



NON-CONFIDENTIAL VERSION

Award of the 700 MHz and 3.6 - 3.8 GHz spectrum bands: revised proposals on auction design

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Comments should be addressed to:
[✂]

Contents

Executive Summary	3
1 Introduction	4
2 Auction design	5
Auction format (SMRA)	5
Lot structure	5
Eligibility points	6
Waivers, withdrawals and minimum requirement	7
Round price increments	8
Information policy	8
‘Small winner’ restriction	9
Negotiation phase	10
Publishing 3.6 - 3.8 GHz assignment stage bid data	11
Reserve prices	12
3 Competition assessment	15
700 MHz band competition concerns	15
Competition issues in relation to 3600 MHz band	18
Competition issues in relation to highly asymmetric overall shares	20
4 Proposed next steps	21

Executive Summary

1. BT¹ welcomes Ofcom's revised proposals on auction design² for the award of 700 MHz and 3.6 - 3.8 GHz spectrum (the "Consultation"). We appreciate the efforts that Ofcom has made to address some of the issues that we made in response to the earlier consultation proposals, notably avoiding an over-complex procedure yet ensuring that an efficient auction outcome should be achieved.
2. We fully support Ofcom's proposal to switch to the Simultaneous Multiple Round Ascending (SMRA) auction format as this is the most appropriate for the circumstances of this award. We have a number of suggestions as to how the design may be further improved in order to maximise the likelihood of the most efficient outcome. For example, we maintain that a 10 MHz lot size for 700 MHz SDL and for 3.6 - 3.8 GHz would further simplify the process. We also continue to favour a 4:1 eligibility points ratio per MHz between 700 MHz FDD and 3.6 - 3.8 GHz. In addition, we suggest that Ofcom permits bidders to specify a minimum spectrum requirement of up to 20 MHz of 3.6 - 3.8 GHz spectrum (but not more, as that would have the potential to create strategic risks for both Ofcom and bidders); this is particularly important if Ofcom maintains a 5 MHz lot size for the 3.6 - 3.8 GHz spectrum.
3. BT particularly welcomes and supports Ofcom's proposal of a negotiation period of up to four weeks, including the partial agreement option if unanimity is not possible. The partial agreement sub-option is crucial given that, for example, a winner who already has an existing contiguous 100 MHz spectrum holding suitable for 5G in the 3.4 - 3.8 GHz band would have an incentive to prevent competitors from achieving the same benefits. We have some comments around the details of this process and how it may be enhanced with the appointment of a broker to facilitate discussions between spectrum winners.
4. The competition measures in relation to the award are important and BT is concerned that, in the current Consultation, Ofcom continues to propose, without explanation, "*a cap of 37% on overall holdings of mobile spectrum (416 MHz), without any sub caps on holdings of either low frequency or 3.4–3.8 GHz spectrum*".³ We believe there is a strong argument for why a 75 MHz sub-1 GHz safeguard cap would be appropriate, necessary, least onerous and proportionate. We also establish why imposing a 140 MHz cap on 3.4 - 3.6 GHz band holdings would be a proportionate measure to address 3.4 - 3.8 GHz competition concerns. Finally, we explain why BT believes that an overall safeguard cap of 416 MHz (i.e. 37%) on total cumulative spectrum holdings by one MNO is unnecessary.

¹ BT including its subsidiary mobile operator EE Limited.

² Consultation on "Award of the 700 MHz and 3.6-3.8 GHz spectrum bands: Revised proposals on auction design", Ofcom, October 2019, https://www.ofcom.org.uk/data/assets/pdf_file/0028/172648/revised-proposal-auction-design.pdf

³ Paragraph 3.2 of the Consultation.

1 Introduction

- 1.1 The award of 700 MHz and 3.6 - 3.8 GHz frequencies is an important milestone towards the wide roll out of 5G in the UK and we expect the award of this spectrum to bring benefits to UK consumers and businesses. We recognise Ofcom's various policy objectives and are generally supportive of its updated plans for auctioning this spectrum as soon as possible.
- 1.2 It is, however, important to get the details of the award right and we welcome this further opportunity to provide our views on some critical aspects of this process, including the proposed detailed rules for Ofcom's SMRA design and the proposed negotiation phase, including the partial agreement option.
- 1.3 Our response is structured largely in line with the consultation document and we have addressed the specific questions that Ofcom has posed within the relevant parts of our response.
 - In **section 2**, we have provided our views on Ofcom's proposals to use an SMRA design for this award and its detailed SMRA design proposals.
 - In **section 3**, we summarise our views on Ofcom's proposed overall safeguard cap of 416 MHz (i.e. 37%) and on (the absence of) proposed sub-caps on holdings of either low frequency spectrum or 3.4 - 3.8 GHz spectrum.
 - Finally, in **section 4** we suggest that further discussion between Ofcom and stakeholders will be important to enable Ofcom to finalise its proposals.
- 1.4 We have responded separately to the parallel consultation on the auction regulations that would give effect to Ofcom's policy proposals. Our response to that consultation addresses only the issue of whether the draft regulations achieve Ofcom's policy proposals and should not be understood as agreement to aspects of the auction design which we comment on in this response.

2 Auction design

Question 1: (Section 3) Do you agree with our proposal to use an SMRA design for this award?

Question 2: (Section 3) Do you have any comments on the proposed detailed rules for our SMRA design?

2.1 In this section we comment on Ofcom's proposals to use an SMRA design for this award and its detailed SMRA design proposals.

Auction format (SMRA)

2.2 BT agrees that the SMRA auction format is more appropriate than the CCA format previously proposed by Ofcom. This is for the reasons Ofcom has considered and explained: in particular the benefit of simplicity and transparency, which may reduce possibilities for gaming, and enable a process that is easier to explain and which has greater certainty as to the outcome and costs compared to the CCA alternative. Even if the coverage obligations had been included in the auction, we still maintain that the SMRA would be the more suitable design: it would allow bidders to manage the key risks that they face; is considerably less complex and risky for bidders than the CCA format previously proposed by Ofcom; and is just as likely (if not more likely) to lead to an efficient outcome as the CCA format previously proposed by Ofcom.⁴

Lot structure

2.3 As regards the packaging of the available spectrum, BT has the following views.

700 MHz FDD

2.4 We agree with Ofcom's proposal for six lots of 2 × 5 MHz as this provides significant flexibility to bidders and is compatible with standardised equipment bandwidths

700 MHz SDL

2.5 BT maintains that the 700 MHz SDL lot size should be 10 MHz rather than 5 MHz as proposed by Ofcom. A 5 MHz (rather than 10 MHz) lot size could encourage non-straightforward bidding; for example, by lowering the risks or costs of accidentally winning spectrum for a price driving bidder.

2.6 Furthermore, Ofcom's assumption that there might be a use case for 5 MHz appears to be purely speculative. We are not aware of any reference to 5 MHz use cases, whereas Telefónica⁵ and we⁶ have referred to 10 MHz use cases.

2.7 Equipment vendors need standardised carriers in order to make the development of equipment commercially viable, especially for a band as new and unfamiliar as 700 MHz SDL. Lack of complete harmonisation between Europe and APAC for the SDL in 700 MHz will result in a slower ecosystem development. Any bandwidth less than 10 MHz for 700 MHz SDL will

⁴ For a fuller explanation of why, please see section 5 of BT's response to the December 2018 consultation.

⁵ NERA (on behalf of O2) non-confidential response to the December 2018 consultation, page 14.

⁶ BT non-confidential response to the December 2018 consultation, page 61, paragraph 5.5.

not provide sufficient incentive for carriers and device manufacturers to prioritise development of the 700 MHz SDL ecosystem for UK and some of the EU states.

3.6 - 3.8 GHz

- 2.8 BT maintains its view that the 3.6 - 3.8 GHz lot size should be 10 MHz. It is unlikely that any bidder will use 3.6 - 3.8 GHz spectrum to deploy anything other than 5G, given the strong demand for 5G spectrum use seen in previous auctions. 5G standardised carriers in this band are all multiples of 10 MHz, with the sole exception of a 15 MHz carrier. No one is likely to deploy 5G with a 15 MHz carrier and this leaves open the risk of someone else being left with 25 MHz or another odd allocation which would not support a single 5G carrier.
- 2.9 Moreover, even if some bidders do wish to deploy non-5G technologies in this band, Ofcom's reasoning that "*a bidder seeking to deploy alternative technologies that are not synchronised with 5G users in the band may require 5 MHz guard bands*"⁷ is unconvincing because, in order to comply with the "restricted" spectrum emissions mask (in addition to adhering to the alternative frame structure), it is likely that considerably wider guard bands than 5 MHz would likely be required⁸.
- 2.10 Furthermore, as Ofcom recognises⁹, a 5 MHz lot size could encourage non-straightforward bidding, compared to a larger lot size of 10 MHz. This is because, for example, a 5 MHz lot size could reduce the risks or costs to a price driving bidder of accidentally winning spectrum it does not want. It is the risk of accidentally winning costly spectrum which dampens incentives to price drive; a 10 MHz lot size which increases this risk will encourage straightforward, non-strategic bidding and increase the likelihood of an efficient auction outcome.

Eligibility points

- 2.11 BT agrees with Ofcom's eligibility point proposals on 700 MHz FDD and 700 MHz SDL, but we continue to favour a 4:1 eligibility point ratio per MHz between 700 MHz FDD and 3.6 - 3.8 GHz (0.5 eligibility points per 5 MHz of 3.6 - 3.8 GHz). Our concern with Ofcom's 2:1 proposed eligibility ratio is that the price per MHz of spectrum in these two bands is not equal, or even approximately equal. The use of eligibility points per MHz which do not correspond to per MHz prices creates two potential concerns for us in such circumstances.
- 2.12 Firstly, [8<]
- 2.13 Secondly, and more concerning for us, the use of an eligibility ratio which does not correspond to approximate (per MHz) prices may mean that bidders who see 700 MHz and 3.6 - 3.8 GHz as being potential (at best weak) partial substitutes for each other, but not at a 2:1 price per MHz, may have to bid for more spectrum than they really need at certain price points, in order to maintain sufficient eligibility to switch their demand into the less valuable (per MHz) spectrum if prices subsequently change in favour of such less valuable spectrum. BT does not think that bidders should have to artificially inflate their bids in order to keep open the

⁷ Paragraph 3.30 of the Consultation.

⁸ For example CEPT [ECC Report 296](#) at para 4.1 mentions a 5 MHz guard band (which if needed to protect other users either side would total 10 MHz guard band requirement).

⁹ Paragraph 3.33 of the Consultation.

possibility of switching to (at least partial) substitutes later on. Our proposed ratio would allow more straightforward and flexible bidding without distorting bidding in earlier rounds.

Waivers, withdrawals and minimum requirement

Waivers

- 2.14 BT agrees with Ofcom's proposal to allow each bidder 3 waivers. We think this strikes the right balance between (i) discouraging non-straightforward bidding and (ii) managing risk in exceptional circumstances, such as a fire alarm.
- 2.15 However, contrary to Ofcom's claim in paragraph 3.76 of its consultation, we do not think the presence of waivers will make a material difference in helping bidders to manage aggregation risk. Waivers can only be used by bidders sparingly, due to the limited availability of them and the need to save at least some of them for technical issues, fire alarms and so on. Therefore, to assist bidders with managing aggregation risk, we continue to believe that Ofcom should allow bidders to specify a minimum requirement of up to 20 MHz for the 3.6 - 3.8 GHz, as explained below.

Withdrawals

- 2.16 In the context of our other requirements being met, BT agrees with Ofcom's proposal of not having any withdrawals. This is for all the reasons Ofcom has considered and explained: in particular the risk of strategic bidding and unsold spectrum; for example, if a bidder bids in one category with the sole intent of pushing up prices before leaving that category altogether, potentially leaving spectrum unsold which, absent the option to withdraw, would have been won by another bidder.

Minimum requirement

- 2.17 BT previously suggested that bidders should have the option to specify a minimum spectrum requirement of up to 20 MHz (2 lots) of 700 MHz spectrum and up to 20 MHz of 3.6 - 3.8 GHz spectrum if they choose to (but not more, as that would have the potential to create strategic risks for both Ofcom and bidders).
- 2.18 The reason for this is to help bidders manage in-band aggregation risk, a risk that applies to all bidders and which could lead to an inefficient outcome. The purpose of the minimum requirement would be to protect all bidders from being stranded with a quantity of spectrum which is below a usable threshold. When considering the likely applications and equipment availability, and the fact that the 3.6 - 3.8 GHz assignments (absent trading) would, for all operators except H3G, be a second carrier isolated from the existing 3.4 GHz assignments, we consider this to be particularly important for all bidders for the 3.6 - 3.8 GHz band. On consideration of these same factors in relation to the 700 MHz band, we would prefer the option to specify a minimum requirement for 700 MHz FDD spectrum, but we see this as less important than for the 3.6 - 3.8 GHz band.
- 2.19 For the 3.6 - 3.8 GHz spectrum, BT's strong preference would be to have a single contiguous assignment of all the spectrum in the 3.4 - 3.8 GHz band so that it could deploy a single 5G carrier utilising all of its assigned spectrum (ideally [8]). If Ofcom were to create rules to guarantee this, BT would be content for there to be no minimum spectrum requirement in the 3.6 - 3.8 GHz band, provided that the lot size was (at least) 10 MHz. If, on the other hand, there were any material risk that BT's spectrum holdings across the 3.4 - 3.8 GHz band might

remain fragmented (which there is, even with a negotiation phase), BT would have a requirement for at least [REDACTED] of spectrum in the 3.6 - 3.8 GHz sub-band in order to be able to deploy a meaningful second carrier if necessary: BT can see little value in deploying a second carrier in the 3.6 - 3.8 GHz band of less than [REDACTED]. [REDACTED]

- 2.20 We are of the view that, at the level of minimum requirement we are proposing (up to 20 MHz), any risk of price driving is very low. To explain why, it seems to us that there are two possible ways in which the option to specify a minimum spectrum requirement might influence price driving behaviour: (i) if it were somehow to allow a potential price driving bidder to be more certain that other bidders would outbid it; or (ii) if it were somehow to allow a potential price driving bidder to reduce the risk that its bid (or a part of it) would win.
- 2.21 With regards to (i), if anything we think the incentive works the other way. As discussed above, price driving is more likely if the 'price driver' expects other bidders to outbid it (because its strategy is to drive prices up without winning the spectrum). If bidders find themselves standing high bidder for a quantity which is insufficient for their usage requirements, then they are more likely to continue to bid. Therefore, all else equal, price driving becomes more likely because the risk of driving and not being outbid is lower.
- 2.22 With regards to (ii), as discussed above, price driving is deterred if there is a high risk of inadvertently winning. Therefore, in order not to be deterred, a price driver specifying a 20 MHz minimum requirement would need to believe that the risk of inadvertently winning 20 MHz was low, because the likelihood of being outbid was high. However, if the likelihood of being outbid for 20 MHz is high, then the likelihood of being outbid for a slightly lesser amount, say 10 MHz, must also be high. This, in turn, implies that the risk of being stranded with 10 MHz is already low; and that a minimum spectrum requirement, therefore, does not make price driving more attractive (by removing this stranding risk).
- 2.23 Therefore, we are of the view that, at the level of minimum requirement we are proposing (20 MHz), any risk of price driving is very low. When balanced against the very high benefit of bidders not being left with small/unusable quantities of spectrum which would not be an efficient outcome, we strongly believe that a minimum spectrum requirement of up to 20 MHz is necessary.
- 2.24 If Ofcom insists on not providing for any level of minimum spectrum requirement then, to help bidders manage in-band aggregation risks, we strongly believe that Ofcom should at least adopt 10 MHz lot sizes for 3.6 - 3.8 GHz as we have proposed.

Round price increments

- 2.25 In advance of the auction, Ofcom should specify a range for the round price increment percentage, or at least a maximum percentage increment, to enable bidders to plan and prepare for when key decisions are likely to be required and to inform governance.
- 2.26 [REDACTED]. For the upcoming 700 MHz and 3.6 - 3.8 GHz auction, we would welcome round price increments of no more than 5%. We do not think this will unduly prolong the auction.

Information policy

- 2.27 BT continues to believe that Ofcom should reveal more precise information about demand to all bidders after each round of the principal stage.

- 2.28 BT notes in particular that Ofcom's proposed auction design will allow a partial standing high bidder to gain extra information about excess demand which is not available to other bidders, in particular towards the end of the auction. This is because a partial standing high bidder will know how many of their bids did not become standing high bids, and hence the exact amount of excess demand assuming that all other bidders became full standing high bidders – which is very likely to be the case towards the end of the auction – whereas other bidders will only know the level of excess demand rounded up to the next 20 MHz.
- 2.29 To resolve this asymmetry of information, Ofcom should make the same information on aggregate excess demand available to all bidders, by sharing the **exact** aggregate excess demand with all bidders after each round of the principal stage.
- 2.30 In addition, as noted in our response to the December 2018 consultation, BT believes Ofcom should consider revealing, after each round, the identity of the standing high bidders in each band and the number of lots on which each is a standing high bidder. Despite what theoreticians might like to believe, the practical reality is that an operator's valuation for spectrum depends not only on the spectrum that it might acquire, but also on the spectrum that its competitors might acquire (because relative spectrum holdings can affect an operator's competitiveness in downstream markets). One of the main advantages of a multi-round auction process is supposed to be a reduction in uncertainty through the regulated sharing of demand and value information.
- 2.31 Overly limiting the quantity and quality of information that is revealed to bidders during a multi-round auction process has the potential to significantly undermine the quality of the result. In practice, if no or very little information is provided to bidders during the auction, bidders engage in guessing what other bidders are active on and make bid decisions partially on the basis of these guesses. Where their guesses turn out to be wrong, there is significant risk of inefficient spectrum assignment.
- 2.32 Ofcom is already proposing a number of other measures to reduce incentives for bidders to engage in strategic bidding, such as no availability of withdrawals, limited availability of waivers and so on. Given the existence of these proposed measures to combat strategic bidding, we believe Ofcom's proposed information policy is overly cautious when considered against the benefits of symmetry of information between all bidders, improved value estimates and more efficient spectrum allocation, ultimately benefitting consumers.
- 2.33 In summary, we believe that Ofcom should at least inform all bidders of the **exact** aggregate demand after each round, especially since this information is already available to partial standing high bidders towards the end of auction. It should also consider revealing, after each round, the identity of the standing high bidders in each band and the number of lots on which each is a standing high bidder.

'Small winner' restriction

- 2.34 We support Ofcom's proposal to restrict the assignment round options available to winners of small spectrum packages to the edges of the 3.6 - 3.8 GHz band. It helps to address the risk of strategic bidding and it improves the likelihood of trades across the wider 3.4 - 3.8 GHz band between winners of larger blocks.
- 2.35 We agree that Ofcom must consider the risk of strategic bidding to prevent competitors from acquiring sufficient new spectrum to support the widest 5G carriers, or to impede other MNOs achieving this objective through spectrum trading. For example, H3G would need only to

acquire a small new allocation positioned away from their existing holding but not at the top of the band to make defragmentation of the band by trading even more problematic than it is already today. Absent Ofcom’s proposal to restrict the options available to winners of small spectrum packages this would be entirely possible. Consider for example the outcome in Figure 2.1 below.

Figure 2.1 Illustrative example auction outcome where H3G is eligible to bid for new spectrum



- 2.36 In this illustrative example, H3G wins just 5 MHz, likely leaving 5 MHz unsold as there would be little value for this spectrum to other bidders. Another similar example would be where H3G wins just 10 MHz and all other spectrum is sold.
- 2.37 The important point we are illustrating in this example is that H3G’s small new allocation would be obtained by them at relatively low cost (as it is 1 or 2 lots only). Given the inability to use more than 100 MHz on a single carrier, H3G might see little value in securing a location next to their existing spectrum through their assignment bid. There may be a higher incentive to secure a location which prevents others from trading existing and new spectrum to secure contiguous assignments (in effect a ‘ransom strip’). By creating such a barrier to exchanges/trades, other operators would be prevented from securing wide contiguous bandwidths thereby matching the advantage that H3G already enjoys following Ofcom’s decision to vary its existing 3.6 GHz licence.
- 2.38 Ofcom proposes that packages of 20 MHz or less be restricted to assignment bids for slots at the edge of the band. We see 20 MHz as a suitable threshold above which spectrum would be likely to be relevant to trades (which can potentially resolve fragmentation issues). We agree, therefore, that the criteria should be “20 MHz or less” rather than “less than 20 MHz”, as this should avoid creating an obstacle or strategic opportunity to prevent trades to achieve contiguity. A 20 MHz package is also more likely to be a winning auction outcome than 15 MHz, given that it is highly unlikely that other bidders will seek multiples of 5 MHz rather than 10 MHz (as mentioned above). The “20 MHz or less” threshold is even more important if Ofcom were to adopt our suggestion above to use 10 MHz rather than 5 MHz sized lots in the 3.6 - 3.8 GHz band, since bidders who are intent on impeding agreements by others may be more likely to bid for 20 MHz if they cannot bid for 15 MHz, but the rule would allow winners of larger blocks to proceed with potential trades.

Negotiation phase

- 2.39 We strongly support Ofcom’s proposal of a negotiation phase of up to four weeks, including the partial agreement option. The relative position of spectrum winners within the 3.6 - 3.8 GHz band could be an important precursor to potential post auction spectrum trades across the wider 3.4 - 3.8 GHz band, enabling potential defragmentation of the wider 3.4 - 3.8 GHz band. We consider that the short extension to the duration of the auction is of minor consequence when considered against the significant performance and efficiency gains that would arise from potential wider band defragmentation, to the ultimate benefit of UK consumers.

- 2.40 Given the potential challenges of reaching unanimous agreement, BT considers it essential that Ofcom includes the sub-option to pursue partial agreements if unanimous agreement cannot be achieved. Such agreements would still deliver substantial benefits and the availability of this sub-option may even increase incentives to reach unanimous agreement. The partial agreement sub-option is crucial given that, for example, a winner who already has an existing contiguous 100 MHz spectrum holding suitable for 5G in the 3.4 - 3.8 GHz band would have an incentive to prevent competitors from achieving the same benefits.
- 2.41 The “partial agreement” option is fair in that all potential winners of 3.6 - 3.8 GHz spectrum would have the opportunity to reach such an agreement. In any case, any parties that do not join an agreement can – unlike the parties to an agreement, whose assignment bids become zero – influence their position within the new spectrum. The inclusion of the partial agreement option is important to prevent any party from vetoing or obstructing agreements that could facilitate defragmentation. If there are any concerns with allowing partial agreements then the answer is surely to work constructively to be part of an agreement, and in this sense the inclusion of the partial agreement option is a positive measure to encourage unanimous agreement. [✂]
- 2.42 In the spirit of reaching agreement, we don’t think winners of small packages should be able to obstruct defragmentation for other bidders. We therefore agree with Ofcom’s proposals at paragraph 2.55 of its June 2019 consultation concerning the assignment of winners of small packages which are not part of a partial agreement. In other words, we agree with Ofcom’s proposal that, under the partial agreement sub-option, winners of 20 MHz or less who are not party to any successful negotiations would need to be placed at the edge of the band.
- 2.43 It is also possible that even though unanimous agreement is not reached in the initial period set aside for that purpose, such agreement is reached in the additional period allowed for the partial agreement negotiation. In this scenario the rules should provide that such agreement is accepted and assignment bids are not used.
- 2.44 Overall, we think the inclusion of a negotiation phase permitting partial agreement is crucially important to achieving defragmentation which will ultimately benefit consumers. However, in the unlikely event that Ofcom does not proceed with its partial agreement sub-option, then we strongly feel that Ofcom’s unanimous agreement sub-option should be amended so that, if all winners other than those on small packages (defined as 20 MHz or less) can agree on their relative assignment positions, this should be deemed as unanimous agreement and those on small packages will be positioned at the edge of the band.
- 2.45 Finally, as outlined in our response to the auction regulations, we see value in appointing an independent broker to facilitate the negotiation period discussions between the winners and to organise a framework for that in advance of the auction. Ofcom could play a valuable role in facilitating any such preparatory work, for example in running tenders in advance of the auction so that a suitable candidate could be confirmed by the parties who have opted in to the negotiation phase.

Publishing 3.6 - 3.8 GHz assignment stage bid data

- 2.46 BT agrees with Ofcom’s proposal to not publish the 3.6 - 3.8 GHz assignment stage data. This is for all the reasons Ofcom has considered and explained, in particular the possibility that the publication of any assignment stage bid data for 3.6 - 3.8 GHz could affect post-auction trades, for example by revealing further information about bidders’ valuations for specific frequency

locations. As Ofcom recognises¹⁰, it would be concerning if publishing information on assignment bids were to adversely affect or undermine future commercial trading negotiations, and thereby reduce the likelihood of successful trades which support defragmentation of holdings within the 3.4 - 3.8 GHz band.

Reserve prices

700 MHz FDD

- 2.47 Ofcom says that it proposes to set reserve prices that are “*materially lower than our benchmarks for possible market value*”.¹¹ However, the **upper limit** of Ofcom’s proposed range for the reserve price for 700 MHz FDD (£240m) is virtually identical to the auction outcome in another one of Ofcom’s benchmarks, Finland (£241m), without any downward adjustment i.e. the **upper limit** of Ofcom’s proposed range is **not materially lower** than Ofcom’s benchmarks.
- 2.48 Therefore, in BT’s view, the reserve price for 700 MHz FDD spectrum should be set much closer to Ofcom’s proposed **lower limit** (£100m) than to Ofcom’s proposed **upper limit** (£240m), if Ofcom is to comply with its own objectives.

700 MHz SDL

- 2.49 For 700 MHz SDL spectrum, BT is content with Ofcom’s proposed reserve price of £1m per 5 MHz (equal to £2m for each of our proposed 10 MHz lots).

3.6 - 3.8 GHz

- 2.50 Ofcom proposes to set a reserve price of between £15m and £25m per 5 MHz of spectrum in the 3.6 - 3.8 GHz band. It uses market prices in the UK’s 3.4 - 3.6 GHz band as a benchmark, and goes on to say it considers this to be “*the most reliable benchmark, as the bands are very similar and using a UK benchmark instead of international benchmarks for this band allows us to accommodate UK-specific market characteristics, meaning that fewer adjustments are necessary*”.¹²
- 2.51 However, the 3.4 - 3.6 GHz auction in 2018 was conducted in an environment of limited available spectrum suitable for 5G (an average of 37 MHz per MNO) as Ofcom choose not to award the full band in a single auction. Ofcom’s statement on UK Broadband’s Annual Licence Fees rejects the presence of artificial scarcity in the 3.4 - 3.6 GHz auction on the grounds that there was a “*clear expectation at the time of the 2018 auction that [it] intended to make 3.6 GHz spectrum available for mobile use*”¹³. However, in our view, at the time of the auction the timing and the circumstances of any future 3.6 - 3.8 GHz auction was highly uncertain.

¹⁰ Paragraph 3.143 of the Consultation.

¹¹ Paragraph 3.147 of the Consultation.

¹² Paragraph 3.159 of the Consultation.

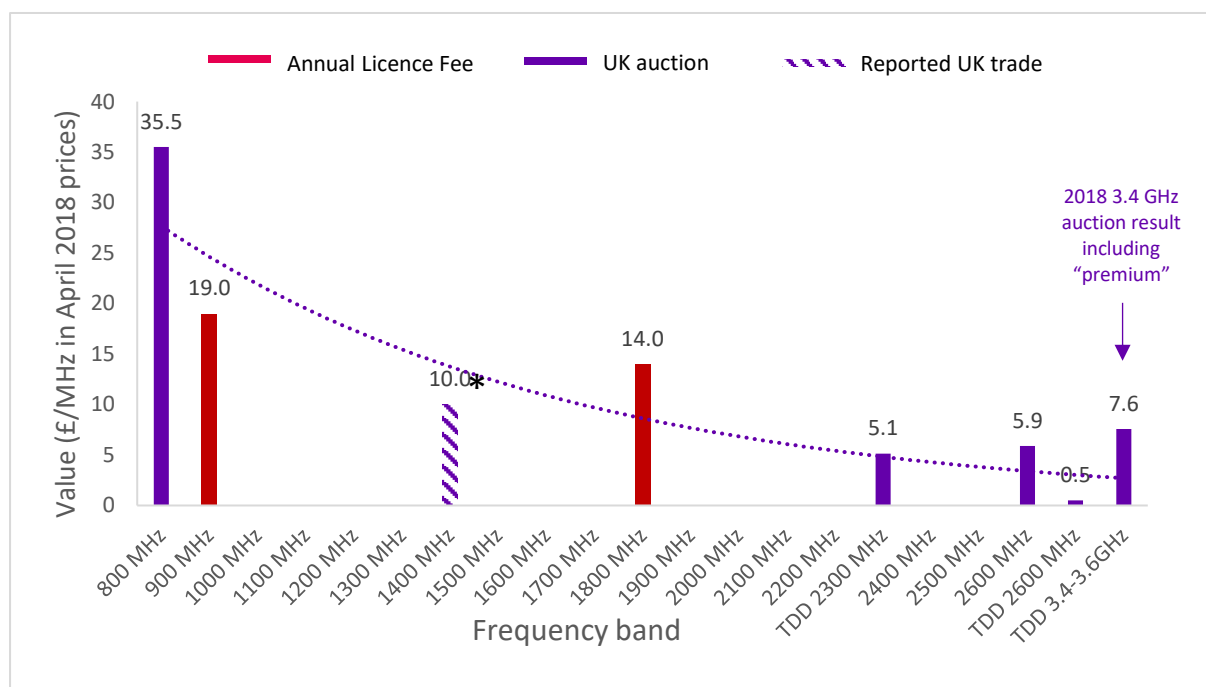
¹³ Paragraph A1.37a of Ofcom’s statement on “Annual Licence Fees for UK Broadband’s 3.4 GHz and 3.6 GHz spectrum”, Ofcom, June 2019, https://www.ofcom.org.uk/data/assets/pdf_file/0013/151231/statement-annual-licence-fees-uk-3.4-ghz-and-3.6-ghz-spectrum.pdf

Therefore, in our view the 3.4 - 3.6 GHz auction was conducted in an environment of artificial scarcity which could have led to an “artificial scarcity premium”.

2.52 In addition, at the time, acquiring 3.4 - 3.6 GHz spectrum was the only way an MNO could be sure of having an opportunity to be the “first to 5G” or even launch 5G in a similar timeframe to its UK competitors. Ofcom’s statement on UK Broadband’s Annual Licence Fees dismisses¹⁴ the possibility of a clear first-mover advantage for 5G on the grounds that: (i) there would be limited uptake of 5G services in 2019, (ii) the impact of being first to 5G on long-term market share appears to be unclear and (iii) 3.4 GHz spectrum value reflects a period of delayed usage. [8] Therefore, in our view there was a “first-mover-advantage premium” that applied to the 3.4 - 3.6 GHz spectrum auctioned in 2018, which is unlikely to apply to the 3.6 - 3.8 GHz spectrum auctioned in 2020.

2.53 We have indicated the combined “premium” paid for 3.4 - 3.6 GHz spectrum by MNOs during the 2018 auction, relative to the trend implied by other bands, in the chart below.

Figure 2.2 UK absolute spectrum value reference points since 2010



2.54 The price of 3.4 - 3.6 GHz spectrum auctioned in 2018 might significantly exceed the price of 3.6 - 3.8 GHz spectrum auctioned in 2020, due to both the “artificial scarcity premium” and the “first mover advantage premium”.

2.55 We are concerned that Ofcom’s proposed range of reserve prices for 3.6 - 3.8 GHz spectrum, which are based on market prices for 3.4 - 3.6 GHz prices, may therefore be set too high. Price discovery could be impeded, or spectrum could go unsold, if it turns out that Ofcom’s estimate of market value for 3.6 - 3.8 GHz spectrum is significantly wrong.

¹⁴ Paragraph A1.37b of Ofcom’s statement on “Annual Licence Fees for UK Broadband’s 3.4 GHz and 3.6 GHz spectrum”, Ofcom, June 2019, https://www.ofcom.org.uk/data/assets/pdf_file/0013/151231/statement-annual-licence-fees-uk-3.4-ghz-and-3.6-ghz-spectrum.pdf

2.56 We therefore maintain that Ofcom needs to adopt a reserve price for 3.6 - 3.8 GHz spectrum which is much closer to the reserve prices used in the 3.4 - 3.6 GHz auction last year.

3 Competition assessment

Question 3: (Section 3) Do you have any other comments you wish to make on our proposals for this award?

- 3.1 In the Consultation, Ofcom continues to propose, without explanation, “a cap of 37% on overall holdings of mobile spectrum (416 MHz), without any sub caps on holdings of either low frequency or 3.4–3.8 GHz spectrum”.¹⁵
- 3.2 In this section, we therefore summarise our views on Ofcom’s proposed overall safeguard cap of 416 MHz (i.e. 37%) and on (the absence of) proposed sub-caps on holdings of either low frequency spectrum or 3.4 - 3.8 GHz spectrum.
- 3.3 This section is a summary of our position. Our full position can be found in BT’s response to the December 2018 consultation.¹⁶

700 MHz band competition concerns

The risk that very asymmetric shares in low frequency spectrum would weaken competition

- 3.4 An assessment of the likely harm to competition from very asymmetric sub-1 GHz spectrum shares in the 700 MHz and 3.6 - 3.8 GHz auction must be based on a forward-looking approach.
- 3.5 Within this assessment a key question for Ofcom is whether promoting static efficiency objectives (awarding spectrum to the bidder(s) with the highest valuation(s)) should be balanced with competition objectives to support innovation, choice and value for consumers.
- 3.6 BT considers that Ofcom’s analysis of what matters most for competition and consumers, as per its December 2018 consultation, is mistaken on a key point. Ofcom believes that demand for data intensive services, such as streaming, is not as important to consumers as basic coverage supporting less-data intensive services such as internet browsing without streaming and voice services. Our experience indicates that customers want mobile data services, with speeds of at least 2 Mbps, and they want it indoors and outdoors. There is compelling evidence to support this:
 - Consumer research (including Ofcom’s) demonstrates that consumers want reliability and consistency in the mobile data service they pay for including using data indoors and outdoors. In other words, consumers want seamless connectivity.¹⁷

¹⁵ Paragraph 3.2 of the Consultation.

¹⁶ BT response to the December 2018 consultation, section 3.

¹⁷ Enders Analysis research (in July 2017) showed that ‘reliability’ is the aspect of network quality considered most important by customers (48%), followed by coverage (33%) and then data speeds (which are increasing in importance but still behind the other factors - 14%, up from 9% in 2014). Our internal analysis of NPS data (in October 2018) is not dissimilar to the Enders survey results: it showed that ‘outdoor coverage/reliability’ was most important (34%), followed by ‘indoor coverage/reliability’ (31%), while ‘speed’ ranked second lowest (11%) above voice quality (10%).

- Ofcom’s Smart Cities report found that data speeds of at least 2 Mbit/s are necessary for a good mobile data service including streaming.¹⁸
 - Even where customers are focused on Internet browsing, this often requires data speeds of at least 2 Mbit/s on popular websites with video streaming, e.g. BBC online, and on popular social media sites using mobile apps where video streaming is part of the standard consumer experience e.g. Facebook, YouTube, Instagram and Snapchat.
 - Consumers currently stream large amounts of video (including on popular social media sites) and this will only increase with new future 5G mobile services. Currently streaming accounts for 40% of traffic on EE’s network.
 - For the 2.3 and 3.4 GHz auction, Ofcom’s rationale for a safeguard cap was to avoid highly asymmetric shares in immediately usable spectrum which might jeopardise the ability of operators to compete for data intensive customers segments.
 - In the December 2018 consultation, Ofcom raised similar concerns that asymmetric mid frequency holdings might affect some operators’ ability to deliver high speeds reliably and consistently to consumers, arguing that an overall safeguard cap is needed to mitigate this risk.
- 3.7 However, in relation to the assessment of asymmetric shares in low frequency spectrum, including sub-1 GHz, Ofcom places the above evidence to one side and focuses instead on the very minimum that customers expect – i.e. basic coverage supporting voice and low data use cases. This finding is clearly at odds with the available evidence (as well as Ofcom’s own justification for its safeguard cap) which demonstrates that most consumers want seamless connectivity for mobile data services with speeds of at least 2 Mbps indoors and outdoors including for streaming.
- 3.8 Ofcom’s technical analysis (as well as our own analysis) shows that sub-1 GHz is important to delivering these mobile data services indoors and deep indoors and therefore asymmetric shares in sub-1 GHz spectrum risk undermining future competition for seamless connectivity and future 5G mobile services.
- 3.9 Macrocell deployment will remain key to extending mobile coverage for the foreseeable future, i.e. at least the next 3-5 years as early 5G services are introduced.
- 3.10 There is a significant and enduring cost disadvantage for an 1800 MHz MNO deploying 700 MHz on new antenna positions including either a second large antenna or multiband

¹⁸ Page 4, paragraph 3, of “Smartphone Cities: Measuring 4G mobile broadband and voice performance”, Ofcom, December 2016, https://www.ofcom.org.uk/data/assets/pdf_file/0027/95904/Smartphone-Cities-Dec16.pdf

antenna that will require extensive mast replacement or strengthening. The cost of mast strengthening and replacement will not be borne by 900 MHz operators.^{19 20 21}

- 3.11 This cost disadvantage for BT is at least [8]. This would mean that BT's overall valuation is heavily discounted such that BT's valuation of the net benefits of 700 MHz would be significantly reduced. Even if 1800 MHz operators such as BT derived a higher customer benefit from 700 MHz than 900 MHz operators, BT's 1800 MHz cost disadvantage still places it at a material disadvantage compared to 900 MHz operators.
- 3.12 There is, therefore, a very real possibility that competition in the market will be eroded leading to lower levels of innovation, and less consumer choice and value in retail and wholesale markets.
- 3.13 Ofcom should therefore intervene with a 75 MHz sub-1 GHz safeguard cap on the basis that it would be appropriate, necessary, least onerous and proportionate to promoting competition. In BT's response²² to the December 2018 consultation, we set out our reasoning and evidence in support of a 75 MHz sub-1 GHz safeguard cap, which can be summarised as follows:
- Challenges in the current – and future – mobile market:
 1. Seamless connectivity indoor/outdoor including for data intensive uses
 - We provide evidence that consumers demand seamless connectivity including when using data-intensive services indoors and outdoors;
 - We highlight BT's and H3G's challenge in serving these customers as we continue to have poorer indoor and deep indoor coverage than Vodafone or O2 due to a lack of sub-1 GHz spectrum;
 - Our technical network analysis (and Ofcom's) demonstrates sub-1 GHz spectrum is critical to offering seamless connectivity; and
 - We explain that macrocell deployments will remain the primary method of delivering coverage benefits for consumers in the foreseeable future.
 2. Future 5G mobile
 - There are important 5G use cases for which sub-1 GHz will be a critical input (Ofcom's market analysis is flawed because it does not address these future 5G mobile issues).
 - The high risk of harm to competition from asymmetric low frequency spectrum shares:
 - We explain why there is a material risk that neither BT nor H3G win any 700 MHz spectrum.

¹⁹ For the avoidance of doubt, we do not include the costs of 700 MHz antenna equipment in the estimated 1800 MHz cost disadvantage as all MNOs will bear these antenna related costs.

²⁰ We are not aware that Vodafone or O2 were required to strengthen or replace masts with their 800 MHz deployment as they already had strengthened and tall masts for 900 MHz. Whilst BT did not need to undertake any mast strengthening or replacement for deploying 800 MHz with H3G, 700 MHz antennas or multiband antennas will require these adjustments.

²¹ These arguments should be read in conjunction with BT's confidential submissions to Ofcom providing evidence including quantitative cost estimates support of our 1800 MHz structural cost disadvantage (3 August 2018 and 5 October 2018).

²² BT response to the December 2018 consultation, section 3.

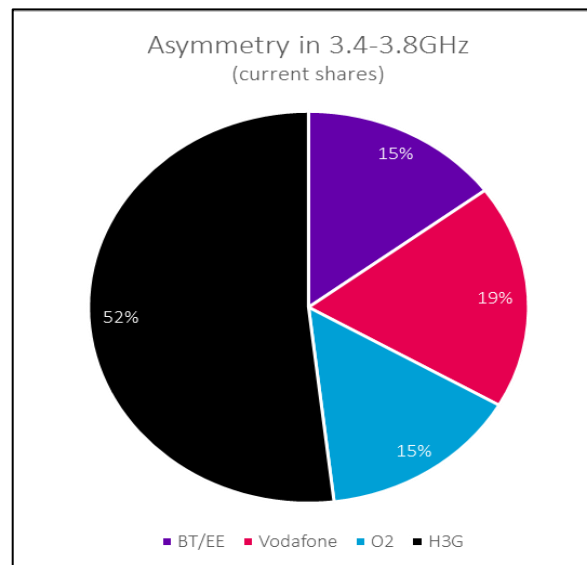
- We consider both intrinsic and strategic value arguments for why the risk of not winning any 700 MHz is high.
 - We show that competition will be weaker as a result with the risk that there is lower customer benefit now and in the future:
 - If neither BT nor H3G win any 700 MHz, they would be less able to compete in offering seamless connectivity including for data intensive services indoors and deep indoors.
 - If neither BT nor H3G win any 700 MHz, 5G services for mobile consumers may be delayed or reduced with less consumer value, choice and innovation.
- There is a strong case for intervention:
 - We provide reasoning and evidence for our criteria to determine when it is optimal to leave spectrum allocations to the market and when it makes sense to propose pro-competitive safeguard caps.
 - We establish why a 75 MHz sub-1 GHz safeguard cap would be appropriate, necessary, least onerous and proportionate.
 - We highlight that Ofcom proposed a sub-1 GHz safeguard cap in the 800 MHz and 2.6 GHz auction held in 2013 for reasons that remains relevant today.
 - Finally, we share evidence of similar competition measures in relevant international jurisdictions.

Competition issues in relation to 3600 MHz band

The risk that other MNOs cannot secure wide contiguous spectrum for 5G carriers

- 3.14 The 3.4 - 3.8 GHz band is widely recognised to be the band most widely supported for 5G in the first years following launch and is particularly important given that it is TDD spectrum, which allows asymmetric allocation of uplink and downlink resources. It is spectrum for which massive MIMO technology is most effective due to channel reciprocity, and higher order MIMO systems are more readily achieved, which deliver the greatest spectral efficiency.
- 3.15 In order to compete effectively in high bandwidth 5G services both in terms of network costs and capabilities it is important that multiple MNOs can acquire contiguous spectrum at the widest supported 5G NR channel bandwidths. It is important to help ensure multiple operators have sufficient spectrum to deliver ultra-high speed/ultra-high bandwidth services.
- 3.16 H3G/UKB already holds 140 MHz (36%) of this 3.4 - 3.8 GHz pioneer 5G band and, uniquely, has access to a contiguous 100 MHz to support the widest 5G NR carrier bandwidth. This follows Ofcom's recent decision to vary their licence, despite concerns from the other three MNOs on the enduring detrimental effects this would have to competition. Figure 3.1 below illustrates the current asymmetry in holdings of the useable 5G spectrum in the currently assigned 3.410 - 3.680 GHz band.

Figure 3.1 Current asymmetry in 3.4 - 3.8 GHz band assignments



- 3.17 BT notes that by H3G’s own admission it has more than 2x as much usable 5G spectrum as any other operator.²³ In fact it has approximately 3x that of the other operators. This contrasts with the 37% overall cap that Ofcom noted in a previous consultation was half as much more than what an operator would have if spectrum were distributed equally between 4 operators, suggesting that Ofcom does care about relative positions in overall spectrum holdings.
- 3.18 A further consideration is that even though H3G may have relatively low intrinsic value for the spectrum, it could, depending on the auction design, game the auction to place bids that stand little chance of winning but affect prices of other operators or even the auction outcome itself.

Solutions to address competition concerns specific to the 3.6 - 3.8 GHz band

- 3.19 We note that Ofcom has recognised the importance of the 3.6 - 3.8 GHz band for 5G capacity but stopped short of imposing competition measures on the basis that other operators than H3G should have greater intrinsic value so that H3G would be unlikely to win all the available spectrum (paragraphs 5.222 - 5.223 of the December 2018 consultation). We agree that other MNOs should have higher intrinsic value for more 3.4 - 3.6 GHz spectrum, especially noting that the 5GNR technology in this TDD spectrum band can deliver much higher capacity than is possible with equivalent amounts of spectrum in other bands.
- 3.20 However, the strategic advantage that could arise from H3G securing additional spectrum, limiting the ability of others to achieve wide contiguous bandwidths in the 3.4 - 3.8 GHz bandwidth is a clear concern that Ofcom needs to address. One solution would be to preclude H3G from bidding for any further spectrum in the 3.4 - 3.8 GHz band by Ofcom imposing a 140 MHz cap on 3.4 - 3.8 GHz band holdings. This would be greater than the 120 MHz cap

²³ “With more than twice as much usable 5G Spectrum as anyone else, the UK’s first cloud core network, state of the art data centres and radio technology, our 5G network will be faster than all the rest - see three.co.uk/5G to find out more.”

imposed in Italy and in our view would be a proportionate measure to address this competition concern.

Competition issues in relation to highly asymmetric overall shares

- 3.21 BT believes that an overall safeguard cap of 416 MHz (i.e. 37%) on total cumulative spectrum holdings by one MNO is unnecessary. We also find that Ofcom's analysis is internally inconsistent when compared against its assessment in certain spectrum frequency ranges. We set out these inconsistencies in our earlier response in relation to sub-1 GHz spectrum and how asymmetry in spectrum holdings will have an adverse impact on competition because of the importance of capacity indoors to consumers.
- 3.22 The 37% overall cap also does not recognise the different properties of the various spectrum bands, neither their ability to provide coverage, as illustrated by the much greater value of low frequencies, nor their different abilities to deliver capacity on a per MHz basis. For example, the 3.4 - 3.8 GHz TDD spectrum can more readily support high levels of MIMO and contributes far greater capacity increments than is possible in lower frequencies. If the cap were applied also when mmWave bands are considered, where per operator bandwidths are potentially far larger than those in other lower bands today, the 37% cap becomes increasingly inappropriate.

4 Proposed next steps

- 4.1 BT would welcome the opportunity to debate any of the points raised in this consultation response in more detail with Ofcom if this would assist Ofcom in reaching conclusions as it works to prepare its final Statement and detailed auction regulations.
- 4.2 We also encourage Ofcom to facilitate discussion between operators and with Ofcom on any points that may benefit from such a process.

Offices worldwide

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