Annual licence fees for 900 MHz and 1800 MHz spectrum: German 2015 auction

Ofcom Update

July 2015

Telefónica UK Ltd response

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Section 1

I. INTRODUCTION

1. Telefónica UK Ltd ("Telefónica") is grateful for the opportunity to provide comments on Ofcom's Update on Annual Licence Fees (ALFs) with respect to the 2015 German spectrum auction of 700 MHz, 900 MHz, 1500 MHz and 1800 MHz.[1]

2. We share Ofcom's view that the 2015 German auction must be included in its analysis of benchmarks for the calculation of ALFs. The auction data are richly informative, transparent and credible. Germany 2015 is clearly a Tier 1 benchmark for both 900 MHz and 1800 MHz. The new data provides important evidence that Ofcom has hitherto overestimated the value of 900 MHz as a proportion of 800 MHz, whereas its distance ratio estimate for the value of UK 1800 MHz may be about right.[2]

Ofcom should place the highest weight possible on Germany 2015

3. Ofcom should place great weight on the German auction outcome for three reasons. Firstly, the bid data provides solid evidence that the auction outcome reflects fair market value in Germany, with little or no distortions owing to strategic bidding. Secondly, the German market is an excellent benchmark for the UK, owing to structural similarities between local mobile markets and the broader economies. Finally, adding Germany significantly improves the breadth and quality of Ofcom's sample of benchmarks, especially at 900 MHz. In sum, from a qualitative perspective, Germany 2015 is arguably the best benchmark in Ofcom's sample.

4. We have analysed Ofcom's calculations and comments on German bid data in detail. We agree with Ofcom that Germany 900 MHz is a Tier 1 reference point. We also agree that, on balance, it is more likely that the German 900 MHz benchmark understates than overstates UK value. We also agree with Ofcom that Germany 1800 MHz is a Tier 1 reference point, but we present evidence that it may overstate UK value.

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1 Ofcom, Update on Annual licence fees for 900 MHz and 1800 MHz spectrum: German 2015 auction, 9 July 2015: http://stakeholders.ofcom.org.uk/consultations/annual-licence-fees-further-consultation/update-german-auction (hereafter "July 2015 Update").

2 For previous Ofcom estimates, see: Ofcom, Annual licence fees for 900 MHz and 1800 MHz spectrum, Provisional decision and further consultation, 19 February 2015: http://stakeholders.ofcom.org.uk/binaries/consultations/annual-licence-fees-further-consultation/summary/alf-further-consultation.pdf (hereafter "February 2015 Consultation").

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Germany raises broader concerns that Ofcom must address in its next paper

5. The German auction results raise three broader issues which Ofcom will need to address when it responds in full to stakeholder comments on its February 2015 Consultation:

   i. The 900 MHz price outcome is consistent with our argument that Ofcom has systematically over-estimated the intrinsic value of 900 MHz spectrum relative to other bands. We think this error derives from Ofcom not full understanding the extent to which the role of 900 MHz as the main band in Europe for legacy 2G deployment limits the scope and certainty regarding its future use for LTE deployment.

   ii. Germany is the first European country to award 700 MHz. The relatively low price outcomes for both 700 MHz and 900 MHz provides the first evidence that availability of 700 MHz has reduced the forward-looking value of 900 MHz for LTE deployment.

   iii. The German results are completely at odds with the price ratios from the 2013 Austria 4G Auction. We hope that the emergence of this new Tier 1 data point, based on a transparent, competitive auction, together with the compelling arguments presented by stakeholders regarding price distortions in Austria, will lead Ofcom to reassess what we consider to be its untenable position regarding the Austria 4G auction, and downgrade it to Tier 3.

Ofcom's estimate for the UK value of 900 MHz should be materially reduced

6. We expect Ofcom to make a "*material downward adjustment*" to its estimate of the lump-sum value of 900 MHz spectrum, based on the new German data and other evidence presented by stakeholders. Our revised view is that a plausible range for the lump sum value of 900 MHz is between 45% and 55% of the value of 800 MHz, i.e. between £10.89m and £18.43m.

7. We do not expect the German result to affect Ofcom's estimate of the lump sum value of 1800 MHz result (although other changes may prompt a reduction). A distance ratio of 27% is a plausible upper bound for the value of 1800 MHz, given the risk of over-statement in Germany 2015 and evidence from other Tier 1 benchmarks. We believe that the lump sum value of 1800 MHz lies between £9.76m and £13.06m.

8. Based on our proposed revisions to the plausible range for lump sum values of 900 MHz and 1800 MHz, and other adjustments to Ofcom's calculations that we proposed in our previous response, we estimate an ALF for Telefónica's holdings of between £0.64m / MHz and £1.08m / MHz for 900 MHz and between £0.57m / MHz and £0.76m / MHz for 1800 MHz, before adjusting for the impact of the geographic voice coverage obligation.

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Structure of this response

9. In the following sections, we provide detailed comments on the German auction results and its implications for the calculation of ALFs. Our response is divided into four further sections:

- **Section II: Telefónica agrees that Germany 2015 is a Tier 1 benchmark**
  We outline why we believe that German 2015 provides an excellent benchmark for the purposes of setting UK ALFs, and therefore should be treated as Tier 1.

- **Section III: Comments on Ofcom's calculations and interpretation of evidence from the German auction**
  We review Ofcom's methodology for estimating UK-equivalent values from the German auction and comment on the appropriateness of Ofcom's interpretations of bidding in the auction.

- **Section IV: Other issues raised by the German auction results**
  We address three broader issues raised by the German auction data, regarding the intrinsic value of the 900 MHz band, impact of the release of 700 MHz band, and the credibility of the 2013 Austria auction as a benchmark for UK values.

- **Section V: Implications for lump sum values and ALFs**
  We discuss the implications of adding Germany as a Tier 1 benchmark for the lump sum values of 900 MHz and 1800 MHz. We set out our revised position on high and low estimates of UK ALFs after incorporating the new evidence from the German auction.

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Section 2

II. TELEFÓNICA AGREES THAT GERMANY 2015 IS A TIER 1 BENCHMARK

10. Telefónica strongly agrees with Ofcom's proposal to integrate the German 2015 auction results into its analysis of benchmarks for the calculation of UK ALFs. The German results are richly informative, transparent and credible. Given that Ofcom has not yet taken a final decision on the appropriate level of fees, it would – as Ofcom implicitly recognises in releasing this update – be a dereliction of Ofcom's duty as an evidence based regulator not to include these results in its analysis.

11. In our response to Ofcom's February 2015 Consultation on ALFs, we commented on then forthcoming German auction:

> "*The German auction of 700 MHz, 900 MHz and 1800 MHz is scheduled to start in May 2015 and likely to conclude within a few weeks (given the use of substantive starting prices, substantive bid increments and an expected average of 8 rounds per day). This will provide the first concrete evidence point of how spectrum values have changed, based on newly available spectrum bands. Given the imminence of the auction and the fact that Germany is a potential Tier 1 benchmark for the UK, we urge Ofcom to take the results of this award into account in its final assessment of ALFs*."

12. As we anticipated, the German auction has indeed provided new evidence regarding the changing relative values of spectrum bands. As Ofcom recognises, it is clearly a Tier 1 benchmark for both 900 MHz and 1800 MHz.

13. Ofcom should place great weight on the German auction outcome for three reasons:

    i. The auction outcome reflects fair market value in Germany;

    ii. The German market is an excellent benchmark for the UK; and

    iii. Adding Germany significantly improves the breadth and quality of Ofcom's sample of benchmarks, especially at 900 MHz.

A. The German outcome represents fair market value

14. An important criteria for Ofcom when assessing the importance of each auction benchmark is evidence that local prices were set by bidders in a competitive process. In auctions where lots sell at reserve, it is often hard to tell if prices reflect market value, as lack of competition may be a result of other factors, such as excessive pricing or strategic demand reduction. In

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contrast, when prices are set by losing bidders, it is clear that reserve prices were not set too high and the impact of demand reduction, if any, was limited.

15. The 2015 German auction meets this criteria:

- All lots in all bands sold for prices significantly above reserve price. The total auction revenue of approximately €5.1 billion represented an increase on the reserve prices of approximately 250%. The three bidders started the auction with incompatible demand that in aggregate exceeded supply – they moderated demand in response to increasing prices but it took 181 rounds and significant price changes across all bands to end the auction. Unsurprisingly, the smallest percentage increase was for the unpaired 1500 MHz band, a new LTE band with uncertain potential. The largest increases were at 1800 MHz, an established LTE band, where prices increased by almost 600%.

- There is evidence of bidders switching demand across bands, notably between 900 MHz and 1800 MHz, in response to price differentials, which suggests that lots in different bands were substitutes.

- The auction format used was an SMRA. In its analysis of other auctions using this format, Ofcom has often expressed scepticism about final prices, arguing that they may have been affected by strategic demand reduction. However, as Ofcom acknowledges, the likelihood that German prices were much affected by demand reduction seems small. A large proportion of the price increases in Germany took place over the final 90 rounds, during which time there was often just 1 lot of excess demand in the auction. In this situation, the potential benefits from demand reduction are strong, and strongest when prices are still low. The fact that no bidder took advantage of the potential to close the auction sooner is a strong indicator that there was no significant demand reduction, and final prices should be a good proxy for fair market value.

B. Germany is an excellent benchmark for the UK

16. In addition to the competitive nature of both the 2010 and 2015 German auctions, there are many reasons to believe Germany is a good reference point for the UK:

- Germany is comparable to the UK in terms of market size and economic development. Both Germany and the UK are large population European economies with high per capita incomes.

- Both countries have similarly highly developed mobile communications markets. LTE market penetration levels are comparable.

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- There are similarities in terms of market structure and spectrum allocation. As in the UK, spectrum holdings in Germany by band vary significantly across incumbents, and these asymmetries are reflected in network configurations, notably in relation to 900 MHz and 1800 MHz.

- Germany is a leading indicator for the UK of the availability of new spectrum bands. In 2010, it made available 800 MHz and 2600 MHz spectrum, several years ahead of the UK. In this auction, it made available 700 MHz, again some years ahead of the UK.

17. For these reasons, we would expect that the intrinsic values of spectrum across the countries should be highly comparable. Indeed, from a qualitative perspective, Germany is clearly the best available benchmark; notably, it is a better match for the UK than either Austria or Ireland, Ofcom's other two Tier 1 benchmarks, based on the above criteria.

C. Germany significantly enhances Ofcom's sample of benchmarks

18. The addition of a German benchmark increases the number of 900 MHz benchmarks from seven to eight. In a modest sized sample, this is a significant addition. Moreover, this is only the 3rd evidence point that Ofcom has recognised as Tier 1. Given that Ofcom ultimately relies on a qualitative assessment of benchmarks, this means that the German 900 MHz data point will have a big impact on its final estimate for the lump sum value of UK 900 MHz spectrum.

19. The fact that the German 2015 auction was conducted using a transparent SMRA format is particularly helpful for benchmarking purposes:

    - The auction generated band specific prices for both 900 MHz and 1800 MHz. This compares favourably to auctions that used the CCA format, such as Austria and Ireland, where Ofcom has had to estimate band specific prices based on information about bids using a complex and opaque methodology.

    - The auction was transparent, with data available on bid decisions in every round. This facilitates a rich analysis of bidder behaviour and informed discussion regarding the impact of strategic behaviour. Again this contrasts favourably with Austria and Ireland, where Ofcom has had to rely on limited responses from regulators to its requests for information plus other information provided by stakeholders.

20. We comment in the following section on Ofcom's detailed analysis of the German auction. While our perspective on certain details differs from Ofcom, we largely agree with Ofcom's conclusions. Notably, the bid data provides clarity that the outcome of the German auction was not greatly affected by strategic bidding behaviour. This contrasts to Austria, where there

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is no transparency over bid data, and huge disagreement between stakeholders and Ofcom regarding the extent to which prices were distorted by strategic bidding behaviour.

21. Uniquely, Germany now offers two price points for the 1800 MHz band, based on the 2010 and 2015 auctions. There is a marked difference between them: in the 2010 auction, the average price for an 1800 MHz non-impaired lot was €20.8m while in 2015 the average price was €247m, and the UK benchmark based on the distance method has risen from £5.6m per MHz in 2010 to £15.2m per MHz in 2015. In our response to Ofcom's October 2013 Consultation, we argued that the 2010 German 1800 MHz benchmark was useful evidence but that "*the German benchmark is more likely to understate rather than overstate the UK price, for example because of the change in sentiment towards the 1800 MHz LTE ecosystem between 2010 and 2013*."[3] For this reason, we agreed with Ofcom's designation of the 2010 benchmark as a Tier 2 observation that is more likely to understate than overstate UK value. The much higher price for 1800 MHz in the 2015 German auction supports this analysis; it reflects the rapid emergence of 1800 MHz as a leading band for LTE deployment.

22. Ofcom has proposed to keep both German 1800 MHz observations. We support this approach. Together, they provide useful information regarding shifting market sentiment towards frequency bands over time. The 2010 benchmark should remain a Tier 2 observation, while the 2015 observation is clearly Tier 1, given the competitive nature of the auction and its recent conclusion. That said, our view is that the actual value of UK 1800 MHz spectrum lies between these two observations. In addition to the impact of changes in the 1800 MHz ecosystem, we suspect that German-specific factors may have contributed to an understatement of 2010 prices and overstatement of 2015 prices for the 1800 MHz band. Both auctions were multi-band auctions, in which bidders were de facto competing for portfolios of spectrum rather than individual bands. In 2010, it is plausible that there was some degree of demand reduction at 1800 MHz and 2600 MHz, which may be linked to the budgetary impact of the high price competition at 800 MHz. [✂].

[3] October 2013 Consultation, §214.

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Section 3

III. COMMENTS ON OFCOM'S CALCULATIONS AND INTERPRETATION OF EVIDENCE FROM THE GERMAN AUCTION

23. In this section, we review Ofcom's approach to calculating the new German benchmarks and its interpretation of evidence from the auction. We strongly support Ofcom's conclusion that both benchmarks are Tier 1 evidence points, but have some concerns regarding its detailed calculations and analysis of the auctions.

24. Our main points are as follows:

- Ofcom's calculations of the UK benchmarks at 900 MHz and 1800 MHz appear to be roughly right, but its choice of PPP rate is opaque.
- The WACC used for Germany provides further evidence that the WACC that Ofcom has used for Austria is too high.
- We agree that Germany 900 MHz is a Tier 1 reference point that is more likely to understate than overstate UK value. However, Ofcom's analysis is over-focused on identifying the incremental value of 900 MHz for LTE and fails to consider the bigger picture issues, such as the impact of managing legacy GSM traffic and the availability of 700 MHz, which are changing spectrum valuations in both Germany and the UK.
- We agree that Germany 1800 MHz is a Tier 1 evidence point. We present evidence that it is more likely to overstate than understate UK value.

A. Calculation of benchmarks

25. In order to convert the Germany auction price outcomes for the 900 MHz and 1800 MHz bands into UK-equivalent prices, Ofcom makes adjustments for various factors, including:

- duration of licenses and start date (vs award date) of licenses;
- exchange rates and purchasing power parity (PPP);
- inflation; and
- relative populations.

26. We have previously argued that Ofcom's approach is unduly complicated and error prone. Furthermore, Ofcom's rationale for making certain adjustments, notably PPP, while ignoring

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other relevant factors that may underpin differences in intrinsic value, such as the mix of mobile technologies in the market, or the relative size, market share and spectrum holdings of operators, is weak. However, as described above, as the German market situation is relatively similar to the UK (more so than most other benchmarks), the inclusion or absence of particular adjustment factors is less important in this case.

27. Our comments here focus on Ofcom's approach to calculating benchmarks. We have attempted to replicate Ofcom's calculation of new UK benchmarks from the German 2015 auction. As has been our experience with past efforts, we find that we cannot replicate the results exactly. However, our calculations at least yield similar price levels for both benchmarks, which suggest that the differences are the results of discrepancies in the use of specific data, most likely PPP, rather than error.

28. It appears that Ofcom has made the appropriate changes to account for differences in the duration of the spectrum licenses in the UK and Germany (20 years vs 17 years), and the late start date for the German 900 MHz and 1800 MHz licences (1 January 2017 vs an award date of June 2015). However, Ofcom should look again at the choice of WACC that is uses for these calculations. Ofcom uses the German regulator (BNetzA)'s allowed real, pre-tax rate of return as a starting point for calculating its own estimate of the real, post-tax rate of return. However, BNetzA uses a "smoothed" WACC, i.e. it first estimates a current WACC and then determines an average WACC over the last eight years, which it uses for calculating tariffs. BNetzA does so to smooth tariffs over time. While there is a rationale for smoothing tariffs over time, it is hard to argue that German companies bidding in the auction would have used anything other than the most recent WACC when determining the financial cost of the delay in award.

29. If Ofcom used the current rather than the smoothed WACC, the starting point for the real, pre-tax WACC drops to 5.3% rather than the 6.38% that Ofcom uses. Adjusting the starting point leads to a drop in the real, post-tax WACCs from 4.15% to 3.39%.[4] Fortuitously, in this case, the impact of reducing the WACC on the duration adjustment and delayed availability adjustment act in opposite directions, so the impact on the final benchmark values will be modest.

30. We continue to have strong reservations regarding Ofcom's unconventional decision to rely on Purchasing Power Parity (PPP) rather than market exchange rates. The use of PPP to convert

[4] We understand that Ofcom first adds inflation to the real, pre-tax WACC, then multiplies the resulting nominal, pre-tax number by a tax factor before subtracting inflation again to arrive at a real, post-tax rate. Following the same process and inflation and tax assumptions as BNetzA leads to a real, post-tax WACC of 3.39% when starting from a real, pre-tax WACC of 5.30%.

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between currencies is not industry practise and we believe creates erroneous results, especially when comparing countries with similar economic development profiles, such as the UK and Germany. To summarise our points from previous responses:

- PPP measures are developed based on comparing prices of baskets of goods within the economy. Changes to the value of these baskets of goods are not necessarily representative of the changes in customer's willingness to pay for a particular good or service, such as mobile services.
- PPP exchange rates are typically only available as an annual average while exchange rates vary greatly over time. The use of an average annual figure can lead to abrupt changes in values depending on which calendar year a spectrum award falls into.
- PPP exchange data is published retrospectively, so numbers are not available for the latest spectrum awards. Forward-looking interpolation is not reliable.
- There are discrepancies in the PPP exchange rate estimates depending on the source of the data.[5]

31. PPP data is now available for 2014. It is unclear whether Ofcom has updated its calculations accordingly. Unfortunately, no PPP data for June 2015, the time of the German auction, will be published until 2016. This makes it hard for stakeholders to replicate Ofcom's numbers as Ofcom has not provided information regarding how it has calculated the relevant PPP exchange rate for the 2015 auction.

B. Country-specific discount rates

32. Independent of whether one adjusts Ofcom's WACC estimate for Germany, even the unadjusted estimate of 4.15% highlights the inappropriateness of Ofcom's discount rate estimate for Austria. As highlighted in our response to the February 2015 Consultation, it is implausible for Ofcom to use a discount rate for Austria that is nearly 50% higher than those of comparable countries (we understand Ofcom uses 6.66% for Austria compared to 4.6% for the UK and 4.9% for Sweden).[6] The rate that Ofcom uses for Germany is broadly consistent with the earlier UK and Sweden estimates, but represents a full 2.5 percentage point (!) premium over its estimated rate for Austria.

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5 For evidence of this, see page 19 of Telefónica's response to the October 2013 Consultation where we compare estimates from the World Bank and Eurostat.

6 See §114-118 of our response to the February 2015 Consultation document.

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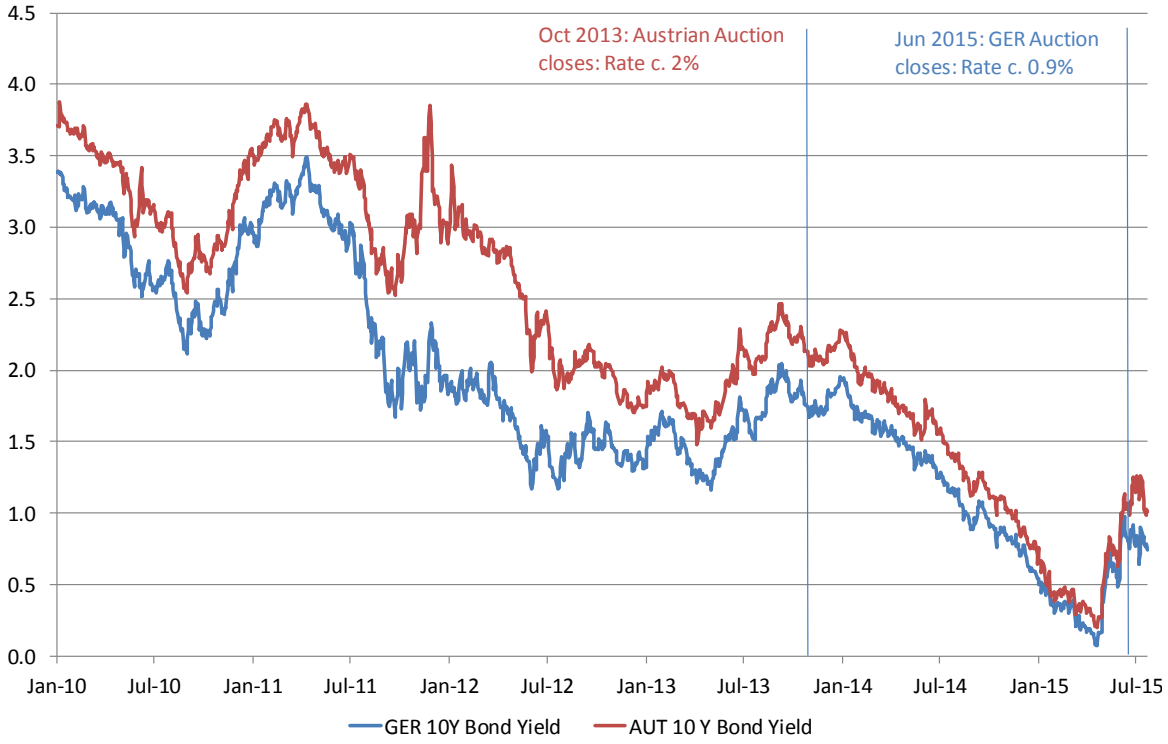
33. Figure 1 shows that the difference in returns that Ofcom estimates for Austria and Germany is not in any way borne out by the difference in government bond yields for German and Austrian government bonds, which for the most part of the last five years have been less than half a percentage point apart. Even when different auction timings are taken into account more than half (1.4 of 2.5 percentage points) of the gap that Ofcom assumes are unexplained. This confirms the implausibility of the value Ofcom assumes for Austria.

Figure 1: Comparison of German and Austrian government bond rates



C. Interpretation of benchmarks: 900 MHz

34. Telefónica agrees with Ofcom's conclusion that Germany 900 MHz is a Tier 1 reference point. We also agree that, on balance, it is more likely that the German 900 MHz benchmark understates than overstates UK value. However, we disagree with a number of aspects of Ofcom's analysis. In particular, we think Ofcom is over-focused on identifying the incremental value of 900 MHz for LTE and fails to consider the bigger picture issues, such as the impact of managing legacy GSM traffic and the availability of 700 MHz, which are changing spectrum valuations in both Germany and the UK.

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The 900 MHz cap and need for GSM provision

35. Ofcom concluded that the spectrum cap at 900 MHz introduces a risk that auction prices understate the forward-looking value of 900 MHz for a 2x10 MHz increment. While we agree with Ofcom that bidders likely had irreducible demand for 900 MHz for legacy GSM (and 3G) capacity, we do not agree that this necessarily means that final prices understate the forward-looking value of 900 MHz spectrum for LTE.

36. All three MNOs in Germany operate GSM 900 networks. Historically, Vodafone and Telekom Deutschland have relied primarily on 900 MHz, whereas Telefónica's O2 and E-Plus networks relied to a greater extent on 1800 MHz. All three operators rely exclusively on 900 MHz to reach some customers in many coverage spots. Looking forward, it is reasonable to suppose all three operators will focus legacy GSM traffic on 900 MHz, with the 1800 MHz band refarmed first for LTE use.

37. BNetzA set a spectrum cap of 3 lots of 900 MHz for each bidder. This cap ensured that each bidder could acquire at least 1 lot, so would be able to continue to provide GSM 900. This was the absolute minimum cap that BNetzA could have set without creating the possibility that any one of the three operators might have been left unable to provide any coverage to some existing GSM-only customers.

38. It seems reasonable to suppose that, at reserve price, each of the three incumbent operators wanted more than just 2x5 MHz at 900 MHz for GSM, as all still have large legacy GSM traffic bases, and Telefónica Germany is integrating two networks. Telekom, which has the smallest allocation of 2100 MHz spectrum, may also have wanted 2x5 MHz for 3G deployment. For each operator in Germany, the value of the first two or even three lots for legacy services may have exceeded their value for LTE use. Even for a third lot, the value of LTE capacity may only be relevant later in the life of a licence once legacy traffic has declined sufficiently to free up additional carriers.

39. In this context, it is not unreasonable to assume that bidders were unable to express a value for 2x10 MHz of 900 MHz for LTE use. However, it does not follow that they would have bid any higher had they been able to do so. The price of 900 MHz in Germany was set by Vodafone's failed attempt to secure a 3rd lot, the value of which may have been derived from a combination of GSM provision in the near term and LTE capacity in the long term. This value presumably exceeded Vodafone's standalone value for 2x5 MHz incremental LTE capacity, and may or may not have exceeded 50% of its value for 2x10 MHz for LTE.

40. The future value of the 900 MHz band for provision of LTE services in Germany may also have been reduced by the availability of substitute spectrum at 700 MHz. The two bands offer

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similar propagation characteristics, and both lag 800 MHz (and 1800 MHz) in terms of their integration into the LTE ecosystem. As 700 MHz will be made available in the UK, this factor is also relevant for forward-looking value of UK 900 MHz spectrum.

Possibility of strategic demand reduction in the 900 MHz band

41. The evidence for strategic demand reduction at 900 MHz in the German auction is weak. As Ofcom points out, there was significant competition for 900 MHz lots, with final prices finishing well above the reserve level. The average price per lot was £192m, up from a reserve of €75m. In many rounds, excess demand was just 1 lot, implying that any bidder could have ended the competition at any time with a unilateral drop of 1 lot. Thus, each bidder had the opportunity to engage in demand reduction, but chose to compete instead.

42. Ofcom nonetheless concludes at §39 that there may have been "*a degree of strategic demand reduction*." This analysis seems not to be based on any evidence from the bidding itself, but rather the fact that 900 MHz closed at a lower price than 1800 MHz.

43. As Telekom won the maximum three lots, the only bidders that could have engaged in demand reduction at 900 MHz are Telefónica and Vodafone, who each won two lots. It is reasonable to suppose that Vodafone's value for a 3rd lot (given its greater focus on 900 MHz and the fact it started the auction with smaller spectrum holdings overall) exceeded Telefónica's value for a 3rd lot, so whether or not Telefónica's failure to bid consistently on a 3rd lot at 900 MHz was demand reduction or not is irrelevant to the price outcome. Therefore, one must conclude that Ofcom is suggesting that Vodafone may have underbid at 900 MHz.

44. We see no evidence that Vodafone significantly underbid for 900 MHz. Its behaviour throughout the auction is consistent with it seeing a 3rd lot at 900 MHz and 5th lot at 1800 MHz as substitutes. Rather than follow a straightforward valuation-based strategy, it pursued each lot sequentially, switching between bands only after driving the price of one band up significantly. This strategy disguised Vodafone's true switching point. This leaves open the possibility that at the relative prices at which the auction closed, it might have preferred 900 MHz but chose 1800 MHz instead in order to close the auction. However, if Vodafone had actually valued the incremental 900 MHz lot higher than 1800 MHz one, it would presumably have approached the auction differently. Therefore, even if Ofcom's speculation regarding strategic demand reduction has some truth, it seems likely that the impact of such behaviour on the 900 MHz price was modest.

45. As an aside, Ofcom should be cautious about interpreting data regarding instances of standing high bids (SHBs) in the German auction. The public data released by BNetZA omits bids submitted in the same round for the same lot that were not selected as SHB because they had a

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lower value or the same value but were bid later in the round. Just because there are periods of more than one round where Telekom and Telefónica were SHB on fewer than 3 and 2 lots respectively at 900 MHz, does not mean that they ever bid for any smaller quantities.

Possibility of signalling in the 900 MHz band

46. Signalling is always possible in a transparent SMRA. There are many instances in the auction when bidders did not bid on the cheapest available 900 MHz lots. Such behaviour may have reflected attempts to signal other bidders. However, as Ofcom says, there is no clear evidence that bidders actually responded to these signals by changing their own demand.

47. We agree that Vodafone's bids imply a degree of interdependence in bidding across 900 MHz and 1800 MHz. Its behaviour is consistent with it viewing a 3rd lot at 900 MHz and a 5th lot at 1800 MHz as substitutes. This is plausible for two reasons. Firstly, our understanding is that Vodafone operates both GSM 900 and GSM 1800 in Germany, so it may view the two lots as substitutes for incremental legacy GSM traffic. Looking longer term, the two lots are substitutes for LTE capacity, for incremental deployment in addition to Vodafone's other holdings of 2x10 MHz at 700 MHz, 2x10 MHz at 800 MHz and 2x20 MHz at 1800 MHz. The key point is that there is no evidence to suggest that Vodafone's willingness to switch between the two bands was driven by strategic motives rather than intrinsic value.

48. At first look, Vodafone's willingness to pay more for 1800 MHz than 900 MHz looks surprising. An explanation may be that Vodafone did not place any significant incremental value on propagation benefits from securing more sub-1GHz spectrum, given the spectrum it already had or was about win across 700 MHz, 800 MHz and 900 MHz. Instead, it may have seen the potential to acquire a contiguous 2x25 MHz block at 1800 MHz as a more valuable option for future proofing its networks.

Possibility of other strategic behaviour

49. We agree that there is no evidence of strategic investment or price driving at 900 MHz.

50. At §45, Ofcom says that Telefónica Germany was "*unlikely to require 900 MHz spectrum for GSM provision*". We find this comment very odd. Telefónica Germany's network operates GSM at both 900 MHz spectrum and 1800 MHz, so there is no reason to suppose that Telefónica Germany would not have demand for 900 MHz for GSM.

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D. Interpretation of benchmarks: 1800 MHz

51. Telefónica agrees with Ofcom's conclusion that Germany 1800 MHz is a Tier 1 reference point. However, unlike Ofcom, we think it is more likely that the German 1800 MHz benchmark overstates than understates UK value. We explain our reasoning here.

52. We generally agree with Ofcom's brief analysis of bidding for 1800 MHz in Germany. Competition in this band was very strong, with prices rising to more than six times the reserve for nine out of ten lots. We agree with Ofcom that there is no evidence that price competition was affected by signalling. We further agree with Ofcom that there is no evidence of strategic demand reduction, price driving or strategic investment.

53. Notwithstanding these points, we are concerned that final prices may overstate the value of incremental 1800 MHz spectrum in Germany, and thus Ofcom should consider that there is a risk of overstatement for the UK. The auction in Germany took place against the backdrop of a merger between the 3rd and 4th operators, E-Plus and Telefónica O2. Owing to this merger, Telefónica Germany entered the auction with the largest spectrum holdings. It seems that Telekom Deutschland viewed the auction as an opportunity to rebalance holdings, and during the auction it demanded and won the highest shares of spectrum at both 900 MHz and 1800 MHz. [✂].

54. [✂].

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Section 4

IV. OTHER ISSUES RAISED BY THE GERMAN AUCTION RESULTS

55. In this section, we address three broader issues raised by the German auction data:

- Ofcom's analysis to date has systematically over-estimated the intrinsic value of 900 MHz spectrum relative to other bands;
- The availability of 700 MHz has likely reduced the forward-looking value of 900 MHz; and
- The German results provide further evidence that price ratios from the 2013 Austria 4G Auction are gross outliers amongst available benchmarks, and should be downgraded to Tier 3 evidence points.

A. Intrinsic value of 900 MHz

56. In our response to the February 2015 submission, we commented on the relative value of the 900 MHz and 800 MHz bands.[7] To date, Ofcom has stuck to the rather vague position that "*900 MHz is unlikely to have a higher value than 800 MHz spectrum in the UK, i.e. the value of the 800 MHz spectrum in the UK is likely to set an upper limit on the value of 900 MHz in the UK*".[8] We argued that the benchmark evidence clearly shows that 900 MHz is worth less than 800 MHz, and that this was supported by technical evidence with respect to the current and future use of the 900 MHz band. We believe that the German auction results support our arguments.

57. Our impression is that Ofcom's analysis throughout this process has been coloured by the fact that it thinks that 800 MHz and 900 MHz should be close substitutes, given that they are in similar frequency ranges and both core to the mobile ecosystem. In the last consultation, this viewpoint within Ofcom may have been reinforced by evidence that availability of LTE equipment at 900 MHz – which lags other major mobile bands – is improving. This position is understandable but fails to take account of the very different roles that these two bands are likely to play in the European ecosystem over the next ten years.

58. Our view, as stated in our previous response, is that whereas 800 MHz has emerged as a core LTE band, 900 MHz will primarily be used as a legacy band for 2G and 3G services. In most

7 §44-49 of our response to the February 2015 Consultation document.

8 February 2015 Consultation, § 4.42.

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European countries (including Germany), 900 MHz spectrum is typically split between at least three operators, and individual operator holdings are smaller than in the UK, so very little 900 MHz spectrum will be used for LTE. This means that manufacturers may continue to make 900 MHz the last priority amongst major bands for LTE deployment for many years to come, especially for LTE aggregation which is ideally based on blocks of 2x10 MHz or larger.

59. For most European incumbent 900 MHz operators, the value of the first one or two blocks of 900 MHz (depending on their size and network deployment) is enormous, as without it they could not service their legacy base. An enforced migration of 2G and 3G customers to 4G would be hugely disruptive to any mobile operator and might tarnish their brand for years to come. However, once an operator has sufficient spectrum to manage their legacy base, additional 900 MHz is much less valuable. In the short-to-medium term, it may be used to ease technology migration and, in the longer term, it may be used for LTE. However, the value of the spectrum for LTE may be rather uncertain, unless and until operators can migrate enough customers to free up at least 2x10 MHz.

60. The legacy role of 900 MHz can be hugely distorting in the context of spectrum auctions. On the one hand, in countries such as Austria and the Netherlands, where there was a CCA with lax spectrum caps, incumbent operators were effectively fighting to protect their legacy networks. In this case, bidding may exceed intrinsic value because bidders so fear the broader disruption to their networks if they fail to secure their base, and have an opportunity to exploit the vulnerability of rivals. In other countries, like Germany, where there was a precautionary cap, competition was likely focused more on the intrinsic incremental value of the spectrum (e.g. how much was Vodafone Germany willing to pay for a 3rd lot to ease its 2G/4G migration process or add more 3G/4G capacity). This technology migration story is consistent with the wide range of values observed for 900 MHz across countries in Ofcom's benchmark sample.

61. Whereas the future evolution of 900 MHz as an LTE band remains uncertain, the 1800 MHz band has emerged over the last five years as a core LTE band. 1800 MHz is seen as an ideal band for urban capacity, owing to the potential to deploy large amounts of contiguous spectrum, much more so than at sub-1 GHz frequencies, where spectrum holdings are typically more fragmented. Competition for urban LTE capacity spectrum no doubt explains the fierce bidding for 1800 MHz seen in the German auction.

B. Forward-looking value of 900 MHz

62. The German auction was the first in Europe to feature the new 700 MHz band, a band that will eventually be released across Europe, including the UK. The introduction of this band substantially increases the availability of sub-1 GHz capacity spectrum. As we argued in our

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previous submission, this reduces spectrum scarcity and erodes the value of both the 800 MHz and 900 MHz relative to higher frequency bands.

63. The German auction results provide the first evidence of these effects. Specifically, there is evidence that:

    - Availability of 700 MHz may have reduced the intrinsic value of LTE capacity spectrum on a forward-looking basis; and
    - The value of 900 MHz has been affected much more than other bands.

64. The 700 MHz band sold at a price of €167m per lot, somewhat lower than both the 900 MHz and 1800 MHz spectrum, and much lower than the 800 MHz band in the 2010 auction. It is possible that there was an element of demand reduction in this outcome, as operators were able to split the band evenly with two lots each. Nevertheless, it is clear that bidders did not value the spectrum nearly as highly as they valued 800 MHz in 2010. Arguably, when comparing the two auctions, both bands were at similar stages on terms of their position in the LTE ecosystem (i.e. a few years ahead of widespread deployment), so the lower price for 700 MHz indicates a decline in the forward-looking value of low band spectrum.

65. The availability of 700 MHz in Germany likely had a bigger impact on the value of 900 MHz than 1800 MHz, for two reasons:

    - The premium that operators have historically paid for sub-1 GHz frequencies reflects the incremental benefits of wide-area coverage and in-building penetration. However, the value of the these benefits falls off significantly once an operator has a critical mass of low frequency spectrum; and
    - For the next few years, deployment of 700 MHz may be limited owing to lack of compatible handsets. This means that 700 MHz is not yet a substitute for 1800 MHz, which can be deployed to meet LTE demand immediately. However, looking 3-5 years ahead, it is a substitute for deploying LTE at 900 MHz, especially for operators making future decisions when to refarm 2G spectrum.

66. This evidence is directly relevant to the UK, given that Ofcom will in due course award 700 MHz for mobile broadband. It reinforces the point that Ofcom first made in the August 2014 Consultation that it should adopt a conservative approach when interpreting the evidence,

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owing to the possibility that forward-looking market values today could be lower that at the time of the auctions from which Ofcom derives its evidence.[9]

C. The 2013 Austrian auctions results are a gross outlier

67. In responses to the last two consultations, Telefónica and other stakeholders have argued that the benchmarks from the 2013 Austrian auction represent a gross over-estimate of UK prices and should be downgraded to Tier 3 evidence points. We have also provided extensive evidence as to why Austrian prices were likely inflated, although our efforts are hampered by the lack of bid data (a factor that should also make Ofcom sceptical about Austria). While the German auction results do not provide any further direct evidence regarding Austria, they are consistent with our arguments that Austria 2013 is a gross outlier to Ofcom's sample.

68. According to Ofcom's most recent calculations, Austria 2013 valued 900 MHz at 115% of 800 MHz. This is not a plausible benchmark, especially as Ofcom clearly shares our view that the value of 900 MHz is significantly less than 800 MHz. In the February 2015 Consultation, Ofcom tentatively suggested that the value of 900 MHz might be 70% of 800 MHz. In light of the lower value observed for Germany (29%), it now says that "*there could be a case for a material downward adjustment to our estimate* .."[10] We hope that the emergence of this new Tier 1 data point, based on a transparent, competitive auction, together with the previous arguments presented by stakeholders, will lead Ofcom to reassess its untenable position regarding Austria.

69. While we support Ofcom's approach of applying qualitative judgement in interpreting benchmarks, we have argued that it should put more weight on quantitative benchmarks as a way to screen for outliers. In support of this, we presented an econometrics analysis by NERA Economic Consulting which showed that Austrian benchmarks were gross outliers to the set of country benchmarks for both 900 MHz and 1800 MHz.[11] For this response, we re-ran this analysis including the new German data. The results again show the Austrian data points to be well above the 98% confidence interval for predicted values. In contrast, the new 2015 German 900 MHz and 1800 MHz data points are within the confidence intervals; their position

9 See August 2014 Consultation, §1.34 and February 2015 Consultation, §1.41.

10 July 2015 Update, §69.

11 See NERA response to Ofcom comments on our paper: Review of country benchmarks used for setting lump sum values for UK 900 MHz and 1800 MHz – 9 April 2015; §130-135 of our response to February 2015 Consultation; Review of country benchmarks used for setting lump sum values for UK 900 MHz and 1800 MHz – A Response to Ofcom's Further Consultation prepared by NERA Economic Consulting – 16 September 2014; and §112-113 of our response to February 2015 Consultation.

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is consistent with the supposition that 900 MHz may (modestly) understate UK value whereas Germany 1800 MHz may overstate UK value.

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Section 5

V. IMPLICATIONS FOR LUMP SUM VALUES AND ALFS

70. Based on the evidence presented in Ofcom's June 2015 Update and the submissions of stakeholders, we anticipate that Ofcom will adopt the new German benchmarks for 900 MHz and 1800 MHz as Tier 1 evidence points. As Ofcom proposes at §69-71, it will thus need to review its estimates of lump sum values for both bands, and this in turn may have a material impact on its estimates for ALFs.

71. In this section, we revisit our own estimates of lump sum values for 900 MHz and 1800 MHz. We conclude that there is a material case for revising downwards our estimated range for the lump sum value of 900 MHz. We do not think there is a case to increase the price of UK 1800 MHz.

72. Based on our proposed revisions to the plausible range for lump sum values of 900 MHz and 1800 MHz, and other adjustments to Ofcom's calculations that we proposed in our previous response, we estimate an ALF for Telefónica's holdings of between £0.64m / MHz and £1.08m / MHz for 900 MHz, and between £0.57m / MHz and £0.76m / MHz for 1800 MHz, before adjusting for the impact of the geographic voice coverage obligation.

A. Lump sum value of 900 MHz

73. Ofcom provisionally concludes that 900 MHz is a Tier 1 evidence point but that it may understate UK value. Based on this assessment, Ofcom states that "*there could be a case for a material downward adjustment to our estimate in the February 2015 consultation of £23m per MHz for the lump-sum value of 900 MHz spectrum*."[12] Telefónica agrees with this assessment. The German auction outcome provides compelling evidence to support our previous arguments that Ofcom has over-priced UK 900 MHz spectrum.

74. In Figure 2, we present the new German benchmark alongside the other benchmarks. This chart is similar to Ofcom's Figure 3 in the June 2015 Update, but we have made adjustments to reflect our views on tiering and risk of under/overstatement of evidence points.[13] We also display percentages (900/800) rather than £ values, as we expect all UK benchmarks to change once Ofcom has (a) revised downwards its estimate of the UK value of 800 MHz based on

12 July 2015 Update, §69.

13 See §119-128 and §143-150 of our response to the February 2015 consultation.

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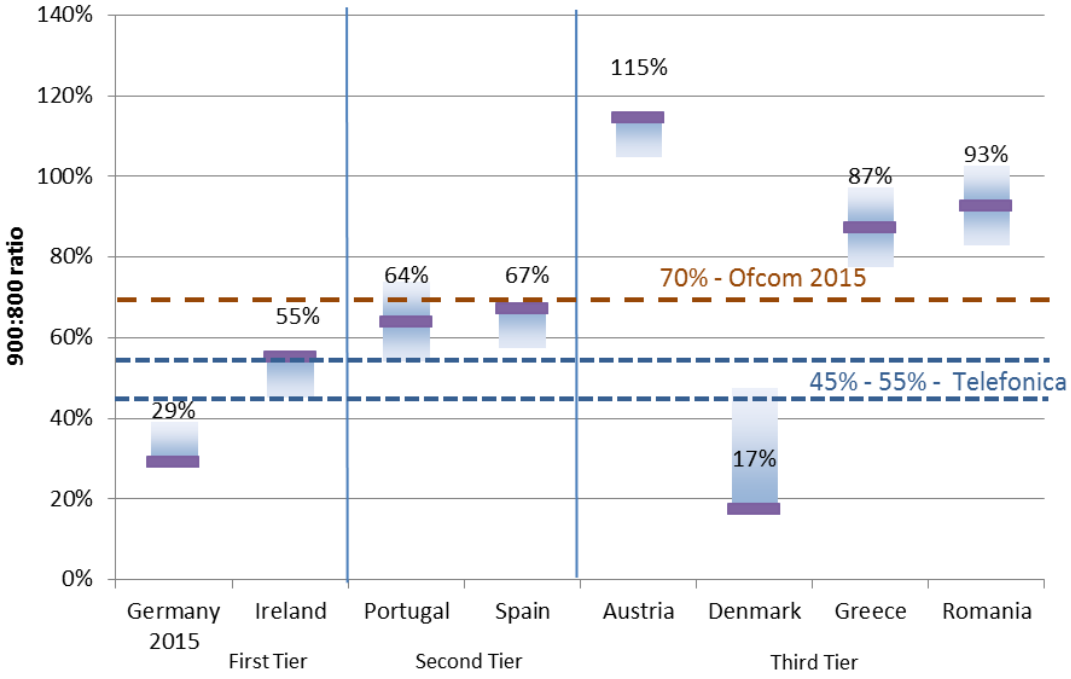
stakeholder responses[14]; and (b) reviewed and corrected for errors in its calculations, as highlighted in our response to the February 2015 Consultation[15]. (Although some percentage values will likely also change, this effect is much smaller).

75. This chart clearly demonstrates that Ofcom's previous estimate of £23m/MHz, which was based on a 70% value ratio between 900 MHz and 800 MHz is much too high.

Figure 2: 900 MHz ratio benchmarks as % of 800 MHz (Ofcom data)



76. Telefónica's previous view was that the available benchmark evidence suggested that "*the ratio of 900:800 MHz falls within a range of between 60% and 65%.*"[16] The new evidence from Germany suggests that that estimated range was too high. Ofcom has two credible Tier 1 benchmarks, which range from 29% up to 55%, and two Tier 2 benchmarks which range from 64% to 67%. Our revised view, based on these benchmarks, is that a plausible range for the

14 See §52-88 of our response to the February 2015 Consultation.

15 See §95-118 of our response to the February 2015 Consultation.

16 See §153 of our response to the February 2015 Consultation.

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UK value of 900 MHz as a proportion of 800 MHz is between 45% and 55%, with the Irish benchmark as an upper bound.

B. Lump sum value of 1800 MHz

77. Ofcom provisionally concludes that 1800 MHz is a Tier 1 evidence point, and has no opinion whether this understates or overstates value. Based on this assessment, Ofcom states that "*there could be a case for a moderate upward adjustment to our estimate of the lump-sum value of 1800 MHz spectrum. Alternatively, we could take the view that it is not necessary to make an adjustment to this estimate*."[17] However, we have presented evidence that the German 1800 MHz auction may overstate UK value. Given that the new German benchmark is only modestly above Ofcom's current estimate and Ofcom's commitment to taking a conservative approach in setting fees, we do not think there is a case to increase the price of UK 1800 MHz.

78. In Figure 2, we present the new German benchmark alongside the other benchmarks. This chart is similar to Ofcom's Figure 4 in the June 2015 Update, but again we have made adjustments to reflect our views on tiering and risk of under/overstatement of evidence points.[18] We also display the distance ratio percentage rather than £ values, as we expect all UK benchmarks to change for the same reasons as stated above for 900 MHz. (Although some distance ratio percentage values will likely also change, this effect is much smaller).

79. This chart suggests that Ofcom's previous estimate of a distance ratio of 27% is plausible.

[17] July 2015 Update, §71.

[18] See §119-128 and §143-150 of our response to the February 2015 consultation.

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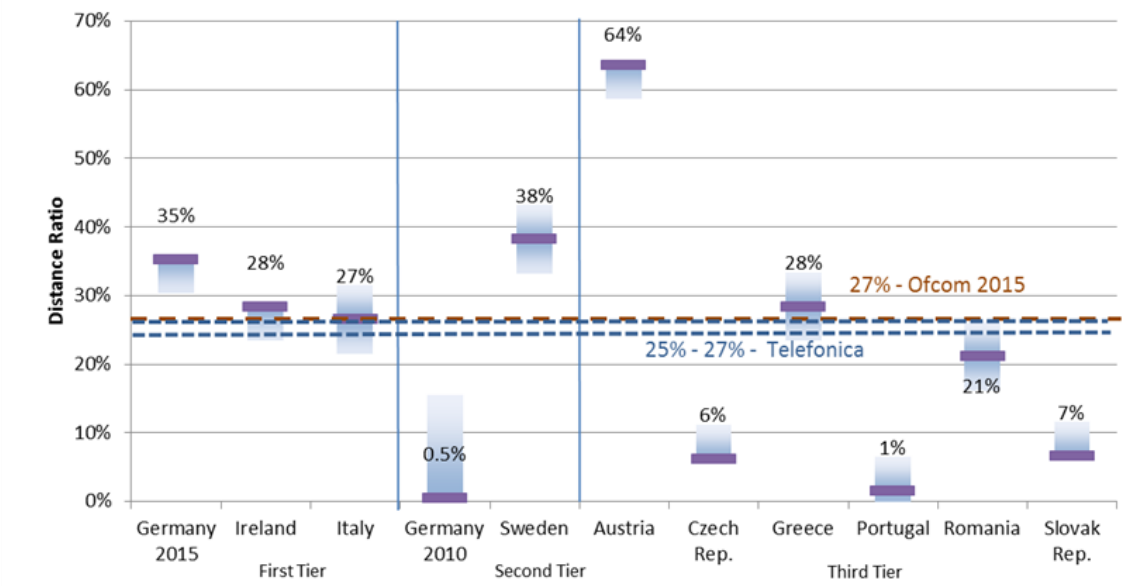
Figure 3: 1800 MHz ratio benchmarks based on distance rate % (Ofcom data)



80. Telefónica's previous view was "*that a fair reflection of the Y/X ratio for determining the 1800 MHz price is between 22% and 27% of the 800 MHz price, and that Ofcom should adopt a ratio at the lower end of this range*."[19] The new evidence from Germany has not changed our view that 27% is a plausible upper bound, given the risk of over-statement in Germany 2015 and evidence from other Tier 1 benchmarks. However, it does suggest that 22% may be too low. Accordingly, we have revised up our estimated range to 25%-27%.

C. Telefónica's estimate of ALFs

81. In our response to the February 2015 Consultation, we set out our own calculations of a conservative estimate of the full market value of ALFs for 900 MHz and 1800 MHz. We have revisited our calculations here, in light of the new evidence that the benchmark value of 900 MHz is lower than previously stated. At each step, we set out the plausible range (low and high) of relevant values based on available evidence, consistent with the rationales put forward here and in our previous response.[20]

19 See §153 of our response to the February 2015 Consultation.

20 For a full description of our approach (which follows the same steps as Ofcom's analysis), please see Section 8 of our response to the February 2015 consultation.

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82. Using these figures results in an ALF for Telefónica's holdings of between £0.64m / MHz and £1.08m / MHz for 900 MHz and an ALF of between £0.57m / MHz and £0.76m / MHz for 1800 MHz, before adjusting for the impact of the geographic voice coverage obligation.

83. Adjusting for the coverage obligation results in a total ALF for Telefónica's holdings of between £19.37m and £28.14m per annum during the phase-in period, and between £23.14m and £40.68m thereafter.

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Table 1: Plausible value ranges for determination of ALFs

	900 MHz		1800 MHz	
	Low*	High	Low*	High
STEP 1				
Lump sum value 800 MHz based on UK auction (£m/MHz)	24.2	30.5	24.2	30.5
Lump sum value 2600 MHz based on UK auction (£m/MHz)	na	na	4.95	5.5
STEP 2				
Value of band, % 800 MHz based on European benchmarks (%)	45%	55%	n/a	n/a
Y/X ratio to determine value of 1800 MHz	n/a	n/a	25%	27%
Lump sum values based on European benchmarks (£m/MHz)	10.89	18.425	9.76	13.06
STEP 3				
Discount factor for determining ALFs (%)	0.9%	0.9%	0.9%	0.9%
STEP 4				
Annual licence fee (ALF) (£m per MHz pa) before adjusting for coverage obligation*	0.64	1.08	0.57	0.76
STEP 5 (coverage obligation)	**900 & 1800 Low**		**900 & 1800 High**	
Aggregate lump-sum value of Telefónica's holdings (£m) *before* adjusting for coverage obligation	492.2		792.7	
Estimated value impact per operator associated with coverage obligation	96		96	
Aggregate lump-sum value of Telefónica's holdings (£m) *after* adjusting for coverage obligation	396.2		696.7	
Annual licence fee (ALF) (£m pa)**	23.14		40.68	
Reduced ALF until end-2017 (£m pa)***	19.37		28.14	

Source: Telefónica calculations as set out in this response and in our responses to the August 2014 Consultation and February 2015 Consultation; *Low 800MHz excludes Ofcom premium for DTT costs; **Calculated using the formula in Ofcom, August 2014 Consultation, para. 4.38, with a TAF of 1.08, before adjustment for inflation indexation; ** *Same formula, but with 50% reduction in difference between current fees and the new ALFs for phase-in period.

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