

Separately, it is apparent that H3G's bids were conditioned to ensure it won set-aside spectrum at the reserve price.[20] In turn, EE's bid structure was likely influenced by (a) the anticipated or observed behaviour of H3G in the auction, given that H3G's set aside strategy affected what EE could win and what it would pay; and (b) uncertainty over the outcome of the auction given that one of its rival bidders finished the clock rounds on 2x20 MHz of low power spectrum.

57. Ofcom's marginal bid approach rests on the assumption that there was no strategic bidding by EE, and that EE's incremental values reflect full market value. Given the evidence that there was strategic bidding in the auction AND that EE's own bid profile is inconsistent with straight forward valuation-based bidding (i.e. a valuation profile that focuses only on the generic value of spectrum and excludes blocking value and price setting), this assumption is neither reasonable nor conservative. At the least, Ofcom should recognise a significant risk that many of EE's smaller bids may understate value and that its larger bids were inflated by strategic considerations, with the implication that its incremental values, especially for larger amounts of 800 MHz, may overstate full market value.

2. Budget constraints

58. Ofcom highlights the observation by the National Audit Office that the UK auction result may have been affected by bidders in the UK auction having budget constraints, and uses this as an argument why prices may understate full market value.[21] This is a moot point: firstly, it depends on what bidder would have bid if they had not been under budget constraints; and secondly, it depends on whether budget constraints are enduring or not. If temporary, then market value may have been understated but only if the additional bids would have exceeded existing marginal bids or displaced winning bids. If enduring, then budget constraints are an integral part of market value, so this point is irrelevant. More generally, it is inconsistent for Ofcom to speculate that auction prices may have been reduced by budget constraints while refusing to recognise the risk that some bid values may have been inflated by strategic bidding.

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19 See, for example: Maarten Janssen & Vladimir Karamychev, Gaming in Combinatorial Clock Auctions, Working Paper, University of Vienna, Erasmus University Rotterdam and Tinbergen Institute, 11-02-2013.

20 Geoffrey Myers, *Spectrum floors in the UK 4G auction: an innovation in regulatory design*, p.15-16, available for download from SSRN.

21 Ofcom, August 2014 consultation, Para 2.88.

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3. Incremental demand for 800 MHz blocks and the contiguity premium

59. In the consultation document, Ofcom debates whether it should calculate marginal value based on a 2x5 MHz or 2x10 MHz unit of demand. This is a false choice. Ofcom should consider both approaches, although it may ultimately put more weight on one or the other. In our view, for 800 MHz, there is a strong case to put more weight on 2x5 MHz as the base unit of demand. At 2600 MHz, the appropriate unit is less certain.

60. Both Vodafone and Ofcom agree that there is a "contiguity premium" associated with bidders acquiring more than one 2x5 MHz block in a low frequency band. Vodafone argue that this contiguity premium should be deducted from the estimate of marginal value based on EE's bids, as a contiguity premium is not relevant to a bidder acquiring a single block in the 900 MHz band. Ofcom alternatively argue that the contiguity premium should be included in full but, so as to allow for this effect, Ofcom should look at 2x10 MHz as the marginal unit of demand.

61. In practice, there are problems with both approaches. Ofcom's approach of looking at 2x10 MHz is superficially attractive because it appears to circumvent the need to calculate the contiguity premium. However, when looking at 800 MHz, this approach has two serious flaws:

    1. **High risk of overpricing 900 MHz.** If 900 MHz spectrum were priced based on the value of 2x10 MHz instead of 2x5 MHz, there is a significant risk that valuable spectrum could go unused. There is only 2x35 MHz of spectrum available in the 900 MHz band. This means that it is not possible to allocate the entire 900 MHz spectrum in blocks of 2x10 MHz. In particular, were 2x5 MHz to be offered in the marketplace, and were this priced at a level that included a contiguity premium, it would presumably go unsold. This is particularly likely in the context of the UK, where: (a) two players currently hold 2x17.5 MHz each of 900 MHz spectrum, and would be much more likely to individually or collectively release 2x5 MHz than they would 2x10 MHz; and (b) a marginal buyer would presumably be an operator that does not currently have any 900 MHz spectrum.

    2. **Depends on non-existent bids.** A further problem is that EE, the marginal bidder for UK 800 MHz spectrum, did not make any bids for an incremental 2x10 MHz of spectrum, in addition to the 2x5 MHz it purchased. Ofcom attempts to get round this problem by looking at the incremental values that EE did express between packages including 2x10 MHz and 2x20 MHz of 800 MHz spectrum, and de facto using these to create hypothetical marginal bids by EE for 2x15 MHz. This approach is flawed, as it ignores the facts that: (a) EE could have submitted bids for packages containing 2x15 MHz if it had had any

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value for them; and (b) EE's bids for 2x20 MHz are suspect as they were likely inflated by strategic factors, as described above.

62. As Ofcom recognises, Vodafone's approach is logically correct when looking at the value of a single 800 MHz lot of 2x5 MHz. However, there is no satisfactory methodology for measuring the size of the contiguity premium. This makes Vodafone's value estimate somewhat uncertain. If EE's bids are taken at face value, its contiguity premium appears to be inconsistent across packages. We know that EE offered to buy one lot of 800 MHz for £23m per MHz. On this basis, as Ofcom's Table 2.5 illustrates, EE's incremental bid values (IBVs) for a second 2x5 MHz lot range from £42m up to £60.5m. If we suppose, for simplicity, that the generic value for incremental blocks is constant at £23m per MHz (it is rather more likely, as Vodafone suggests, that it declines), then EE's contiguity premium varies between £19m and £37.5m. This variation is hard to reconcile with Ofcom's assumption that EE bid straight forwardly.

63. We also question whether it is applicable to carry over EE's contiguity premium to the 900 MHz band, even if looking at the incremental value of 2x10 MHz. EE's bid amounts imply a trade-off between acquiring more 800 MHz spectrum and more high frequency spectrum at 2600 MHz (FDD or TDD). At the time of the auction, its contiguity premium may have been uniquely high relative to other operators, owing to its position as the UK's largest operator by subscribers and one-off option to refocus its network using low frequency of spectrum. Now that the auction outcome has reinforced its focus on high frequency spectrum, there is no reason to believe its value of 900 MHz spectrum (a band that is less important for LTE than 800 MHz) would be inflated in the same way. Meanwhile, based on their choice of package bids in the UK auction, one may presume that other potential marginal buyers of 900 MHz, such H3G or Niche, have lower values than EE for marginal 800 MHz and presumably lower contiguity premiums.

64. With respect to 2600 MHz, we think the case for considering marginal demand for 2x10 MHz as well as 2x5 MHz is stronger. It is widely recognised that a single block of 2x5 MHz at 2600 MHz is not very useful, so a typical bidder will likely only express values for two or more blocks. This effect can only be captured by looking at marginal bids for the first 2x10 MHz. Beyond this point, however, each additional 2x5 MHz is useful, so it is important also to consider incremental 2x5MHz units of demand.

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260 Bath Road
Slough
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4. Coverage premium

65. Ofcom identifies a risk that its estimates of EE's marginal value may be affected by the existence of a coverage premium from EE acquiring its first lot of low frequency spectrum.[22] Such a premium would not apply to a second 800 MHz lots (the relevant unit for marginal value) or to EE's value of 900 MHz spectrum as an increment to its post-auction holdings. Ofcom states that "*in principle a downward adjustment* [to its estimate of marginal value for 800 MHz] *should be made to account for this*", but in practice does not make any adjustment as "*there is not a reliable basis to make such an adjustment*."[23]

66. We consider the issue of the coverage premium to be second order relative to the other flaws in Ofcom's marginal bidder analysis. We agree that the existence of a coverage premium is one (amongst many) reasons why its upper bound marginal value estimate of £35.3m (based on the values that EE expressed for the first two lots of 800 MHz) may be an over-estimate. We disagree that the possible inclusion of a declining coverage premium for acquiring more than two 800 MHz lots is a reason why Ofcom's marginal value estimate of £32.63m is conservative (based on an expressed value by EE for a 3rd and a 4th block), as this effect is likely small compared to countervailing strategic factors inflating this bid.

5. Coverage obligation lot

67. In our previous consultation response, we urged Ofcom to consider the value of all 800 MHz spectrum, rather than focus solely on the value of lots without the coverage obligation. We argued that Ofcom has a duty to consider the value of all 800 MHz lots sold in the auction and should not cherry-pick evidence points. We also pointed out that the differences in bid values across the two 800 MHz categories, although non-trivial, are too small to draw definitive conclusions on whether the coverage obligation really affected valuations. For example, bid decisions may have been distorted by other factors such as differences in lot size and frequency placement. Based on these reasons, we maintain our position that greater weight should be placed on a combined approach if LRP is used to determine the 800 MHz value. However, we recognise the value of Ofcom's approach as an alternative benchmark.

68. Ofcom's switch to a marginal value approach de facto leads it to look only at specific EE bids that concern only the non-coverage obligation lots at 800 MHz. We view this undue focus on specific bids in the context of a package bid auction as a weakness of this approach. We view this as an argument in favour of LRP over Ofcom's marginal bidder approach. As Ofcom

[22] Ofcom, August 2014 consultation, Para 2.71 & 2.75 and Annex 6.

[23] Ofcom, August 2014 consultation, Para 2.75.

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point out, a significant advantage of LRP is that "*it considers bids for all bands in the auction simultaneously and so takes account of cross-band effects as reflected in the auction bids*."[24]

69. Separately, Ofcom does consider the differences in implied prices for 800 MHz lots with and without coverage obligations in order to derive a premium for avoiding the coverage obligation. It uses LRP to determine this value.[25] We accept this approach in principle but object to it in practice given that we think UK bid data is too "noisy" to draw reliable conclusions about the value of avoiding the coverage obligation lot. In our view, it would be consistent with Ofcom's "*conservative approach*" to set this value to zero. We also have concerns about Ofcom's application of a coverage obligation premium to country benchmarks for 900 MHz (see Section 4 of our response).

6. DTT co-existence costs

70. In its original consultation, Ofcom proposed to add £3m/MHz to its estimate of the value of 800 MHz to account for the expected cost of managing DTT co-existence. This calculation was based on the maximum possible DMSL payment due from each operator. As Ofcom noted, this calculation assumes that bidders entered into the auction expecting to receive no refund of such payments. Subsequently, Ofcom issued a Section 32A request for information from bidders regarding their assumptions about DTT co-existence costs in deciding their bids for 800 MHz spectrum in the UK auction. In the latest consultation, Ofcom concludes that an adjustment of £3m/MHz is appropriate, based on an analysis of responses from the four UK operators. However, it is impossible for stakeholders to verify this as the associated evidence is redacted.

71. We note there is a subtle change in Ofcom's position on DTT co-existence. Previously, its arguments assumed that all bidders must have factored in the full £3m/MHz into their bids. Now, it appears to base its case solely on EE, which Ofcom identifies as the marginal bidder. The implication is that EE did factor the maximum DMSL payments into its bids, but this of course cannot be verified by respondents.

72. Telefonica's position regarding DTT co-existence remains unchanged: they should be excluded entirely from the calculation of the market value of 800 MHz. Our reasoning is as follows:

[24] Ofcom, August 2014 consultation, Para 2.56.

[25] Ofcom, August 2014 consultation, Para 6.34.

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Slough
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- Actual DMSL costs are now expected to be very small, meaning that operators will only spend a tiny proportion of the £3m/MHz max payment. Although the situation at the time of the auction was less clear cut, evidence was already emerging from other countries (e.g. Germany and Sweden) that this issue was not as serious as originally feared. In this context, it beggars belief that any operator saw this as a hard number within their valuations.

- Excluding DMSL costs completely (or at least only applying a modest proportion of the £3m/MHz) would be consistent with Ofcom's stated position that it should take a "*conservative approach*" in assessing the full market value of spectrum bands. To apply the full £3m/MHz is clearly not conservative; it poses a clear risk of unduly inflating Ofcom's figures to the prejudice of Ofcom's statutory objectives.

- We are deeply uncomfortable with Ofcom making an adjustment that could ultimately increase fees for our 900 MHz holdings by 10-15%, based on a confidential response from a single competitor (EE) that does not own any 900 MHz spectrum. The lack of transparency on this issue sits uncomfortably with the rest of Ofcom's calculations.

- As discussed above, EE's valuations for incremental 800 MHz observed in the auction are highly variable, implying that its valuation model was driven by strategic factors, such as blocking value or price setting. This makes individual EE bids highly unreliable as estimates of the value of 800 MHz. Arbitrarily adding on £3m/MHz to such bids only compounds this error in Ofcom's analysis.

73. We note also that Ofcom has changed its approach to how it applies DTT co-existence costs when deriving the value of 900 MHz. Now, instead of adding £3m/MHz to all country benchmarks, it only applies them to countries where DTT co-existence costs are believed to have influenced the spectrum packaging and/or bidding in the auction. We recognise that prices in some other countries (especially in auctions in 2010-11) were likely affected by DTT co-existence concerns, so in principle the approach of making the adjustment selectively has merit. However, in practice, we have multiple concerns with this approach, as described in Section 4 on the value of 900 MHz, including the use of £3m/MHz as an arbitrary adjustment factor.

Methodology issues

7. Revenue constraint

74. Ofcom has reversed its previous position that a revenue constraint should be applied when determining prices. This leads to big jump in prices using LRP and is also a critical

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assumption underpinning Ofcom's marginal value approach. We do not object to Ofcom exploring the impact of including or excluding the revenue constraint. However, Ofcom should consider both approaches, not arbitrarily switch from one approach to the other. There are also good reasons why greater weight should be attached to methodologies consistent with a revenue constraint.

75. In the October 2013 consultation, Ofcom provided the following assessment of the case for determining LRP without a revenue constraint:

> "*… it could be argued that it yields linear prices which are closer to market clearing prices, in the sense of better separating the winning bids from the losing bids compared to linear prices with the revenue constraint. However, the linear prices derived without the revenue constraint are higher overall than the prices actually paid in the auction, which raises a question of whether substantial weight should be placed on them for the purpose of revising annual licence fees. On balance we do not consider there is a stronger case for this approach compared to the base case* [of using LRP with a revenue constraint]."[26]

76. Telefonica supports this statement and we are disappointed that Ofcom has retreated from its previous balanced position in the August 2014 consultation. We recognise that there is a theoretical case why the revenue constraint could lead to prices that may be perceived as understating the marginal value of spectrum. However, we think these risks are offset by the downsides of relaxing the revenue constraint:

- Without a revenue constraint, prices may overstate the revenue achieved in the auction, grossly so in the case of Ofcom's marginal value estimates.
- Approaches with a revenue constraint produce prices that are – as DotEcon said in their September 2013 report for Ofcom – a proxy for "*some hypothetical market with an institutional constraint of uniform pricing (i.e. the same price per lot for everyone), whereas the CCA allows discounting from uniform pricing to avoid inefficiently unallocated lots when there complementarities across lots*." Such a comparison is dubious because, as DotEcon go on to say, "*bidders may have placed different bids in such circumstances*."[27]

[26] Ofcom, October 2013 consultation, para A8.43.

[27] DotEcon, 800 MHz and 2.6GHz linear reference prices and additional spectrum methodology, Report prepared for Ofcom, September 2013, p.34.

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260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
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- One of Ofcom's arguments for using the LRP methodology in the first place, rather than a simple linear fit (as outlined in section 3.1.1 of the October 2013 consultation) was that the latter approach does not take into account information contained in losing bids. Abandoning the revenue constraint has a similar affect, whether using LRP or marginal bidder analysis: it results in prices based on only a few losing prices, while ignoring broader information about losing bids that were relevant in determining actual auction prices.

77. We conclude that Ofcom is right to consider estimates of value both with and without revenue constraints, but should put greater weight on prices that actually or implicitly include a revenue constraint.

8. Reserve price bids

78. In our responses to the October 2013 consultation, both Telefonica and Vodafone argued strongly that Ofcom should discard government reserve price bids when determining the value of 800 MHz and 2600 MHz spectrum. We both pointed out that these bids led to prices being higher than would otherwise have been the case. As we discuss below, they are also the source of the so-called "packing problem" that causes one lot of 800 MHz to be nominally unsold in the alternative coalition that sets the prices for Telefonica and Vodafone.

79. Ofcom rejects these arguments, on two grounds[28], both of which are wrong:

- First, Ofcom observes that "*the absence of a losing bid for Telefonica's first 2x5 MHz of 800 MHz did not reflect a general lack of demand for additional 800 MHz.*" This is correct but entirely misses the point. Absent reserve price bids, there is a highest value alternative coalition in which EE takes all of Telefonica's spectrum that would set a market price for Telefonica.

- Second, Ofcom claims that "*it is the marginal opportunity cost which is more relevant for the purpose of ALF and in the 4G auction this is £38.4m/MHz for a 2x5 MHz increment*". We completely disagree, as this marginal value is derived from EE bids that are not relevant for price setting, and only acquire relevance in Ofcom's analysis through heroic assumptions regarding hypothetical bids.

80. A reasonable approach that Ofcom should take is to consider approaches both with and without the impact of reserve bids. We think that greater weight should be attached to methodologies that remove the distorting impact of reserve price bids.

[28] Ofcom, August 2014 consultation, paras 2.39-2.40.

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9. Packing issue

81. Ofcom alleges that there is a "packing issue" that leads to LRP reporting values "below market value" for 800 MHz. In essence, Ofcom is suggesting that Vodafone and Telefonica's prices are below market value because there are no bids of the right size to exactly replace them in the price determination. Ofcom's analysis is incorrect: there is no packing issue in this case, as there are bids by EE and H3G that can exactly replace bids by either Vodafone and Telefonica's in the price determination – the only reason that they are not selected is that they are being out-competed by a coalition of bids including an Ofcom reserve bid for 800 MHz.

82. Ofcom's claim that there is a packing issue is closely linked to the level of reserve prices for 800 MHz. In the price determination for either Vodafone or Telefonica, the set of bids that determines the price includes a reserve price bid for one lot of 800 MHz. Ofcom describes this as a "packing problem" and essentially proposes that the reserve price bids in the price determination should be replaced by "missing bids", based on incremental values for relevant amounts of spectrum taken from other bids (i.e. one of EE's bids).

83. Ofcom's argument is completely false, as the so-called packing problem is an artefact of the high level of the Ofcom reserve price for 800 MHz. If the winner and price determination algorithm is re-run with all bids, but with reserve prices eliminated, then the price setting coalition does include real bids for all 800 MHz lots (i.e. 2 for Vodafone or Telefonica, and 4 for EE, with H3G moving to 2600 MHz). Put differently, there is a bid from EE that could replace either Vodafone or Telefonica's winning demand for 800 MHz, but the price setting set of bids including this EE bid is displaced by one including a reserve price bid, thereby leading Ofcom to conclude erroneously that there is a "packing issue".

84. Notwithstanding this conclusion, even if there were a packing issue, we do not agree that Ofcom should rely on hypothetical bids to try to compensate for this issue – outcomes with packing issues are a feature rather than a problem in a CCA. The possibility of lumpy outcomes reflects the inherent lumpiness of demand for spectrum in some bands and this known issue was a reason why Ofcom selected the CCA format.

10. Spectrum caps

85. In its analysis of methodologies, Ofcom poses the question "*whether or not, for the purpose of ALF, we should treat the overall spectrum cap in the 4G auction as a binding constraint on a*

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260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
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forward-looking basis."[29] It goes on to argue that the cap should be relaxed for the purposes of analysing bids in the auction. This is a critical assumption underpinning its marginal bidder approach, as it uses this as justification for extracting marginal values from selected EE bids and de facto applying them to hypothetical bids by EE that would exceed the spectrum cap. On the same basis, it concludes that all LRP values understate market value, because they are based on actual bids in the auction rather than the hypothetical bids that EE might have made if its demand had not been capped.

86. Telefonica fundamentally disagrees with Ofcom's position on spectrum caps. The amount of spectrum that EE acquired in the auction was at the very limit of Ofcom's overall spectrum cap of 2x105 MHz. This cap was established by Ofcom as a "*safeguard*" and was determined as the "*minimum necessary to avoid very asymmetric distributions of spectrum*."[30] It was established on the basis of "*competition analysis*"[31] with the purpose of "*preventing highly asymmetric outcomes that might distort competition in the future*."[32] It is highly inappropriate for Ofcom to speculate how much EE might have bid for packages of spectrum beyond this cap, given that its own analysis deemed such bids incompatible with a competitive market.

87. It is also pure speculation on the part of Ofcom to suggest that EE had an intrinsic value for more 800 MHz spectrum in addition to the package of 800 MHz and 2600 MHz spectrum it won in the auction. Owing to the spectrum cap, no such bids were permitted. Even if such bids had been observed, given the competitive context at the time, there would be strong reasons to fear that the amount would have been inflated by strategic considerations, such as blocking value or price setting.

88. There is also a fundamental inconsistency in Ofcom's arguments. The spectrum cap in the UK auction was based on an assessment of spectrum scarcity at the time of the auction. If spectrum scarcity conditions change owing to the newly anticipated "early" release of the 700 MHz and 2.3 GHz bands, then the value of spectrum will also change. As discussed in Section 3, this value will likely fall. Ofcom cannot simultaneously argue that it should ignore the spectrum cap for the purposes of its analysis AND rely on bid values from the 2013 UK auction to estimate marginal values for spectrum.

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29 Ofcom, August 2014 consultation document, para. 2.57.

30 Ofcom, Second consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues, January 2012, p. 63.

31 Ofcom, Consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues, March 2011, para 1.19.

32 Ibid., para 9.62.

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11. Bids including D1 and D2 lots

89. Ofcom has proposed disregarding package bids containing low power 2600 MHz lots (D lots) for purposes of analysis, owing to issues with modelling this category. We support this approach, as we do not think any bids containing D lots affected the winner and price determination. Given information available to bidders about participation in the auction, it is clear that such bids must have been placed for strategic purposes and do not reflect market value.

C. Specific concerns with Ofcom's marginal value approach

90. The "marginal bidder" approach is based on the simple premise that the value of spectrum in each band should reflect the value placed on one lot by the strongest losing bidder. Both Vodafone and (now) Ofcom argue that this value can be derived by analysing the bids of the marginal bidders for each band: EE for 800 MHz; and Telefonica and Niche (BT) for 2600 MHz. Telefonica is sympathetic to this methodology in principle but has grave doubts about its application in practice. In our view, we think it is a mistake for Ofcom to rely too heavily on this method alone to determine UK prices, given the sensitivity of results to assumptions and methodological decisions that are highly contentious.

91. Vodafone were the first stakeholder to propose the marginal bidder approach. In order to estimate the value of an additional 2x5 MHz block of 800 MHz, they decompose EE's bids into a generic spectrum valuation and a contiguity premium. Using this approach, Vodafone estimates the value of 800 MHz at between £17.9m and £21.4m per MHz.[33] Vodafone's reasoning appears sensible. However, their value range is significantly lower than the anchor points we identified in Section A above, which implies a risk that this approach underestimates full market value. A possible explanation could be that Vodafone has over-estimated the size of the contiguity premium and thus under-estimated generic value, as the relationship between the two is inherently uncertain. Another is that the decomposition of EE's bids may be overly simplistic, as this approach necessarily assumes that other factors (such as blocking value) did not distort EE's bids.

92. Ofcom's estimates of marginal value ranges between £32.63m and £38.3m per MHz, and are at the opposite end of the valuation scale from Vodafone. This reflects a series of highly aggressive assumptions underpinning Ofcom's analysis.

[33] Vodafone's response to Ofcom Consultation, January 2014, Annex 2, Section 5.3.5.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

93. Ofcom's higher number, £38.3m/MHz, is based on a 2x5 MHz increment and Ofcom makes no attempt to isolate a contiguity premium. The failure to isolate a contiguity premium is the main difference between Ofcom's analysis and the marginal bidder analysis of Vodafone. Ofcom identifies £38.3m as the difference between EE's bid for the 2-6[34] package, and EE's winning bid for the 1-7 package. This difference is £310.5m, and Ofcom then adds £72.5m to adjust for the difference in the amount of 2600 MHz spectrum. Ofcom does, however, recognise the validity of contiguity argument, and concludes that £38.3 may therefore be an over-estimate.

94. Rather than trying to assess the size of the contiguity premium, Ofcom circumvents the problem by arguing that the relevant increment is 2x10 MHz at 800 MHz. With this in mind, Ofcom derives its lower number, £32.63m, indirectly from EE's bids. Specifically, £32.63m is the difference between EE's bid for the 2-4 package and EE's bid for the 4-4 package. £32.63 is therefore EE's marginal value for a second block of 2x10 MHz at 800 MHz. As such, Ofcom's analysis does not isolate a contiguity premium, unlike Vodafone's analysis.

95. A problem with this methodology is that the marginal bid value for a second 2x10 MHz block at 800 MHz is derived from a bid containing 2x20 MHz at 2600 MHz, much less than EE actually won. Ofcom is obliged to do this because of the lack of EE bids for larger amounts of 2600 MHz spectrum. To the extent that EE's marginal generic spectrum value for 800 MHz decreases with the amount of 2600 MHz spectrum, this method may overestimate the marginal value. We make this point notwithstanding Ofcom's observation that EE's observed incremental bid values for 800 MHz are actually higher for the 3rd and 4th blocks than for its first block. We do not consider this to be a credible observation of incremental value, based on engineering considerations alone, and contend that EE's bid value for larger packages of 800 MHz must have been influenced by strategic factors that are not relevant to Ofcom's calculations.

96. A second problem with Ofcom's marginal bid analysis is that it depends on very few data points from only one bidder (EE). As such, Ofcom's marginal bid analysis is unlikely to produce robust results that can be relied upon for determining ALF. We note that Ofcom has previously dismissed a simple regression analysis of auction prices and winning packages on the grounds that such an approach would only rely on a few bids, as opposed to the LRP approach which takes into account all (winning and losing) bids. As such, we do not view Ofcom's proposed marginal bid analysis as a robust methodology, especially in the context of our comments on strategic bidding.

[34] i.e. 2 lots of 2x5 MHz at 800 MHz and 6 lots of 2x5 MHz at 2600 MHz.

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97. The lack of robustness of the marginal bid analysis is also evidenced by the large discrepancy between Ofcom's marginal bid analysis and Vodafone's marginal bid analysis. The difference comes down to whether a contiguity premium should be included or not, and in turn this comes down to whether the relevant increment is 2x5 MHz or 2x10 MHz (see discussion above). Ofcom accepts the potential for a contiguity premium, and as such Ofcom does not dismiss Vodafone's approach.

98. The various methodologies proposed by Ofcom, including the marginal bid analysis, all share one common assumption: that bids submitted in the auction represent true valuations. If we take this assumption at face value and accept that no bidder was behaving strategically, the bids submitted during clock rounds also contain information about valuations for packages that did not receive bids. Specifically, the relative cap rule allows us to calculate an upper bound on valuations for packages that received no bids.

99. This follows from the mechanics of the CCA auction: if you bid in a straight forward way during the clock rounds (i.e. bid in each round on the package that yields highest surplus at round prices), then the relative caps will allow the bidder to bid full value for any package in the supplementary round. It would be inconsistent to argue that no bidder was behaving strategically, and at the same time use a pricing methodology that implies a marginal value for extra lots that would break the relative caps.

100. If we take Ofcom's assumption at face value (that bids in the auction were non-strategic and fully reflective of actual valuations), each bid set contains two types of information: (i) bids that were placed provide direct information on valuations; and (ii) bids that were not placed provide indirect information on valuations through relative price caps in the supplementary round.

101. For example, although EE did not place a bid for a package containing 2x15 MHz at 800 MHz, we can calculate EE's relative caps for various packages containing 2x15 MHz. Such caps are shown in Table 4. The table first lists actual bids EE placed on packages containing 2x10 MHz at 800 MHz; then we list relative caps for hypothetical larger packages (we add one 2x5 MHz lot at 800 MHz); and, finally, we calculate the implied cap on the marginal value for an incremental 2x5 MHz lot at 800 MHz.

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260 Bath Road
Slough
Berkshire
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Table 4: EE's relative caps for selected packages in the supplementary round

Actual Bid	Hypothetical Package and relative cap	Implied cap on marginal value for 2x5MHz at 800 MHz
2-0-4 at 1,145,478,000	3-0-4 at 1,470,400,000	324,922,000
2-0-5 at 1,233,478,000	3-0-5 at 1,516,800,000	283,322,000
2-0-6 at 1,360,000,000	3-0-6[35] at 1,563,000,000	203,200,000

Source: Telefonica calculations using bid data published by Ofcom. Note: "2-0-4" means a package containing 2 lots of 800 MHz (no coverage obligation); zero lots of 800 MHz with coverage obligation; and 4 lots of 2600 MHz FDD, and so on.

102. Unlike the various methodologies proposed by Ofcom, the relative cap argument above does not produce price estimates. Instead, the relative cap argument provides a sanity check on the various pricing methodologies. Any pricing methodology that produces a price estimate that violates the relative caps cannot be considered reasonable; as such prices are inconsistent with Ofcom's underlying assumption that bidding was non-strategic. The caps on marginal values for 2x5MHz at 800 MHz, as illustrated in table 3 above, are below the values suggested by Ofcom's marginal bid analysis, and we therefore believe there is a fundamental inconsistency in Ofcom's approach.

[35] This package is above EE's spectrum cap but is shown for illustrative purposes, given that Ofcom's approach is de facto based on hypothetical bids that exceed the spectrum cap.

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260 Bath Road
Slough
Berkshire
SL1 4DX
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D. A conservative estimate of the value of 800 MHz and 2600 MHz

103. We now apply the methodology described at the end of part A to determine a conservative estimate of the full market value for 800 MHz and 2600 MHz. Unlike Ofcom's approach, which focuses on just one approach based on many questionable assumptions, our estimates are based on a broad analysis of all the plausible methodologies for estimating value.

104. For 800 MHz, we took the following steps:

- **Step 1:** We identified a reasonably exhaustive list of methodologies. We use the list in Table 1.
- **Step 2:** We identified a range of values for each methodology based on different assumptions, such as: including or not including reserve price bids; or applying or not applying a revenue constraint to LRP. We used the numbers in Table 1, which reflect the results reported by Ofcom, Telefonica and other stakeholders.
- **Step 3:** We next considered what weight to give to each methodology and estimate in our analysis. We put the least weight on ASM and absolute European benchmarks, as there is broad agreement between Ofcom and stakeholders that these methodologies have significant deficiencies. We also used the anchor points to identify a reference point for determining if the results produced by remaining methodologies are plausible. This leads us to put greatest weight on estimates of value of 800 MHz between £21.5m and £32.63m, a range in which there are a number of plausible value estimates and anchor points. On the same basis, we put lower weight on Vodafone's estimates for decomposition, and Vodafone's low-end and Ofcom's high-end estimates for marginal bidder values, because they return estimates outside this range.
- **Step 4:** From within our reference range, we identify £25.0m as a conservative estimate of full market value, based on a qualitative assessment of the available evidence points. To facilitate this qualitative analysis, we display all evidence points on a chart (Figure 6) using an approach directly analogous to that proposed by Ofcom for comparing European benchmarks for the value of 900 MHz and 1800 MHz:

105. The reasons why we put least weight on ASM and European benchmarks are as follows:

- **Additional Spectrum Methodology (ASM).** The results are very volatile and depend critically on specific assumptions, for example regarding spectrum caps, the competition constraint etc. The methodology is better suited for a CCA where the outcome is less influenced by policy constraints than the UK auction.

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260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
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- **Absolute European benchmarks.** Individual country benchmarks produce an exceptionally wide range of estimates for UK value, and are clearly significantly influenced by country-specific factors which are hard to identify. As Ofcom recognises, the level of absolute benchmarks are also highly sensitive to assumptions about adjustment factors, such as use of PPP and discount rates when converting annual fees to lump sums.

106. We used two anchor points to identify a reference point for determining if the results produced by remaining methodologies appear plausible: £25.4m, the price at which 800 MHz would otherwise have gone unsold in the auction; and £27.5m, the price paid by Telefonica. As discussed above, these numbers are not estimates of market value per se. There are many reasons why these may be over-estimates, for example because auction results were distorted by strategic bidding or the use of reserve price bids. Ofcom also identify reasons why they could underestimate value; we disagree with Ofcom's arguments in this case but recognise its statutory duty to explore such reasoning. Nevertheless, these are easily identifiable benchmarks that will likely to be used as a public reference point for Ofcom's decision.

107. The mid-point of our anchor points is £27.2m. We propose a simple sanity check on all value estimates: if any estimate is more than 25% above or below £27.2m (i.e. a range of £20.4m – £34.3m), then it should be regarded as suspect and receive lower weight in our analysis. On this basis, we draw the following conclusions regarding each methodology:

- **Decomposition.** In Vodafone's analysis, this approach produces values ranging from £13.5m up to £20.3m, depending on assumptions about reserve price bids and H3G bids, all below our confidence interval. Given also that Vodafone itself prefers the marginal bidder approach, we put low weight on this methodology.

- **LRP.** The various approaches to calculating LRP, as put forward by Ofcom and Telefonica, produce a value range from £24.16m to £31.2m. All these values fall within our confidence interval. We conclude that we should place greater weight on the various LRP estimates, notwithstanding the recognised limitations of this method.

- **Marginal bidder.** This approach produces a wide range of values, from 17.9m (Vodafone low estimate) up to 38.4m (Ofcom high estimate), depending on the specific assumptions used. These low and high observations are outside the confidence interval, so we put low weight on these observations. We focus instead on Vodafone's high estimate and Ofcom's low estimate which form a narrower range of £21.5m-£32.63m, albeit one that spans almost our entire confidence interval. We conclude that we should put greater weight on the marginal bidder methodology but note that the results are highly sensitive to assumptions about specific EE bids and their composition.

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Slough
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SL1 4DX
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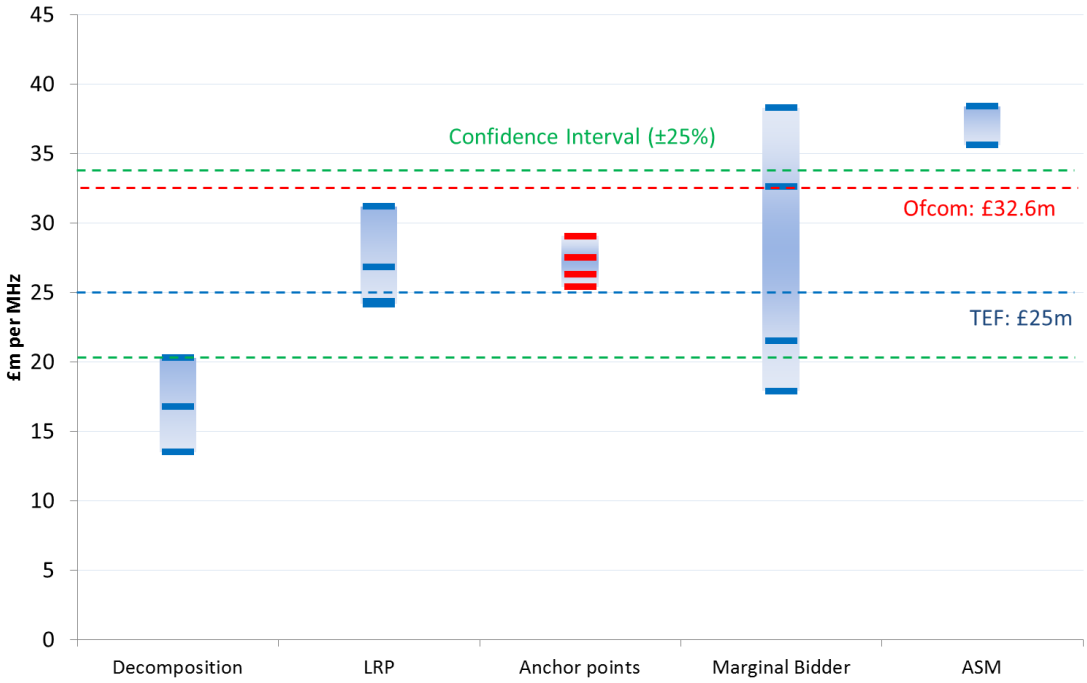
- **ASM.** This approach produces values (£35.6m+) above our confidence interval. This reinforces the conclusion of Ofcom and stakeholders that little weight should be placed on this approach.

108. All the benchmark evidence points for the value of 800 MHz (including those we discarded apart from country benchmarks) are displayed in Figure 6. As can be seen, Ofcom's estimate of value of £32.6m is at the very upper bounds of our confidence interval, and way above our anchor points. We propose an alternative value of £25.0m as a conservative estimate of the full market value of 800 MHz. This is at the lower end of the anchor points and LRP estimates, and in the middle of the wide ranging estimates for marginal value.

Figure 6: A conservative estimate of the full market value of 800 MHz



Source and notes: See Figure 7 below.

109. We undertook the same four-step exercise to identify the value of 2600 MHz, using the methodologies and values from Table 2. As with 800 MHz, we put greatest weight on the LRP and Marginal Bidder approaches. All the benchmark evidence points for the value of 2600 MHz are displayed in Figure 7. In this case, we have identified only one anchor point at £5.5m per MHz, which is based on the level of reserve price at which a 2600 MHz lot would have gone unsold (this is the same amount as the incremental bid value of Niche for its third lot, as

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Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
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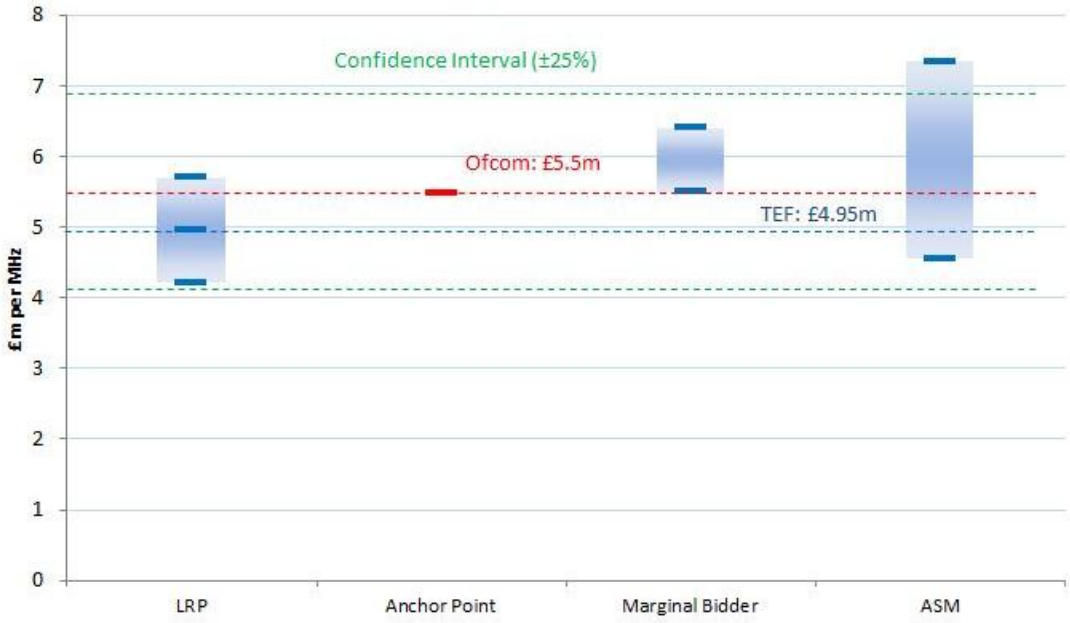
identified by Ofcom in its marginal bidder analysis[36]). This is at the upper end of the reported ranges for LRP and low end of the marginal bidder analysis. Ofcom uses this anchor point as its value estimate, but this seems aggressive, as it essentially means no weight is being given to LRP estimates with a revenue constraint. We propose instead that Ofcom use its original estimate of £4.95m per MHz as a conservative estimate of full market value.

Figure 7: A conservative estimate of the full market value of 2600 MHz



Source: Telefonica analysis using data from Ofcom and Telefonica. Notes: the blue columns show the range of value estimates and the bold blue lines (bold red lines for anchor points) show specific estimates for each methodology; the green dotted lines show our confidence interval; the red dotted line shows Ofcom's estimate and the blue dotted line shows our own estimate of full market value.

110. Our preferred figures, which are conservative estimates of full market value derived from a broad assessment of all plausible methodologies and assumptions, are:

- 800 MHz band: £25.0m/MHz; and
- 2600 MHz band: £4.95m/MHz.

[36] Ofcom, August 2014 consultation, p.28.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Section 5

V. ASSESSMENT OF LUMP SUM VALUES FOR 900 MHZ AND 1800 MHZ

111. In this section, we review Ofcom's revised approach for using benchmarks from European awards to derive the lump sum values for 900 MHz and 1800 MHz. The section is divided into four parts:

- Part A: We discuss Ofcom's decision to focus on benchmark price ratios across bands (relative benchmarks) rather than absolute values. Telefonica strongly supports this change in approach.
- Part B: We set out our comments on Ofcom's use of raw data to derive benchmarks. Here, we have some issues with Ofcom's approach but, in the main, these are now second order, given the focus on price ratios across bands rather than absolute price benchmarks.
- Part C: We review Ofcom's qualitative approach to deriving UK values from European benchmarks. We support Ofcom's intent to use a conservative approach but observe that it fails to do this owing to errors in its tiering of European benchmark data. In particular, its proposal that observations for the value of 900 MHz and 1800 MHz spectrum in Austria should be Tier 1 (best evidence) instead of Tier 3 (weakest evidence) is not reasonable based on the available evidence.
- Part D: We set out our view on the UK lump sum values for 900 MHz and 1800 MHz, taking into account: (a) our own estimates of the UK value of 800 MHz and 2600 MHz as set out in Section 4; (b) modest changes that we propose to Ofcom's benchmark data; (c) revisions to Ofcom's tier structure based on a reasonable assessment of available evidence; and (d) Ofcom's commitment to taking a conservative approach when estimating the final values.

112. Overall, Telefonica strongly supports Ofcom's focus on price ratios across bands in other European countries to derive UK lump sums, but we have concerns about other important aspects of Ofcom's methodology. In particular, we think that Ofcom's approach to weighing evidence regarding country benchmarks lacks structure, and this is leading to errors in its assessment of some benchmarks, notably Austria. We commissioned NERA Economic Consulting to investigate our concerns. In their report, presented in Annex I, NERA propose an econometric test for screening country benchmarks prior to the qualitative analysis. The test is based on the straight forward premise that all benchmarks should be estimates, albeit

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260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

noisy ones, of the same thing, and their test determines a confidence interval for the expected value of country benchmarks by band, while allowing for country-specific variations. NERA argue that observations outside a reasonable confidence interval should be subject to a higher bar regarding qualitative evidence.

113. NERA's econometric test confirms that Austria is a high price outlier amongst both the 900 MHz and 1800 MHz benchmarks. Accordingly, Ofcom's starting point for its analysis of Austria should be that it significantly overestimates UK value unless there is strong evidence to believe otherwise. NERA reviews the qualitative evidence regarding Austria and concludes that there is no such evidence. Therefore, the reasonable approach is to downgrade Austria to Tier 3. NERA also propose some changes to Ofcom's assessment of benchmarks from Denmark (900 and 1800 MHz), Ireland (1800 MHz) and Sweden (1800 MHz). Taking into account all these changes, it is apparent that Ofcom's current estimates of lump sum values are not conservative. In our view, conservative estimates of UK value are £15.5m/MHz for 900 MHz and £10m/MHz for 1800 MHz (equivalent to £20m/MHz and £12.4m/MHz respectively using Ofcom's values for 800 MHz and 2600 MHz).

A. Ofcom's interpretation of European benchmark evidence

114. Ofcom has changed its approach to interpreting European benchmark evidence. Instead of looking at both absolute benchmarks and ratios across bands, it now places the main evidence on ratios ("relative benchmarks"). Absolute benchmarks, to the extent they are considered at all, are used only as a sanity check on the conclusions. The change in approach is in line with the recommendations that Telefonica set out in our response to the October consultation. We strongly support this change for the reasons we set out below.

115. As Ofcom now recognises, one of the key advantages of using relative benchmarks is that such figures are unaffected by the detailed methodology for defining benchmarks, provided that each band is treated in the same way. For example, for bands of the same duration sold on a common date, relative benchmarks will be unaffected by decisions whether or not to apply regular exchange rates or purchasing power parity exchange rates and/or to adjust for inflation (there may, however, be issues when comparing prices for bands sold in different auctions, as exchange rate and inflation adjustments fluctuate over time). Furthermore, for benchmarks where values may have been distorted by country-specific factors, ratios will not be affected if the distortion is common to and reasonably consistent across bands (but they will be if the distortions vary across bands).

116. In Table 5, we compare Ofcom's estimates of relative benchmarks across its two consultations with Telefonica's own estimates submitted in our response to the October 2013

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
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consultation. Each approach uses the same raw data but makes very different assumptions about adjustment factors. Observe, however, that the results for most countries are almost identical.

117. In contrast, the level of absolute benchmarks can vary hugely depending on assumptions about adjustment factors, such as type of exchange rate, inflation index and relevant discount rate adjustments. Furthermore, there is no consensus on what adjustment factors should be used and how they should be applied. In Table 6, we compare Ofcom's estimates of absolute benchmarks across its two consultations with Telefonica's own estimates submitted in our response to the October 2013 consultation. These estimates vary hugely for some countries, for example owing to the change in discount rate used when comparing licences of different durations.

Table 5: Estimates of relative price benchmarks (% ratios)

Ratios	900 MHz / 800 MHz			1800 (Distance Method)		
	TEF	OFCOM 2013	OFCOM 2014	TEF	OFCOM 2013	OFCOM 2014
Austria			110%			66%
Czech Republic				-4%		7%
Denmark	22%	24%	18%	-68%	-1417%	-154%
Germany				0%	1%	1%
Greece						
Ireland	60%	61%	62%			32%
Italy				27%	27%	27%
Portugal	67%	67%	67%	2%	2%	2%
Romania	115%	114%	108%	20%	19%	25%
Slovak Republic						7%
Spain	81%	81%	65%			
Sweden				-1%	-13%	40%

Source: Telefonica and Ofcom data; NOTE: For 1800 MHz Distance Method, we report the following benchmark ratio: (1800 MHz – 2600 MHz) / (800 MHz – 2600 MHz).

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Slough
Berkshire
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Table 6: Estimates of absolute benchmarks (£/MHz)

£m/MHz (UK Equivalent)	800 MHz			900 MHz			1800 MHz			2600 MHz		
	TEF	OFCOM 2013	OFCOM 2014	TEF	OFCOM 2013	OFCOM 2014	TEF	OFCOM 2013	OFCOM 2014	TEF	OFCOM 2013	OFCOM 2014
Austria	N/A	N/A	72.2	N/A	N/A	79.4	N/A	N/A	48.6	1.5	1.8	1.9
Czech Republic	30.1	N/A	44.1				0.8	N/A	6.0	2.0	N/A	3.0
Denmark	18.0	10.1	16.2	3.9	2.4	2.9	1.7	1.0	1.2	8.3	9.5	10.3
Germany	47.8	50.1	52.9				1.7	1.8	1.9	1.5	1.5	1.6
Greece				27.5	31.4	32.8	12.1	13.9	14.5			
Ireland	60.9	58.6	63.5	36.8	35.7	39.6	23.9	23.1	25.2			*6.8*
Italy	46.8	48.3	52.1				15.1	15.5	16.7	3.4	3.5	3.8
Portugal	28.0	36.1	37.3	18.7	24.1	24.9	2.4	3.1	3.2	1.9	2.4	2.5
Romania	11.4	21.8	43.9	13.1	24.9	47.3	3.3	6.2	19.0	1.3	2.5	10.6
Slovak Republic	N/A	N/A	38.5				N/A	N/A	7.1	N/A	N/A	4.6
Spain	26.8	31.4	40.4	21.7	25.4	26.4				1.5	3.1	3.3
Sweden	19.0	14.3	21.2				10.6	9.1	9.7	10.7	9.7	*2.0*

Sources: Ofcom, October 2013 consultation; Ofcom August 2014 consultation; and Telefonica response to October 2013 consultation.

118. In conclusion, we strongly support Ofcom's decision to focus on relative benchmarks rather than absolute benchmarks. This is a prudent decision that substantially eliminates concerns over the methodology for calculating individual benchmarks. Put differently, whereas it may be impossible for the regulator and stakeholders to reach agreement on the level of absolute benchmarks, we anticipate that there is scope for broad consensus over benchmark ratios between bands for individual benchmarks. In the following subsections, we comment further on the specific methodologies that Ofcom uses for deriving benchmarks for 900 MHz and for 1800 MHz.

1. Ratio method for deriving 900 MHz values

119. For deriving benchmarks for the UK value of 900 MHz, Ofcom now focuses on observed 900 MHz to 800 MHz value ratios from other European countries. This is consistent with Telefonica's proposal in our response to the October consultation, where we argued that this was by far the best of the available benchmarks. We strongly support this change in approach.

120. To determine a UK benchmark for each European country, Ofcom identifies the value ratio between 900 MHz and 800 MHz for that country and multiplies it by its estimate for the lump sum value of 800 MHz. We agree with this methodology. However, as Ofcom over-estimates the value of 800 MHz in the UK (see discussion in Section 4), all its results systematically exaggerate the UK value of 900 MHz. We also have concerns about Ofcom's approach of making essentially arbitrary adjustments to the UK 800 MHz value depending on whether it believes that DTT coordination and/or coverage obligation costs were included in each European benchmark (see discussion in part C below).

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260 Bath Road
Slough
Berkshire
SL1 4DX
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121. One unavoidable issue with the 900/800 ratio is that the sample of available data points is small: there are only six European countries that have sold spectrum in both bands in the last five years. Furthermore, as illustrated in Table 5, the reported range of ratios is wide, varying from a low of 18% in Denmark to a high of 110% in Austria. As highlighted by NERA in their report (Annex I), the final estimate of the value of 900 MHz is highly sensitive to the weight given to specific benchmarks. By way of example, the mean average of Ofcom's six values is £24.00 per MHz (compared to Ofcom's proposal of £23.00), but this average falls to £20.10 if the Austrian benchmark is excluded.

122. In Telefonica's previous response, we proposed taking a simple average of available data points. We recognise, however, that with a sample of only six data points, the average is highly sensitive to outliers. This is a particularly relevant issue for this sample, given the wide range between benchmark values. In this context, Ofcom's approach of assessing each benchmark qualitatively has considerable merit. If undertaken correctly, a qualitative assessment should be able to identify and account for potential outliers. Unfortunately, Ofcom's approach to analysing evidence points lacks structure, leaving it vulnerable to error (see discussion in Part C and the NERA report in Annex I).

123. In conclusion, we strongly support Ofcom's proposal to focus on 900/800 relative benchmarks to derive an estimate for the value of UK 900 MHz spectrum. We also agree that it is prudent to undertake a qualitative assessment of each benchmark rather than taking a simple average value, given the small sample size. Unfortunately, as we go on to explain in Part C, we believe Ofcom has made errors in its qualitative analysis, in particular regarding the weighting put on Austria as a benchmark for the UK. These errors, together with mistakes in valuing 800 MHz, leads Ofcom to propose an unduly high UK value for 900 MHz even though its benchmark methodology appears sound.

2. Distance method for deriving 1800 MHz values

124. For deriving benchmarks for the UK value of 1800 MHz, Ofcom now focuses on the "distance method", a technique that derives a single benchmark from evidence regarding the relative values of 1800 MHz and both the 800 MHz and 2600 MHz bands. This method was proposed by Analysys Mason and Aetha Consulting (AM&A) on behalf of EE and H3G. This approach is based on the entirely reasonable premise – supported by technical and commercial evidence – that the value of 1800 MHz should lie between the values of 800 MHz and 2600 MHz.

125. In our previous response, Telefonica considered both absolute and relative benchmarks. However, consistent with our position on 900 MHz, we argued that Ofcom should put greater

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260 Bath Road
Slough
Berkshire
SL1 4DX
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weight on relative benchmarks. Although we did not consider the possibility of combining ratios across multiple bands to identify a single benchmark for each country, we recognise the advantages of this approach.

126. To calculate a UK 1800 MHz benchmark for each European country, Ofcom uses a bespoke equation described in paragraph 3.24 of its response. We have reviewed this equation and agree with this methodology. However, because Ofcom over-estimates the value of 800 MHz and (to a lesser extent) 2600 MHz in the UK (see discussion in Section 4), all its results systematically exaggerate the UK value of 1800 MHz. As with 900 MHz, we also have concerns about Ofcom's approach of making essentially arbitrary adjustments to the UK 800 MHz value depending on whether it believes that DTT coordination and/or coverage obligation costs were included in each European benchmark (see discussion in part B below).

127. A concern with any approach to analysing this data is that the sample of available data points is small. In this case, there are only eight European countries that have sold spectrum in all three bands in the last five years. Ofcom increases the sample to ten countries by deriving proxy values for 2600 MHz for Ireland (which has not awarded this band) and Sweden (which awarded the band in 2008, outside Ofcom's sample range). As we discuss in part C, we broadly support these changes to the sample, although we have concerns about Ofcom's approach to estimating proxy values and urge Ofcom to take account of such changes when weighing evidence qualitatively.

128. Ofcom also disregards Denmark from its sample, as it reports a value for 2600 MHz that is above 1800 MHz, something that is not compatible with the model. This is an important precedent which is not given the attention it deserves in Ofcom's consultation response. Essentially, Ofcom is identifying Denmark as an outlier because its numbers (a) are not consistent with the results for other benchmark countries; and (b) do not fit with technical and commercial evidence that UK 1800 MHz is more valuable than 2600 MHz. Based on the numbers that Ofcom is currently using in its analysis of the Danish auction, this makes sense. However, we believe that Ofcom is looking at the wrong values for 800 MHz and 2600 MHz from Denmark, leading it to disregard a benchmark that is relevant to its ratio approach (see Part B below). More generally, Ofcom's approach to the Danish 1800 MHz benchmark highlights two broader inconsistencies in its approach: firstly, it omits a low price outlier without exploring whether there may be high price outliers that should also be discarded; and, secondly, it considers an 1800 MHz value being below 2600 MHz as grounds to dismiss a benchmark but does not apply the same logic to 900 MHz values that exceed 800 MHz.

129. As illustrated in Table 5, the range of benchmark results using the distance method is wide: the ratio of (1800 MHz – 2600 MHz) / (800 MHz – 2600 MHz) varies from a low of 1%

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in Germany to a high of 66% in Austria. As a result, the final estimate of the value of 1800 MHz is highly sensitive to the emphasis given to specific benchmarks in its qualitative assessment. By way of example, the mean average value is £12.20 per MHz (compared to the Ofcom proposal of £14.00), but this falls to £10.50 if Austria is excluded.

130. In Telefonica's previous response, one of the techniques we explored was taking a simple average of available data points. As with the 900 MHz analysis, we recognise, however, that with a sample of only eight data points, the average is highly sensitive to outliers (in particular this sample is very sensitive to the inclusion of Austria). In this context, Ofcom's approach of assessing each benchmark qualitatively has considerable merit. If undertaken correctly, a qualitative assessment should be able to identify and account for potential outliers, and also allows Ofcom to consider the impact of using proxy data points (as in Ireland and Sweden) on a case-by-case basis.

131. In conclusion, we strongly support Ofcom's proposal to use the distance method for deriving a benchmark for the UK value of 1800 MHz, based on European relative benchmarks for 800, 1800 and 2600 MHz. We also agree that it is prudent to undertake a qualitative assessment of each benchmark rather than taking a simple average value, given the small sample size. Unfortunately, as we explain in Part C below, we believe Ofcom has made errors in its qualitative analysis, in particular regarding the weighting put on Austria as a benchmark for the UK. These errors, together with mistakes in valuing 800 MHz and 2600 MHz, leads Ofcom to propose an unduly high UK value for 1800 MHz even though its benchmark methodology appears sound.

B. Revisions to the set of European benchmarks

132. Ofcom has completely revised its European benchmarks. We welcome this update, as Ofcom's previous dataset contained errors. Most of these changes affect absolute values rather than relative values, so their impact on Ofcom's revised methodology is typically limited. However, certain changes do affect relative values and, in our view, Ofcom should give more weight to the risk that these changes may distort benchmark values in its qualitative analysis. We have particular concerns about the way Ofcom revises benchmarks to take account of costs associated with coverage obligations and DTT coordination.

133. The changes to the set of European benchmarks fall into four categories, which we discuss in turn below:

1. the dataset has been expanded to take account of recent awards;

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2. Ofcom has revised its approach of using adjustment factors (such as purchasing power parity, inflation and discount rates) to derive benchmarks;

3. Ofcom has revised its approach for taking account of potential costs associated with coverage obligations and DTT coordination; and

4. the dataset now includes proxy values for a limited number of "missing" benchmarks.

134. While OFCOM has improved its methodology, there are still errors in its approach. For example, OFCOM continues to use linear extrapolated PPP rates for 2013 even though the World Bank has released the data. The PPP rates that Ofcom use in their benchmark calculations differ from actual PPP rates by as much as 5%. Ofcom also applies UK-specific discount rates to European benchmarks, when it should use country-specific rates.

135. We also note that spectrum licences in Romania were sold in Euros, and annual fees are assessed in Euros. Ofcom, however, calculates the Romania benchmarks based on Romanian Leu which means Ofcom has converted the price from Euros to Leu, presumably using the market exchange rate at the time of the auction. We are deeply sceptical about the merits of this adjustment, especially in relation to conversion of annual fees into local currency and subsequent application of PPP. We suspect these changes have the impact of grossly exaggerating the absolute value of bands in Romania and distorting relative values. Given these (and other) issues with Romania, we strongly support Ofcom's revised decision to place little weight on Romania as a benchmark for UK prices.

136. Notwithstanding these errors, we judge that their overall impact on Ofcom's conclusions is modest. Therefore, we have not attempted to recalculate the correct benchmarks and continue to use Ofcom's numbers in the following analysis, so as to facilitate comparison between our own conclusions and Ofcom's proposals.

1. Recent awards

137. Ofcom has expanded its data set to include spectrum awards that took place after its original consultation was drafted. We have previously responded on this change, stating that we support the expansion of the data set but expressing concern about undue focus on the Austrian multi-band auction as a benchmark for the UK.[37] Our position remains the same. We agree in principle that Ofcom should try to take account of evidence points from as many

[37] Telefonica, response to Ofcom's May 2014 Update on European auctions since Ofcom's consultation on Annual licence fees for 900 MHz and 1800 MHz spectrum.

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recent European auctions as possible within the constraints of the relative price methodology. However, we are very concerned about how this is being done in practice, with Ofcom only adding three new data points and putting huge emphasis on just one of these – Austria – despite there being strong evidence that the Austrian 2013 multiband auction is an outlier from the dataset.

138. In the current consultation document and previous update on European benchmarks, Ofcom reports its efforts to expand the set of European benchmarks. It did this in two ways. Firstly, it gathered information about ten European auctions that took place since the first consultation was published in October 2013. Secondly, it has contacted every regulator in Europe that ran a multi-band CCA and asked them to provide bid data or determine LRPs using Ofcom software. These two actions could potentially have increased the number of benchmark countries by twelve.

139. In practice, despite Ofcom's best efforts, it has only been able to add three new countries to the relevant sample of European benchmarks. These are:

- **Austria (October 2013).** This was a multi-band CCA including 800 MHz, 900 MHz and 1800 MHz. No individual band prices are available but the Austrian regulator has provided Ofcom with LRP values for each band using software provided to them by Ofcom. Austria previously held an auction for 2600 MHz only. Ofcom uses data from both auctions in its analysis of relative benchmarks for both 900 MHz and 1800 MHz.

- **Czech Republic (November 2013).** This was a multi-band SMRA including 800 MHz, 1800 MHz and 2600 MHz. The results of the auction include band-by-band prices, so it is straight forward to add this auction to the sample data set. However, as the Czechs did not sell 900 MHz, this auction is only relevant for determining the UK 1800 MHz price.

- **Slovakia (November 2013).** This was a multi-band CCA including 800 MHz, 1800 MHz and 2600 MHz. No individual band prices are available and the Slovak regulator did not respond to Ofcom's request for LRP-based values. However, as final prices are very close to reserve, Ofcom concluded that it could use reserve prices as a proxy for band-specific prices. This is consistent with Telefonica's analysis in our response to Ofcom's May 2014 update on European benchmarks. As the Slovaks did not sell 900 MHz, this auction is only relevant for determining the UK 1800 MHz price.

140. The following other auctions are actually or de facto not considered by Ofcom:

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- **Belgium (2013, 2011).** Belgium auctioned 800 MHz and 2600 MHz spectrum in two separate auctions. Ofcom has not added these two auctions to its sample of absolute benchmarks; however, it has used the 800/2600 ratio in the calculation of 2600 MHz proxy prices for Ireland and Sweden. As Belgium did not auction 900 MHz or 1800 MHz, Ofcom necessarily does not consider Belgium in its relative benchmark methodology.

- **France (2011).** France auctioned 800 MHz and 2600 MHz spectrum in two separate auctions in 2011. Ofcom has not added these two auctions to its sample of absolute benchmarks, nor have they included the 800/2600 ratio in their calculation of 2600 MHz proxy prices (which we assume is an omission). Additionally, as France did not auction 900 MHz or 1800 MHz, Ofcom necessarily does not consider them in its relative benchmark methodology.

- **Finland, Latvia, Lithuania and Estonia (2013).** These four auctions were only for 800 MHz. As these countries have also not auctioned 900 MHz or 1800 MHz, they cannot be considered for the relative benchmark methodology. However, Ofcom also fails to include these countries in its reported sample of absolute benchmarks.

- **Netherlands (December 2012); Switzerland (February 2012) and Slovenia (April 2012).** These three auctions were all multi-band CCAs which included relevant frequency bands. However, local regulators declined to make information available to Ofcom on grounds of bid data confidentiality. Although various stakeholders have provided guesstimates for band-specific values in these countries, Ofcom has decided to disregard the auctions given the lack of good data.

- **Norway (December 2013).** Norway used a first price, sealed bid package auction for its multi-band award of 800, 900 and 1800 MHz spectrum. In our response to the Ofcom update on European arguments, Telefonica argued this auction should be excluded for a number of reasons, including the fact that the format created strong incentives for bidders to shade their bids, with the implication that prices may not reflect marginal valuations. Ofcom also excluded this auction, citing similar concerns.[38]

141. In most cases, we agree with Ofcom's rationale for excluding auctions. In particular, we agree that without any information about bid data, it is best to exclude results from CCAs from the analysis. However, in the following cases, we ask that Ofcom reassess its position:

[38] Ofcom, August 2014 Consultation, Annex 8, p.63.

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- **Denmark.** Currently, Danish data is disregarded for the purposes of analysing 1800 MHz, because its 1800 MHz benchmark is below its 2600 MHz benchmark. Also, although 900 MHz data is used, it returns a very low ratio with 800 MHz, so is treated as third tier evidence. These problems arise because Ofcom is not comparing equivalent numbers. It is benchmarking the price of the most expensive licences from Denmark's 800 MHz and 2600 MHz auctions, which were set by the 2nd/3rd and 4th strongest bidders respectively, and comparing these to 900 MHz and 1800 MHz licence prices that were sold at reserve, equivalent to a hypothetical 5th strongest bidder. A better approach for relative values is either (a) to take the least expensive licences in Denmark's 800 MHz and 2600 MHz auctions, which were set by the 3rd/4th strongest bidder and reserve price (hypothetical 5th bidder) respectively, and thus are more directly comparable to the 900 and 1800 MHz auctions; or (b) to take the reserve prices for these auctions.[39] We report the revised benchmarks in Table 7: between £13.6 million and £15.3 million per MHz for 900 MHz and £5.8 million and £5.9 million per MHz for 1800 MHz. We think that these numbers – in particular the reserve price ratio – are credible benchmarks for both 900 MHz and 1800 MHz.

Table 7: Revised benchmark values and ratios for Denmark

	800 MHz	900 MHz	1800 MHz	2600 MHz	900 / 800 ratio	900 / 800 price	1800 (Distance method)
Using lowest auction prices for 800 & 2600 MHz	7.0	2.9	1.2	1.1	42%	13.6	5.8
Using reserve prices for 800 & 2600 MHz	6.5	2.9	1.2	1.1	45%	15.3	5.9

Source: Telefonica, using original source data.

- **Belgium, Finland and France.** The omission of these countries from the 800 MHz data set is odd – although we accept these are relevant only for absolute benchmarks which are second order to the analysis. There is no rationale for excluding these countries as they have similar wealth and demographic characteristics to the UK. These countries provide plausible comparisons to the UK and deserve to be included as second tier evidence. Additionally, it is inexplicable to exclude France from the 2600 MHz proxy price calculations, especially as Belgium is included.

- **Estonia, Latvia and Lithuania**. The omission of these countries from the 800 MHz data set is also odd – although again we accept these are relevant only for absolute

[39] For 800 MHz, we propose using the reserve price for the A lot won by TDC as this was unencumbered by using restrictions.

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benchmarks which are second order to the analysis. Given that Estonia, Latvia, and Lithuania are much less wealthy than the UK, these are unlikely to be the most reliable benchmarks; but this is no reason for them to be disregarded in circumstances where other much less wealthy countries than the UK (for example, Romania) are included. We note that these three countries are amongst the lowest price benchmarks for 800 MHz, and their exclusion fits with a broader pattern of Ofcom favouring high price benchmarks over lower ones without clear justification.

142. We are also concerned about the emphasis that Ofcom places on the countries it has included in the revised data set. Although three countries are added, two of these – Czech Republic and Slovakia – are ultimately rated as Tier 3 evidence points. Thus, even though Ofcom started out by considering 12 further auctions for inclusion in the benchmark sample, ultimately just one – Austria – plays a substantial role in its analysis. This one country happens to have the highest absolute values for 800, 900 and 1800 MHz and the highest relative values for 900 and 1800 MHz across all of Europe. Furthermore, it is a high price outlier amongst both the 900 MHz and 1800 MHz benchmarks in NERA's econometric analysis of country benchmarks (Annex I). This leaves Ofcom's analysis hugely vulnerable to sample bias, something it should address in its qualitative analysis, as we discuss below.

2. Benchmark adjustment factors

143. It is standard practice to use price per MHz per pop data from spectrum awards to create benchmark comparisons across countries. Ofcom's approach is unusually sophisticated in that it proposes a series of further adjustments to account for other factors that may plausibly influence licence price (but also ignores many others). As we explained in our January consultation response, we think that Ofcom's approach is overly complex, and vulnerable to error and distortion. It remains our view that Ofcom should have adopted a simpler approach, such as the one we described in our response to the October 2013 consultation. Notwithstanding this point, we welcome the fact that Ofcom now focuses on relative rather than absolute benchmarks, which greatly reduces the impact of Ofcom's complex adjustments, as many but not all adjustments net out when the ratios are applied.

144. When determining absolute benchmarks, Ofcom makes the following adjustments in addition to the standard per MHz per pop comparison:

1) **Licence fees.** Ofcom calculates the present value of annual fees using a 2.4% discount rate. We agree that annual licence fees should be included in the benchmarks. However, we do not believe that the same discount rate should be used for every country. UK government bonds are rated Aa1/AAA whereas many

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SL1 4DX
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benchmark countries government bonds are rated differently (see Table 8). Using a uniform 2.4% discount rate severely overstates the value of annual fees in some countries, while slightly understating values in some others.

Table 8: Country discount rates at time of auction

Country	Auction date	Country Rating
Austria	Oct-13	Aaa/AA+
Denmark	Sep-10	Aaa/AAA
Germany	May-10	Aaa/AAA
Ireland	Nov-12	Ba1/BBB+
Italy	Sep-11	Aa2/A+
Portugal	Nov-11	Ba2/BBB-
Romania	Sep-12	Baa3/BB+
Slovakia	Dec-13	A2/A
Spain	Jul-11	Aa2/AA
Sweden	Oct-11	Aaa/AAA

Source: Research by NERA Economic Consulting; Note: These rates should be compared against a UK rating of Aa1/AAA.

We asked the NERA team that advised us on annuity rates to estimate the potential over- or underestimate of discount rates for relevant countries. Their findings are illustrated in Figure 8, which compares UK government bond yields and the local government bond rate at the time each auction took place (see Section 6 for further discussion of the relevance of bond rate analysis). Negative values indicate that using a common discount rate understates the local discount rate, which will cause Ofcom to overestimate the value of annual fees. Romania is not shown, owing to lack of information, but it is likely that this benchmark is particular exaggerated by the use of a common discount rate.

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Slough
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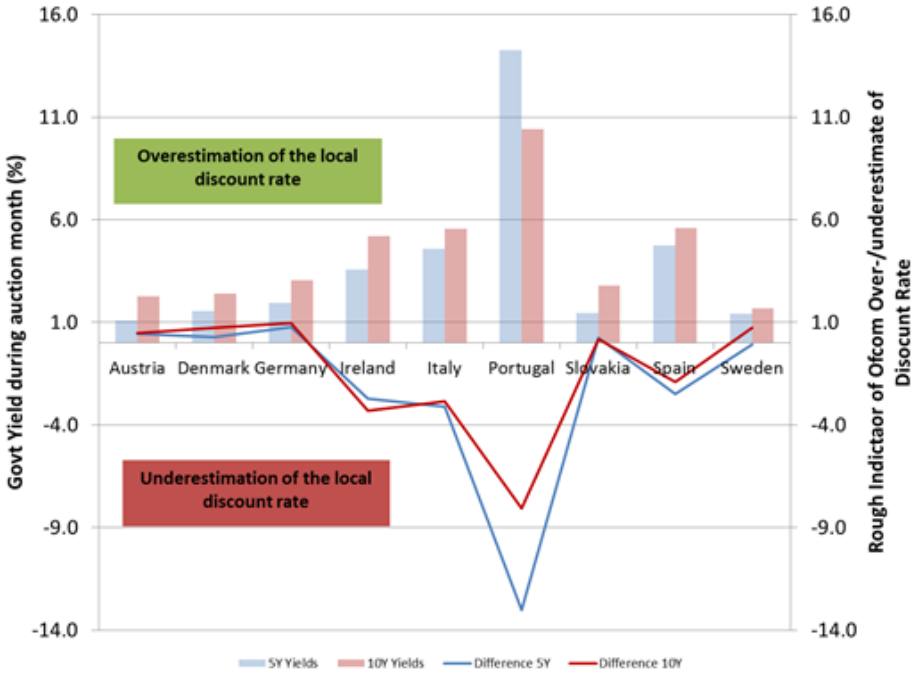
Figure 8: Estimated over/underestimation of discount rate when using empirical data on the nominal spot risk-free rate



Source: Research by NERA Economic Consulting;
Notes: These are government bond rates, not corporate bond rates. There is no readily available corporate bond index for most European countries so NERA approximated differences in corporate bond yields by differences in government bond yields. These are generally driven by similar factors; although some deviations cannot be ruled out, there is no consensus as to the direction in which this will affect spreads.

2) **Licence duration.** Ofcom normalizes all licences to a 20-year term using a 4.7% discount rate. We agree that, in principle, it is appropriate to adjust licence prices so they have a hypothetical common duration. However, in practice, as illustrated in Figure 9, we observe that licence duration appears to be very poorly correlated with licence prices. One obvious issue is that the expected returns from owning a licence are not linear across the licence period, and in particular may be lower at the beginning and end of a 20-year period, relative to the middle. We do not propose that Ofcom eliminates licence duration adjustments, but we do think Ofcom should consider that its linear adjustment methodology risks overstating the value of benchmarks for licences that were less than 20 years.

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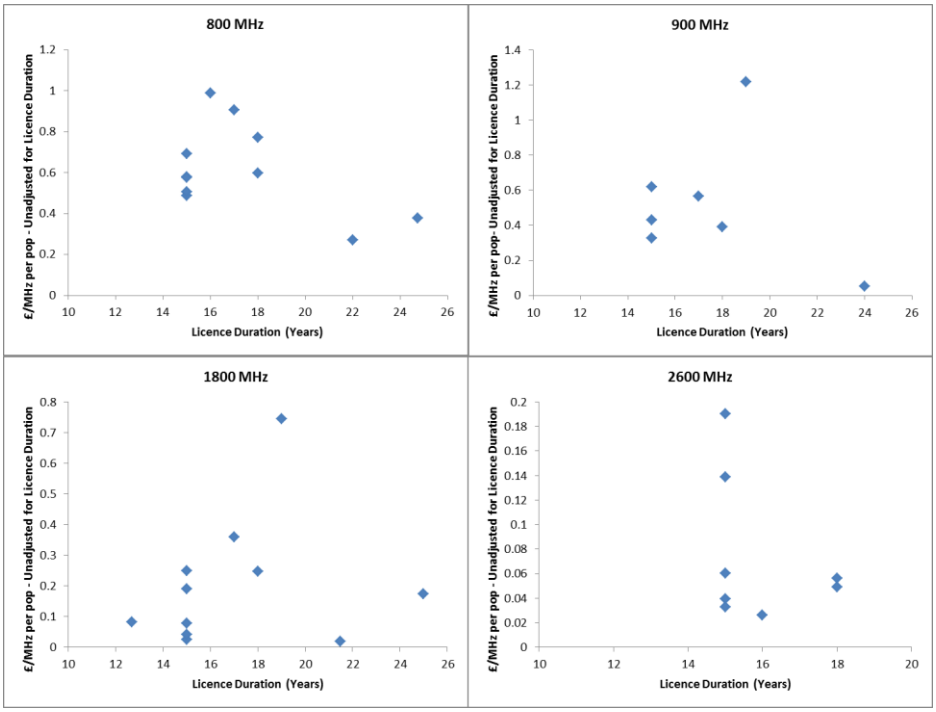
Figure 9: Licence duration scatter plots



Source: Telefonica analysis using Ofcom, ALF 900-1800 MHz: Final benchmarking dataset.
Note: The format of these charts is based on Ofcom's scatter plots of potential adjustment factors in Annex 7 (p.67-70). We strip out the effect of licence duration adjustments from Ofcom licence price benchmarks. We observe that there is no positive correlation between the resulting price benchmarks and licence duration.

3) **Inflation.** Ofcom adjusts benchmarks for inflation using UK CPI at the date of the benchmark auction to adjust for inflation. Telefonica's view is that, given the limited time period from which benchmark data is taken, adjustments for inflation amount to spurious precision on the part of Ofcom (please see our response to the October 2013 consultation for further discussion on this point). Notwithstanding this position, we welcome the correction of the methodological error in Ofcom's October 2013 benchmarks (when it used US inflation instead of UK inflation).

4) **Licence start date.** Ofcom adjusts the value of benchmarks when spectrum was not immediately available for use. The arguments for such adjustment are similar to those with respect to licence duration, and the pitfalls are similar too.

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Slough
Berkshire
SL1 4DX
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5) **Purchasing power parity (PPP) exchange rates.** Ofcom adjusts for currency differences using PPP instead of market exchange rates. We are deeply sceptical that PPP is an appropriate adjustment factor for these benchmarks. PPP is a very poor proxy for spending on telecoms and is not correlated to any telecom revenue metrics such as ARPU, ARPM or total spend on telecom services. In general, we do not think such adjustments are necessary when comparing auctions across Western Europe. We do recognise that some adjustment is appropriate when comparing the UK to much less wealthy countries, for example in Eastern Europe, but we doubt that PPP is the right metric.

145. In Annex 7 of the August 2014 consultation, Ofcom considers a number of other adjustment factors, namely AMPU (as a proxy for market profitability), 3G penetration (as a proxy for 2G demand) and urbanisation. It rejects all these additional factors on the basis that they are poorly correlated with spectrum prices. We support this approach but note that Ofcom is already making other adjustments, for example with respect to licence duration, that are also poorly correlated with spectrum prices. More generally, the fact that none of these factors – which obviously are relevant to spectrum valuation – are well correlated with licence prices suggests that country specific factors are very important in explaining country benchmarks. In turn, this highlights the importance of Ofcom relying on relative rather than absolute benchmarks, as the impact of such assumptions will often be netted out.

146. Overall, we think Ofcom's approach to calculating absolute values for benchmarks is aggressive, and carries a significant risk of overestimating UK value. However, as Ofcom correctly only uses absolute values as secondary evidence, this undue aggression has little impact on its conclusion.

147. In many of the benchmark countries, licences in different bands were sold simultaneously and on similar terms. In these cases, adjustment factors typically net out so do not materially affect Ofcom relative benchmarks. However, in certain cases, for example where there was a significant time gap between bands being awarded or where licence duration varied, adjustment factors can have a significant impact. We are concerned that Ofcom fails to consider this impact in its qualitative analysis. For example, in deriving the 1800 MHz lump sum, Ofcom puts great weight on Austria, and directly compares the 2600 MHz price from the 2010 auction against the 800 MHz and 1800 MHz prices from the 2013 auction. Given the time gaps between these auctions, there is a greater risk of this benchmark being distorted by adjustment factors than most others, and Ofcom should consider this in its qualitative analysis.

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Slough
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3. Coverage and DTT co-existence costs

148. For each European benchmark, Ofcom now use different 800 MHz benchmarks for the UK, depending on whether they think that European benchmark incorporated substantial DTT co-existence costs and/or coverage obligations. For some countries, Ofcom also cherry picks the prices of particular licences that it thinks are most relevant to particular UK 800 MHz benchmarks.

149. This approach is an improvement on Ofcom's previous methodology in which Ofcom arbitrarily ignored the 800 MHz coverage obligation lot and added a DMSL adjustment factor to all benchmarks. However, we still have multiple concerns:

- The adjustment for coverage obligation is based on the difference in estimated prices for the UK coverage obligation lot and other UK 800 MHz lots. In effect, Ofcom is assuming that the observed UK price difference is a good benchmark for both the coverage obligation costs in the UK and in other applicable European countries. There is no reason to suppose that this is the case, given that coverage obligation costs are highly country-specific. Even within countries, operators may place very different valuations on coverage obligations, owing to differences in their business plans and existing networks. For example, Telefonica did not place any premium on non-coverage obligation lots in our UK auction bids, whereas auction bids by some other UK operators imply they had a mild preference for non-coverage obligation lots. This suggests that any effort to use auction data to benchmark the cost of a coverage obligation is subject to significant uncertainty.

- The adjustment for DTT coordination costs is based on the maximum cost of UK DMSL obligations, which is £3m per MHz. In effect, Ofcom is saying that maximum DMSL costs are a good benchmark for pre-auction expectations of DTT coordination costs for *both* the UK *and* other applicable European countries. Again, there is no reason to suppose that this is the case. In particular, one issue here is that estimates of costs likely declined over time. Telefonica's own experience is that costs in Germany (one of the first countries to sell 800 MHz) were lower than expected, and we were aware of this at the time of the UK auction.

  As discussed in Section 4, Telefonica strongly disagrees with Ofcom's use of the full £3m/MHz amount to adjust benchmarks. This is a huge adjustment which bears no relation to the actual costs of DTT coordination in the UK, which are much lower. Ofcom claims it has evidence to support use of this amount but as all relevant paragraphs of its consultation are marked as confidential, it is impossible for us to verify this.

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- Wherever feasible, Ofcom always cherry picks prices from European licences that did not have coverage obligations and are believed not to have been influenced by anticipated DTT costs. However, for the same countries, it would be valid to consider also those prices that were affected by such factors. What weight to give to each benchmark is a matter for qualitative assessment. By only following the approach that results in higher absolute benchmarks, Ofcom is disregarding valid data and prejudicing its qualitative assessment.

150. In conclusion, we recognise the rationale for considering the impact of coverage obligation and DTT co-existence costs. However, the actual adjustments being made by Ofcom are arbitrary and not supported by any substantial evidence. In particular, the DTT co-existence adjustment is very aggressive and has a huge impact on Ofcom's lump sum values. We are concerned that once Ofcom makes such adjustments, it treats the results as if they were factual and does not even consider the possibility that they are overstated when it proceeds to its qualitative analysis.

151. In the context of Ofcom's methodology, we propose a simple solution to this issue. For each country where coverage obligations and/or DTT costs are relevant, Ofcom should calculate at least two benchmarks, one with adjustment factors added and one without. These can be represented as two lines (instead of one) on its charts reporting 900 MHz and 1800 MHz ratio benchmarks, as we do in Figure 12 and Figure 13.[40] Ofcom should also consider adding a third line, for relevant countries, using those local licence prices that were not affected by such adjustments as a cross-check. Displaying all these points on the same chart provides an easy visual check to support qualitative assessment.

4. Use of proxy data points

152. In order to expand the number of benchmarks for 1800 MHz, Ofcom proposes to use proxy values for 2600 MHz for two countries, Ireland and Sweden. In Ireland, 2600 MHz has not yet been awarded. In Sweden, 2600 MHz was awarded in 2008, outside Ofcom's date range, so Ofcom does not consider the price (which is above Sweden's 1800 MHz benchmark) to be reliable.

153. In principle, we support the approach of expanding the dataset by using proxies for these two specific countries. Both are Western European countries with demographic and economic characteristics that imply they should be good benchmarks for the UK. Furthermore, both have data points for 800 MHz and 1800 MHz. Given the general shortage of data, it would be

[40] Ofcom, August 2014 Consultation, Figures 3.2 and 3.3.

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wrong to eliminate these countries from the assessment of the UK 1800 MHz price just because they do not report a 2600 MHz value within the relevant timeframe.

154. In their original proposal for the distance method, we understand that AM&A proposed setting the 2600 MHz price to zero when calculating proxies, on the basis that this establishes an upper bound for the value of 1800 MHz in the UK. However, in the context of Ofcom's broader qualitative analysis, modelling an upper bound is not the ideal approach, as this is inconsistent with the methodology for other countries. Accordingly, we agree with Ofcom that it is more appropriate to set non-zero proxies.

155. There are a number of possible methodologies that could be used to determine proxy values. Ofcom focuses on only one approach: (1) calculate the average ratio of 2600 MHz to 800 MHz across all available benchmarks, and multiply this against 800 MHz values for Ireland and Sweden respectively. Two other approaches, which may also have merit, are: (2) to use the average ratio of 2600 MHz to 1800 MHz instead of 800 MHz; or (3) apply the simple average of 2600 MHz absolute benchmarks to both countries. In Table 9, we compare how the proxy values change depending on which approach is used. We also use our updated reserve price benchmarks for Denmark 800 and 2600 MHz. In addition, we include the French 800 MHz and 2600 MHz benchmarks, which Ofcom omits from its sample.

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Table 9: Comparison of possible proxy values for Ireland and Sweden 2600 MHz (£m)

Country	2600/800	2600/1800	2600 Value
Austria	3%	4%	1.9
Belgium	17%		5.0
CZ	7%	50%	3.0
Denmark	17%	94%	1.1
France	15%		5.4
Germany	27%	*	14.5
Greece			
Ireland			
Italy	7%	23%	3.8
Portugal	7%	78%	2.5
Romania	24%	56%	10.6
Slovakia	12%	65%	4.6
Spain	8%		3.3
Geometric Average	**10.9%**	**38.2%**	**4.0**

	Lump Sum 2.6 GHz Value		
Ireland Proxy	6.9	9.6	4.0
Sweden Proxy	2.3	3.7	4.0

	Average 2.6 GHz
Ireland Proxy	6.8
Sweden Proxy	3.3

Source: Telefonica calculations based on Ofcom and Telefonica data.

156. Ofcom proposes proxy values for 2600 MHz in Ireland and Sweden of £6.8m and £2.0m per MHz respectively (or £6.9m and £2.3m using our slightly revised sample). Looking at this from a purely qualitative perspective, the Irish benchmark looks plausible: as the absolute value of 1800 MHz is high in that country, it makes sense to use a relatively high absolute proxy for 2600 MHz. However, the Swedish benchmark looks very low, given that we know that 2600 MHz actually sold at a relatively high absolute price (£9.7m/MHz), albeit outside Ofcom's time window for benchmarks and before 1800 MHz emerged as a leading band for LTE deployment. Comparing Ofcom's methodology to other approaches reinforces the impression that Ofcom's Swedish benchmark is too low.

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157. We do not believe there is one correct way to calculate a proxy value for 2600 MHz, and the Ofcom approach has no obvious merit over the others. Given this uncertainty, a pragmatic option might be to take an average of the three approaches so as to mitigate margin for error arising from a single methodology. On this basis, the proxy values for 2600 MHz in Ireland and Sweden would be £6.8m and £3.3m per MHz respectively. These are the numbers we use going forward and the ones we asked NERA to use in their analysis of our alternative sample of European benchmarks (Annex I). However, we note that NERA's econometric test using both Ofcom and our data finds that the observed benchmarks for Ireland and (especially) Sweden are significantly above the predicted level. This suggests that Ofcom should consider putting greater weight on 2600/1800 ratios when determining proxy values, as this approach results in higher 2600 MHz values and would bring Ireland and Sweden observed values more closely into line with the prediction.

158. In conclusion, although we support the use of proxy data points for Ireland and Sweden, we are concerned that Ofcom is placing too much weight on its specific choice of proxy values. There are at least three plausible methodologies for identifying proxy values, and we suggest that Ofcom either takes an average or puts greater weight on approaches that produce Irish and Swedish benchmarks that are closer to predicted levels, based on NERA's econometric test (as described in Annex I). We also suggest that, in view of this uncertainty, Ofcom treat both the Irish and Swedish distance method benchmarks as Tier 2 rather than Tier 1 measures of the value of 1800 MHz in the UK.

C. Qualitative assessment of benchmarks

159. The final step in Ofcom's analysis is to derive an estimate for UK values for 900 MHz and 1800 MHz based on a qualitative estimate of the relevant country benchmarks. There are two main elements to this:

- Ofcom categorises each country benchmark into one of three tiers, based on qualitative analysis, with Tier 1 results given the greatest weight and Tier 3 the least weight; and
- Ofcom uses a "conservative" approach to estimate the full market value for the UK.

160. Telefonica supports this methodology but believes Ofcom's approach to weighing evidence regarding country benchmarks lacks structure, and this is leading to errors in its assessment of some benchmarks, notably Austria. We commissioned NERA Economic Consulting to investigate our concerns. In their report, presented in Annex I, NERA propose an econometric test for screening country benchmarks prior to the qualitative analysis. The test is based on the straight forward premise that all benchmarks should be estimates, albeit noisy ones, of the same thing, and their test determines a confidence interval for the expected

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Slough
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SL1 4DX
T +44 (0)113 272 2000
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value of country benchmarks by band, while allowing for country-specific variations. NERA argue that observations outside a reasonable confidence interval should be subject to a higher bar regarding qualitative evidence.

161. In the following subsections, we describe a three-step process for analysing the benchmark evidence that can be applied for both the 900 MHz and 1800 MHz lump sums:

- Step 1: Use NERA's econometric test to screen to outliers and identify provisional tiers for each benchmark.
- Step 2: Refine tier structure based on qualitative analysis.
- Step 3: Estimate lump sum values based on a conservative assessment.

This process is substantially the same as Ofcom's approach except for the crucial addition of the statistical screening test. However, the results are different because this approach is effective in identifying a number of mistakes in Ofcom's analysis, in particular the undue weight placed on Austria as a benchmark for the UK.

1. Econometric test to screen for outliers

162. We propose a "top down" econometric evaluation to screen for potential outliers, as described by NERA in Annex I. The model provides a framework for allocating observations to Ofcom's three tiers of evidence which can then be refined through qualitative analysis. In particular, in cases where lack of evidence may make qualitative reasoning difficult, it provides an objective basis for tier designation.

163. The structure of the model is quite straight forward: it is based on the reported benchmark prices and takes account of country-specific effects that may cause variations in the level of benchmark prices. Given the limited and noisy sample size available, we do not see any value in attempting to build a more complex model. NERA use the model to generate a prediction for any given ratio in any particular country and then compares a 98 percent confidence interval with the actual ratio reported for that country.

164. Figure 10 and Figure 11 report actual versus predicted observations for ratio price benchmarks using two samples: Sample 1 is Ofcom's original data; and Sample 2 is an adjusted dataset that includes changes proposed in this response, such as the revised Danish ratio benchmarks and revised 2600 MHz proxies for Ireland and Sweden (see Annex I for a full list).

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Figure 10: Actual versus predicted ratio price benchmarks for Ofcom benchmarks

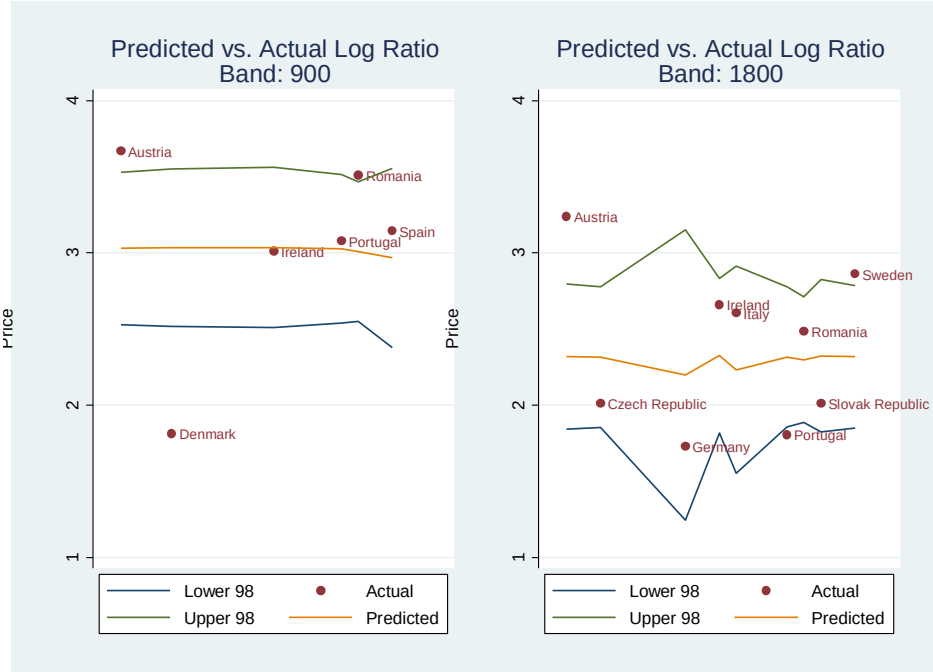
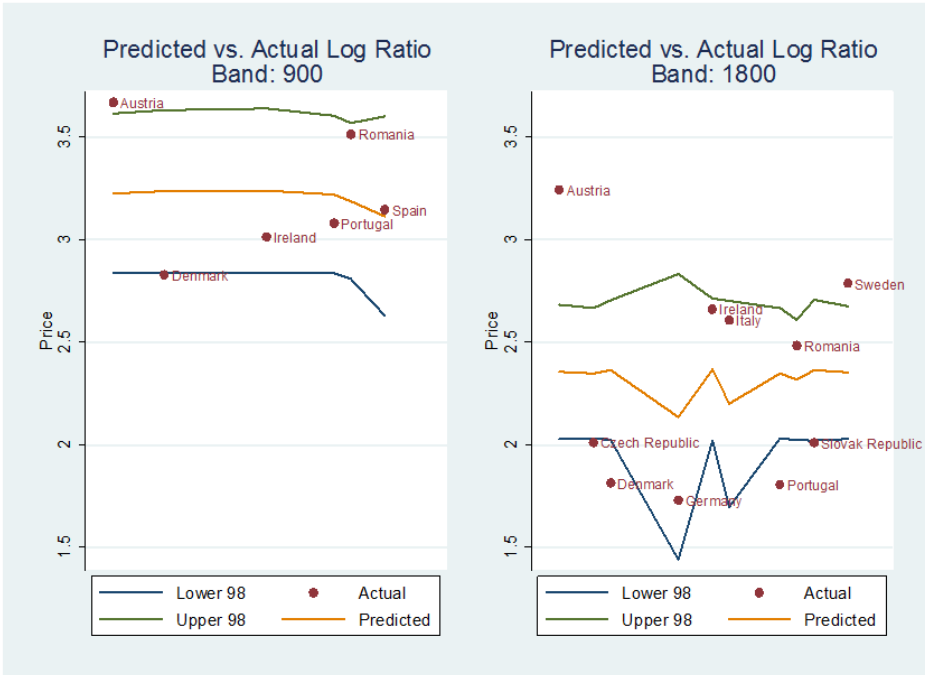


Figure 11: Actual versus predicted ratio price benchmarks for adjusted benchmarks



Source for Figure 10 and Figure 11: NERA Economic Consulting (Annex I)

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Berkshire
SL1 4DX
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165. Using this test, the following country benchmarks based on the ratio approach are identified as outliers:

- Austria 900 MHz and 1800 MHz (both samples);
- Denmark 900 MHz (sample 1) and 1800 MHz (sample 2);
- Portugal 1800 MHz (both samples);
- Romania 900 MHz (sample 1); and
- Sweden 1800 MHz (both samples).

166. The model implies that all these points should be ranked Tier 3, unless there is clear qualitative evidence to the contrary. Ofcom does indeed rank Denmark 900, Portugal 900 and Romania 900 as Tier 3. However, it ranks Austria 900 and 1800 as Tier 1 and Sweden 1800 as Tier 2.

2. Tiering of evidence points

167. Our next step is the qualitative analysis of the benchmarks. Previously, Ofcom used qualitative analysis to identify each point as a more or less important evidence point but now it uses a three-tier structure. We support this change in approach as it allows for a more granular qualitative assessment. However, we do not believe it appropriate to carry out such an analysis without first running a "top down" econometric model, so as to establish a framework for identifying potential outliers.

168. We have reviewed Ofcom's proposed tiering of country benchmarks. We agree with many of Ofcom's proposed tier designations. Notably, we strongly support Ofcom's change in position in relation to Romania, which is demoted from more important evidence to a Tier 3 benchmark. The NERA report (Annex I) identifies Romania as a likely outlier from the 900 MHz benchmarks. Furthermore, as discussed above and at length in our response to the October consultation, there are many qualitative reasons to believe that Romania is a poor benchmark for the UK.

169. In line with the recommendations of the NERA report, we propose two changes to the 900 MHz tiers:

- **Austria 900 MHz** (from Tier 1 to **Tier 3 with risk of overstatement**). This observation is a high price outlier in the econometric test. The ratio of 900 to 800 also

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Slough
Berkshire
SL1 4DX
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exceeds 100%, which is inconsistent with the consensus that 800 MHz is more valuable than 900 MHz. As Ofcom acknowledges, there is qualitative evidence that prices may have been distorted by strategic bidding, with unpredictable implications for price ratios. This hypothesis cannot be proven given lack of bid data, but it is the most plausible available explanation for both the exceptionally high prices and high price ratios in Austria. It is also supported by public statements from bidders in the multi-band auction. In this context, it is beholden on Ofcom to demonstrate that price ratios were not distorted, not the other way round. Ofcom does not and cannot provide such evidence, given the lack of bid data. Accordingly, the reasonable presumption is that Austria 900 MHz is at best a Tier 3 observation, with a high risk of overstating UK value.

- **Denmark 900 MHz** (from Tier 3 to **Tier 2 with risk of understatement**). In this response, we put forward alternative benchmarks for Denmark from which we generate a revised ratio benchmark for 900 MHz. Our benchmark is higher than the Ofcom number, which we all agree is a low price outlier, and a better fit with the econometric model. Our benchmark sits on the lower confidence interval. We believe it merits inclusion as a Tier 2 evidence point, but we recognise that there is a risk that it understates UK value.

170. We propose four changes to the 1800 MHz tiers:

- **Austria 1800 MHz** (from Tier 1 to **Tier 3 with risk of overstatement**). The same arguments apply to 1800 MHz as for 900 MHz in Austria. This is a high price outlier and given concerns about strategic bidding, the presumption should be that price ratios were distorted. Ofcom does not and cannot provide evidence to refute these concerns, given the lack of bid data. Accordingly, the reasonable presumption is that Austria 1800 MHz is at best a Tier 3 observation, with a high risk of overstating UK value.

- **Denmark 1800 MHz** (from excluded to **Tier 3 with risk of understatement**). Telefonica's alternative values for Denmark make it possible to generate a 1800 MHz benchmark using the distance method. However, this is a low price outlier. We propose that this be included as Tier 3, with a high risk of understating UK value.

- **Ireland 1800 MHz** (from Tier 1 to **Tier 2 with risk of overstatement**). This value is within the confidence interval but significantly above the predicted level. Given that this value is sensitive to the level of the 2600 MHz proxy, the level of which is somewhat arbitrary, we propose that this benchmark be downgraded from Tier 1 to Tier 2.

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Slough
Berkshire
SL1 4DX
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- **Sweden 1800 MHz** (**Tier 2 with risk of overstatement**). This value is a high price outlier. There is a qualitative evidence to suggest that the benchmark overstates value and may have been inflated by Ofcom's decision to set the 2600 MHz proxy value at the low end of the plausible range. In this context, we do not think that Ofcom's assertion that the benchmark could under- or overstate value is reasonable. We propose that Ofcom either downgrade Sweden 1800 MHz to a Tier 3 benchmark or maintain it as Tier 2, but: (a) recalculate the proxy value; and (b) acknowledge that it is much more likely to overstate rather than understate UK value.

171. Of these changes, the demotion of Austria from Tier 1 to Tier 3 is by far the most important and essential change. The current designation of Austrian values as a Tier 1 benchmarks is not reasonable and undermines the credibility of the entire benchmarking exercise, given overwhelming statistical evidence that it is an exceptionally high outlier to the sample and qualitative evidence to support this conclusion.

3. Qualitative reasoning using a "conservative approach"

172. Ofcom's final step is to derive the UK value of 900 MHz and 1800 MHz based on a "conservative" analysis of the country data points. Telefonica supports this approach provided the final number is based on sound reasoning. Unfortunately, we think that Ofcom's reasoning is flawed, primarily because it places exceptional weight on Austria as a Tier 1 benchmark, even though the Austrian data points are gross outliers to its sample.

173. A more general problem is that Ofcom does not appear to have any principles underlying its commitment to a conservative approach or a proper understanding of why (as we have explained) such an approach is required by Ofcom's own statutory duties. The closest that Ofcom comes to approaching a definition of "conservative approach" is paragraph 3.56 on 900 MHz, where it states that: "*We consider that an appropriate estimate for UK market value should be towards the lower end of the range of first-tier benchmarks because: We consider that we should adopt a conservative approach when interpreting the evidence* …".[41] In practice, this approach is far from conservative, given that this range is set by just two observations, of which: the upper bound is set by Austria, a gross outlier to the sample, and the lower bound is set by Ireland, even though Ofcom says there is a risk that Ireland "*overstates the UK market value*." Once it is recognised that Austria is not a reliable data point, Ofcom's stated conservative approach is exposed as carrying a high risk of overstatement of market value, and accordingly as inimical to the fulfilment of Ofcom's statutory duties.

[41] Ofcom, August 2014 Consultation, p.46.

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174. As a way forward, we urge Ofcom to define a set of basic principles that it will apply when taking a conservative approach to assessing the benchmark data points. We propose four principles, as described in Table 10.

Table 10: Four principles of a conservative approach in determining a UK value estimate

	The UK value estimates for 900 MHz and 1800 MHz should:
1.	not be dependent on specific benchmarks that appear to be gross outliers to the sample, without clear qualitative evidence that they are not distorted.
2.	not exceed the lowest Tier 1 benchmark without a clear qualitative rationale for why that benchmark may understate value.
3.	not exceed the mean average across all Tier 1 and Tier 2 benchmarks without a clear qualitative rationale for why the average may understate value.
4.	be based on both a statistical analysis of all benchmarks and a qualitative analysis of individual country benchmarks, and take into account the impact of assumptions underpinning those numbers.

175. Currently, Ofcom's approach for both 900 MHz and 1800 MHz fails to consider any of these principles. Firstly, it is unduly dependent on Austria, even though Austrian data is a gross outlier and highly contentious [contrary to Principle 1]. Secondly, its proposed values are, in both cases well above the lowest Tier 1 benchmark (£23.0m vs £20.3m for 900 MHz, and £14.0m vs £12.75m[42] for 1800 MHz) [contrary to Principle 2] and well above the mean average of all Tier 1 and Tier 2 benchmarks after excluding outliers (£19.7m for 900 MHz and £11.9m for 1800 MHz)[43] [contrary to Principle 3].[44] Ofcom's qualitative arguments for setting its value estimates so high appear to depend solely on the premise that it is being conservative relative to the contentious Austrian benchmark. Finally, Ofcom fails to undertake a statistical analysis of the all benchmarks and fails to consider that its individual benchmarks were often based on quite aggressive assumptions, for example with respect to adjustments for DTT coordination [contrary to Principle 4].

42 We have two benchmarks for Italy depending on whether Ofcom's adjustment for DTT coordination costs is included. We use the lower number here. The higher number (£13.5m) is also below Ofcom's estimate.

43 We have two benchmarks each for the 900 MHz and 1800 MHz averages. We use the lower numbers here. The higher numbers (£20.5m and £12.4m) are also below Ofcom's estimates.

44 When calculating these values, we included our revised benchmark for Denmark.

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Slough
Berkshire
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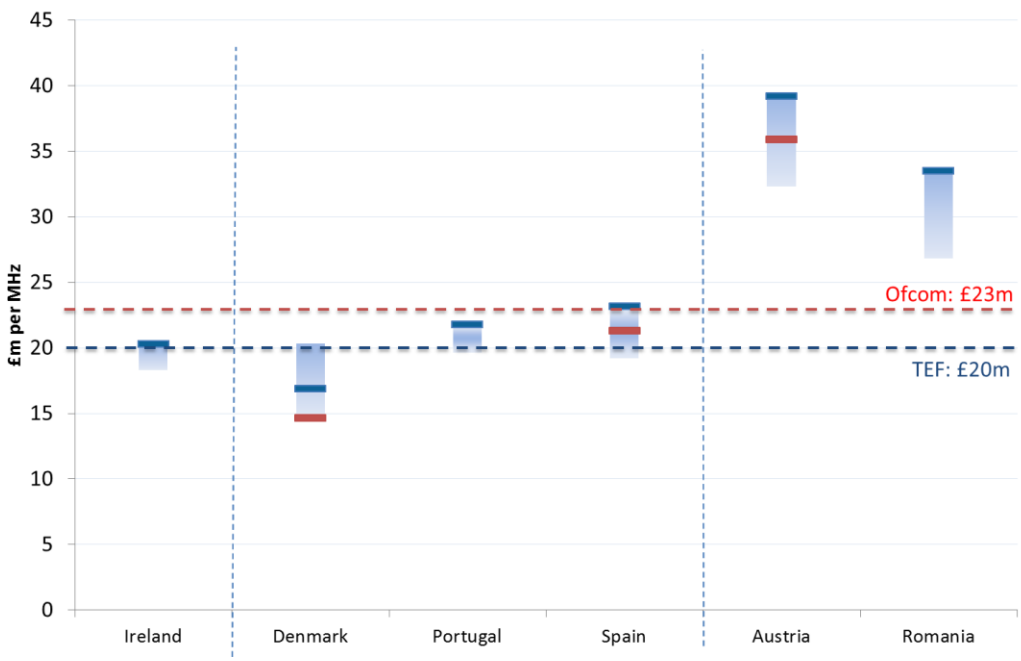
176. In Figure 12 and Figure 13, we set out our view of what a conservative approach should look like using the same graphical view developed by Ofcom for its consultation.[45] For each band, we use Ofcom data but we have adjusted the figures to take account of: (1) revised proxy values for Ireland and Sweden; (2) our revised Danish benchmarks; (3) changes to Tier designations, such as demotion of Austria to Tier 3; and (4) using bold blue and red lines to show benchmarks with and without adjustments for DTT interference and coverage obligations. The red dotted line shows Ofcom's value estimate and the blue dotted line shows our alternative proposal based on a conservative approach.

Figure 12: A conservative estimate of full market value for 900 MHz using Ofcom data



[45] Ofcom, August 2014 Consultation, Figure 3.2 on p.45 and Figure 3.3. on p.51.

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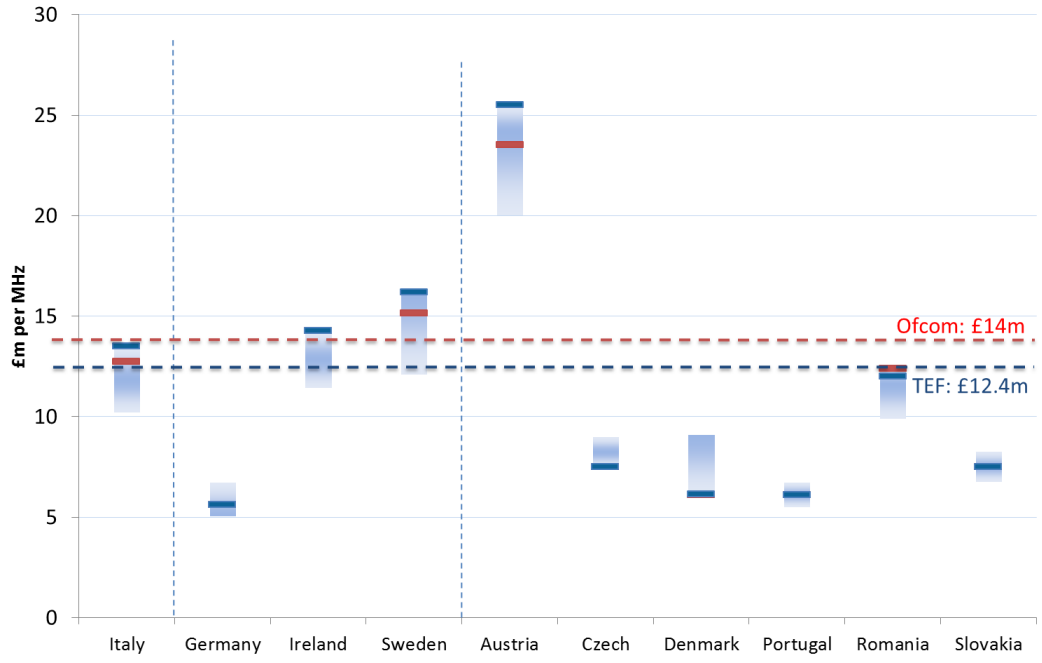
Figure 13: A conservative estimate of full market value for 1800 MHz using Ofcom data



177. For 900 MHz, using Ofcom data, we believe that a value of £20.0m per MHz would be a realistic estimate using a conservative approach (Note: this figure uses Ofcom's estimate for the value of 800 MHz, so overstates actual value). This number is set slightly below the Irish Tier 1 benchmark and in line with the average of Tier 1 and Tier 2 benchmarks. It is below the Portuguese and Spanish Tier 2 benchmarks, but these are considered likely to overstate value, and significantly above the Danish benchmark which is considered likely to understate value. It is below the two Tier 3 benchmarks, but as these are high price outliers, we put little weight on them.

178. For 1800 MHz, using Ofcom data, we believe that a value of £12.4m per MHz would be a realistic estimate using a conservative approach. This number is set slightly below the low end Italian Tier 1 benchmark. It is slightly above the average of Tier 1 and Tier 2 benchmarks, and in line with the average of Tier 1 and Tier 2 benchmarks. It is below the Irish and Swedish Tier 2 benchmarks, but these are considered likely to overstate value, and significantly above the German benchmark which is considered likely to understate value. It is below the Tier 3 Austrian benchmark and above four of five other Tier 3 benchmarks, all of which are outliers.

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260 Bath Road
Slough
Berkshire
SL1 4DX
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D. Lump sum value estimates for 900 MHz and 1800 MHz

179. We broadly support Ofcom's approach for deriving lump sum values for 900 MHz and 1800 MHz using European benchmarks. However, Ofcom has made mistakes in assessing certain key evidence points, and this means that their estimates are too high. After correcting for these errors (notably downgrading Austria to the third tier), our proposed benchmarks based on Ofcom lump sum values for 800 MHz and 2600 MHz are £20m/MHz for 900 MHz and £12.4m/MHz for 2600 MHz.

180. Our final step is to correct for the errors made by Ofcom is assessing the lump sum values of 800 MHz and 2600 MHz, as described in Section 4. In Figure 14 and Figure 15, we present the revised European benchmarks for 900 MHz and 1800 MHz, using our preferred values of £25m/MHz for 800 MHz and £4.95m/MHz for 1800 MHz. We apply the same conservative approach to assessing full market value as described in Part C.

181. Our estimates of lump sum values are:

- 900 MHz: £15.5m/MHz; and
- 1800 MHz: £10.0m/MHz.

182. In each chart, we compare our estimate (blue dashed line) with Ofcom's estimate (red dashed line). As can be seen, after correcting for the issues identified by us in Section 4 and Section 5 of this response, it is apparent that Ofcom's estimate grossly exceeds any level that could reasonable by construed as a conservative estimate of full market value.

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Figure 14: A conservative estimate of full market value for 900 MHz

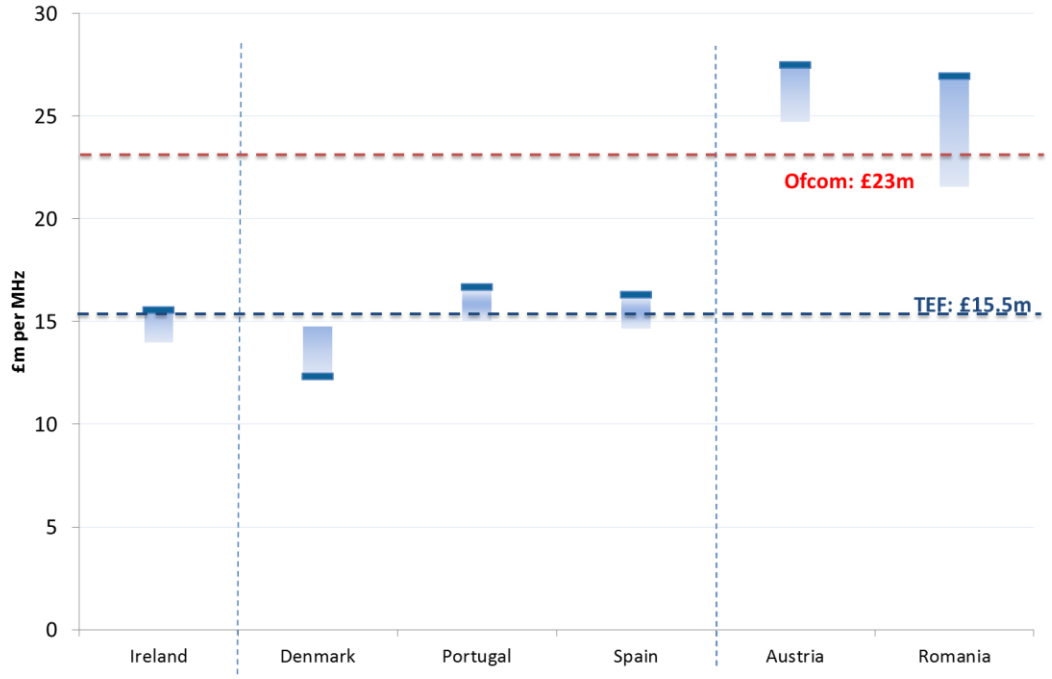
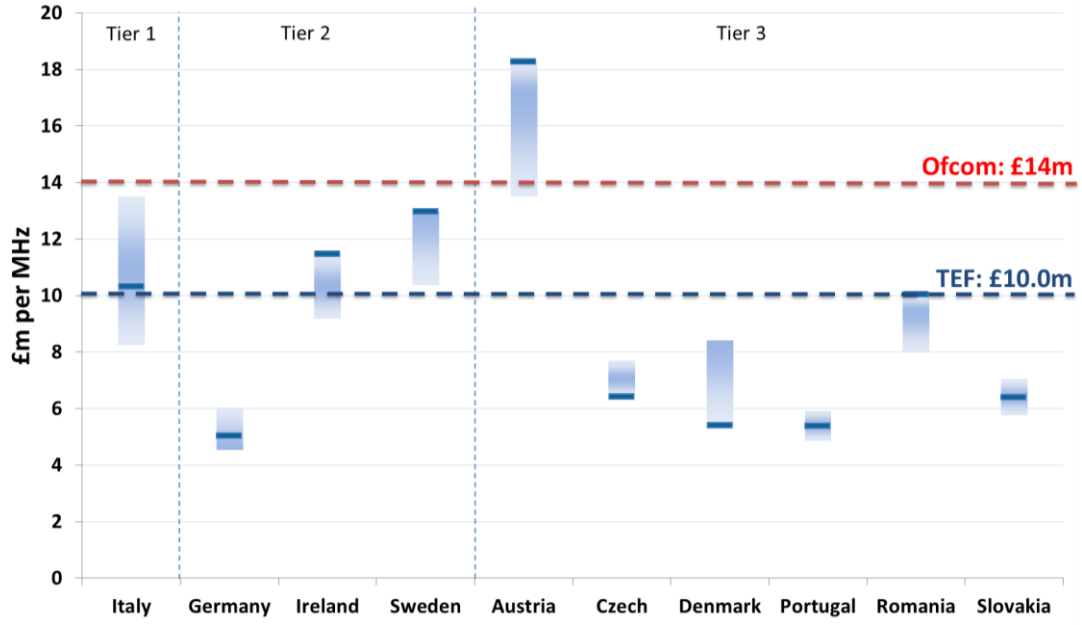


Figure 15: A conservative estimate of full market value for 1800 MHz



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260 Bath Road
Slough
Berkshire
SL1 4DX
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Section 6

VI. DERIVING ALFs FROM LUMP SUM VALUES

A. Ofcom's revised approach to deriving annuities

183. Ofcom seeks to estimate the appropriate discount rate to transform the lump sum values for 900 MHz and 1900 MHz spectrum into annuities (ALFs). Telefonica welcomes the fact that, in its revised proposal, Ofcom uses the cost of debt (instead of the WACC) for annuitisation, which is the conceptually correct approach given the ALF cash flow structure. The annual licence fee is structurally very similar to a loan granted by the government to the mobile operator: it consists of fixed annuities payable over a predefined time horizon.

184. However, Ofcom's *implementation* of the cost of debt approach contains a number of errors relating to the specific construction of the ALF payments. They concern, in particular, the averaging period used to calculate the cost of debt and the components included in Ofcom's debt premium. In sum, these errors cause a substantial bias in Ofcom's discount rate, which we set out below. For a more detailed discussion, we refer to the NERA expert report in Annex II.

B. Ofcom's use of a "long-run average" in setting the discount factor is incorrect

1. Conceptual inconsistency

185. Ofcom proposes to apply the same approach for calculating the discount factor as for setting the cost of debt for the WACC. Ofcom's approach of using long-run averages for setting the cost of debt for the WACC has economic merit: the cost of debt set at the beginning of each regulatory period needs to remunerate the expected cost of new and embedded debt raised over the regulatory period. Under this approach, long-run estimates are better indicators than spot rates. This is, however, conceptually different from the determination of a "one-off" ALF contract today.

186. Ofcom is therefore incorrect to argue that the long-term nature of the contract also requires a long-term observation period for deriving yields: ex-ante the government should be indifferent between receiving the lump sum now or the ALF payment over a 20-year period. This is because it is akin to the government providing a lease in the size of the lump sum to the MNO and receiving the ALF payments over 20 years. The financing costs of this lease, however, would be determined by current financing conditions and not by historical long-run

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

averages. Hence using the current yield is the appropriate approach for determining the ALF payments.

187. In addition, we note that Ofcom itself does not use an entirely consistent method between the MCT 2014 Consultation, where it uses bonds with an average maturity of around 10 years for the debt spread calculation, and the ALF setting, where it uses 20 year bonds.

2. Relevant market evidence on bond yields

188. In light of the above, the correct discount rate for the ALF setting process has to rely on current data for long-run debt instruments. A detailed analysis of relevant benchmark bond yields can be found in the NERA expert report (Annex II). Recent evidence on bonds issued by MNO parent companies with an average maturity of c.20 years lies in a range from 4.4% to 4.7% (nominal, pre-tax), significantly below Ofcom's current estimate of 5.8% (nominal, pre-tax).

189. Evidence on yields from UK non-financial corporate bond indices with comparable rating and maturity confirms the evidence on the current cost of debt of UK mobile operators. Average yields of the A and BBB indices over short-run averaging periods coincide with the range of 4.4% to 4.7% observed for MNO parent companies.

190. This evidence strongly suggests that a reasonable estimate of the current cost of debt for a notional UK mobile-only operator 20-year debt instrument lies in a range of 4.4% to 4.7% nominal pre-tax, or 1.5% to 1.7% real, post-tax. This difference alone leads to an upward bias in Ofcom's real, post-tax cost of debt estimate of 90 to 110 basis points.

191. Ofcom's estimate contains further upward bias as Ofcom fails to adjust its debt premium for a number of risk premium components that are not relevant for the case of ALF setting.

C. Ofcom's debt premium estimate overstates actual risk exposure

192. In addition to the upward bias resulting from the use of inappropriate averaging periods, Ofcom's approach fails to adjust for a number of other elements that lead to a clear upward bias of the discount factor:

- **Liquidity risk** contained in observed MNO bond yields, which is irrelevant to the UK government as there is no (realistic) option for the government to sell the ALF contract with the MNO to a third party;

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

- The **benefits of securitisation**, which are not contained in Ofcom's risk premium estimate based on unsecured debt; and
- **Inflation risk** contained in observed corporate bond yields, which Ofcom would have to deduct.

193. We address these elements below and refer to the NERA expert report (Annex II) for a more detailed analysis, which draws on both academic research and empirical evidence.

1. Liquidity risk

194. The spread of corporate bond yields over the risk-free rate reflects a number of different components. In addition to idiosyncratic default risk, creditors face systemic (market) risk and liquidity risk.

195. Ofcom fails to consider that such illiquidity risk is not relevant to the UK government when setting ALFs as there is no (realistic) option for the government to sell the ALF contract to a third party. Instead the government will hold the contract to maturity unless the MNO "defaults", which means default risk is the only risk that is relevant to the government. Liquidity risk, a typical feature of corporate bonds, does not apply to the case of spectrum licence fees. Ofcom fails to adjust its discount rate for it.

196. A review of the academic literature used e.g. in the Competition Commission enquiry into Heathrow and Gatwick's cost of capital in 2007/08 and regulatory precedent suggests that liquidity risk inflates the applicable debt premium estimate by at least 32 basis points.

2. Securitisation

197. The ALF can be viewed as a debt obligation secured against the value of the spectrum licence. Ofcom argues that based on observed spreads between secured and unsecured debt and due to the specific nature of the "ALF asset" it is reasonable to assume that the security provided through the "ALF asset" does not justify a reduction of the debt premium. As shown in the NERA expert report (Annex II), these claims do not stand up to a critical assessment.

198. Moody's, for example, sets out in in its "Rating Methodology for Regulated Electric and Gas Networks" (2009) that the credit rating of debt issued by utilities, where the security typically also comes from "special purpose assets", can be enhanced by up to three notches due to securitisation. An empirical analysis of spreads between secured and unsecured debt in combination with Moody's practice for securitised utility debt suggests that securitisation

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

accounts for 10 to 12 basis points of the debt premium used to calculate ALF annuities. That is, Ofcom's current estimate of the debt premium based on senior, unsecured debt contains a non-negligible upward bias owing to securitisation through spectrum licence value.

3. Inflation risk

199. Under Ofcom's approach, the real ALF payment for year one is calculated with respect to forecast inflation; the government will receive the real payment over the course of the 20-year period independent of outturn inflation. Thus, the ALF structure provides the government with a safeguard against unexpected changes in inflation. The reference bonds used by Ofcom do not contain such protection but instead pay higher yields. Our analysis shows that this protection provided by the MNO is worth 10 to 20bps. Ofcom fails to reduce the real discount factor by this premium.

D. The appropriate discount rate

200. Ofcom's failure to adjust for liquidity risk, securitisation and inflation risk leads it to overstate the appropriate discount factor.

201. Taken together, a correction of the current biases in Ofcom's debt premium will produce an adjusted range for the discount factor of 0.9% to 1.3% (real, post-tax) significantly below Ofcom's current estimate of 2.6%.

202. Considering that a mobile operator faces less adverse consequences from defaulting on its ALF obligation than on a corporate bond, the upper end of this range of 1.3% (real, post-tax) seems appropriate for the discount rate.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Section 7

VII. TELEFONICA'S ESTIMATE OF ALFs

203. We follow Ofcom's 4-step approach, as set out in Figure 3, to derive a conservative estimate of the full market value of ALFs for 900 MHz and 1800 MHz.

204. In Section 4, which corresponds to Step 1 of Ofcom's approach, we reviewed the available methodologies for deriving estimates of the lump sum value of 800 MHz and 2600 MHz from UK auction data. Unlike Ofcom's approach, which focuses on just one approach based on many questionable assumptions, our estimates are based on a broad analysis of all the plausible methodologies for estimating value. We focus on full market value, but take a conservative approach. On this basis, our preferred estimates of lump sum values are **up to £25m/MHz for 800 MHz** and **up to £4.95m/MHz for 1800 MHz**.

205. In Section 5, which corresponds to Step 2 of Ofcom's approach, we use these estimates for 800 MHz and 1800 MHz to derive European benchmarks for the lump sum value of 900 MHz and 1800 MHz. We broadly support Ofcom's approach for calculating European benchmarks. However, Ofcom has made mistakes in assessing certain key evidence points, most notably grossly overstating the importance of Austria, and this means that its estimates are too high. After correcting for these errors, we determine that a conservative estimate of lump sum full market value is **£15.5m/MHz for 900 MHz** and **£10.0m/MHz for 1800 MHz**.

206. In Section 5, which corresponds to Step 3 of Ofcom's approach, we review Ofcom's estimate of the appropriate discount rate to transform the lump sum values into annuities (ALFs). Telefonica welcomes the fact that, in its revised proposal, Ofcom uses the cost of debt (instead of the WACC) for annuitisation, which is the conceptually correct approach given the ALF cash flow structure. However, errors relating to the averaging period used to calculate the cost of debt and failure to adjust for liquidity risk, securitisation and inflation risk leads Ofcom to over-estimate the discount factor. After correcting for these issues, we estimate the **appropriate discount rate as 1.3% (real, post-tax)**.

207. The final step in Ofcom's process is to convert the lump sum values into annuities (ALFs) using the discount rate. Using our calculations, we conclude that Ofcom could reasonably set ALFs of **up to £0.94m/MHz per annum for 900 MHz** and **up to £0.61m/MHz per annum for 1800 MHz**, based on a conservative estimate of the full market value. Telefonica's estimates at each of the four steps in the process are set out in Table 5.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

Table 11: Telefonica estimates for each step in the determination of ALFs

	800 MHz	900 MHz	1800 MHz	2600 MHz
STEP 1				
Lump sum values based on UK auction (£/MHz)	£25.0m			£4.95m
STEP 2				
Lump sum values based on European benchmarks (£/MHz)		£15.5m	£10.0m	
STEP 3				
Discount factor for determining ALFs (%)		1.3%	1.3%	
STEP 4				
Annual licence fee (£ per MHz pa)*		£0.94m	£0.61m	

Source: Telefonica calculations as set out in this response.

*Calculated using the formula in Ofcom, August 2014 consultation, para. 4.38, with a TAF of 1.08, before adjustment for inflation indexation.

208. Using these figures result in ALFs in respect of Telefonica's spectrum holdings of no more than £39.8m per annum.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

ANNEX I

NERA REPORT ON COUNTRY BENCHMARKS

209. Please see report submitted alongside this response: "Review of country benchmarks used for setting UK 900 MHz and 1800 MHz prices", prepared by NERA Economic Consulting for Telefonica UK.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

ANNEX II

NERA REPORT ON DERIVING ANNUAL FEES FROM LUMP SUM VALUES

210. Please see report submitted alongside this response: "Deriving ALFs from Lump sum Valuations", prepared by NERA Economic Consulting for Telefonica UK.

Telefónica UK Limited
260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com

ANNEX III

RESPONSE TO CONSULTATION QUESTIONS

211. Please find here our responses to the specific questions raised in the consultation document:

Question 1. Do you have any comments on our proposal to base our assessment of the market value of 800 MHz and 2600 MHz spectrum in the UK on an analysis of bids by the marginal bidders in the UK 4G auction?

Yes. Please see Section 4 of this response.

Question 2. Do you have any comments on our revised assessment of the lump sum values of 900 MHz spectrum and 1800 MHz spectrum?

Yes. Please see Section 5 and Annex I of this response.

Question 3. Do you have any comments on our revised approach to converting our estimate of the lump sum value of the spectrum into annual fees using a discount rate based on the cost of debt?

Yes. Please see Section 6 and Annex II of this response.

Question 4. Do you have any further comments on our revised proposals?

Yes, please see our general comments about the proposals in Sections 3 and 7 of this response, and also our Executive Summary to this response.

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260 Bath Road
Slough
Berkshire
SL1 4DX
T +44 (0)113 272 2000
www.telefonica.com