TELEFÓNICA UK LIMITED RESPONSE TO:

“Improving mobile coverage:
Proposals for coverage obligations in the award of the 700 MHz spectrum band”

NON-CONFIDENTIAL VERSION

May 2018

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I. INTRODUCTION

1. Telefónica UK Limited ("Telefónica") welcomes the opportunity to respond to Ofcom's consultation on Improving mobile coverage: proposals for coverage obligations in the award of the 700 MHz spectrum band[1].

2. Telefónica is supportive of appropriate actions, such as the timely release of spectrum, including in the 700 MHz band, which could lead to even greater improvements in mobile coverage and help to facilitate 5G and long term growth, as well as consumer and citizen benefits from the increasing use of mobile services.

3. We agree with Ofcom's perception that expectations of mobile services are changing as they become ever more central to our lives. It is indeed true that consumers increasingly want to use their mobile devices wherever they are – at work, at home, or on the move. Mobile coverage has improved significantly in recent years to help meet this demand; this has been a result of significant investments from mobile operators, which has delivered better services and availability for consumers.

4. We acknowledge that mobile coverage is not perfect and there is always scope for improvement, historically infrastructure competition has made mobile networks ever more widely available. However, as Ofcom correctly identifies, building the mobile sites necessary to extend coverage in areas of low population density is often unprofitable – this is a reality that cannot be ignored and must be sensibly addressed in order to provide further improvements in mobile coverage, ensure maximum benefits to rural consumers whilst not overly diluting investment in capacity to serve the vast majority of customs in urban areas.

5. In the following sections, we make some general comments on the enablers required to support investment in 4G and 5G mobile services, and then focus on three key issues for this award:

    - **Coverage obligations** – we are concerned that Ofcom's proposed obligations may be too onerous and that deeper analysis is required to assess costs.

[1] https://www.ofcom.org.uk/__data/assets/pdf_file/0022/111937/consultation-700mhz-coverage-obligations.pdf

- **Infrastructure sharing** – infrastructure sharing has a key role to play in supporting improved mobile coverage; we encourage Ofcom to explore how coverage obligations could promote such sharing rather than raising new barriers.

- **Auction design** – we fear that Ofcom's initial proposal to attach coverage obligations to individual 2x5 MHz lots will unduly constrain its design options, leading it to adopt a sub-optimal auction format for this award. The current proposals heighten the risk of spectrum going unsold and the premises obligation not being achieved. This regulatory failure would be a bad outcome for citizens and consumers. We therefore encourage Ofcom to explore alternative approaches that decouple bidding for coverage obligations from bidding for 700 MHz spectrum.

II. GENERAL COMMENTS

The Development of 4G and 5G mobile services

6. The UK Government has set out a clear ambition that the UK should be a global leader in 5G to take early advantage of its potential and help to create a world-leading digital economy that works for everyone, with high quality coverage where people live, work and travel. Telefónica recognises the Government's vision for 5G and the benefits it can bring to the UK. We are excited by the possibilities and opportunities presented by 5G. Telefónica is already leading provider of 4G services and a major investor in national infrastructure, as evidenced by our investment of over £523m in Ofcom's recent auction of 2.3 and 3.4GHz spectrum and we continue to invest £2m every day on improving our network. This demonstrates our strong commitment to the UK and the fact that Telefónica is well placed to help the Government achieve its vision.

7. Crucial to the future of 5G deployment is the continued evolution of 4G. Telefónica considers that ongoing investment and development in 4G technologies is a decisive step towards 5G deployment. The continued evolution of 4G will ensure that consumers receive the best possible experience and that networks are able to support new use cases. Continued investment in 4G is therefore necessary to ensure that 4G reaches its full potential and is, in itself, vital to ensuring the right conditions exist for the development of 5G.

8. Telefónica has therefore identified the following as key enablers of continued 4G evolution and improved mobile services and, ultimately, 5G deployment:

(a) Removal of barriers to investment

- Ofcom must continue to work with Government to reduce the enduring barriers to network rollout and help operators to deploy mobile infrastructure. This requires an improved planning regime which appropriately recognises and facilitates the availability of mobile services in the same way as traditional utilities such as electricity, gas and water. Such a regime should allow all mobile infrastructure, within a broad range of designs, to be considered as permitted development, especially in rural areas. Planning also needs to enable the deployment of high masts, e.g. 50 metres.

- Progress in this area has been slow. Although the new Electronic Communications Code is a step forward, it still needs to be proven in the field and go much further to enable deployment if the UK wishes to realise its ambition of great coverage and to be a leader in 5G. It is critical that Ofcom continues to focus on measures to promote investment which are imperative to future development of mobile services. As well as access to fibre networks, Ofcom must devote sufficient time and resources to working with Government to reduce the burden of planning regulations and increase the efficiency and ease with which networks can be deployed. Setting challenging coverage obligations in spectrum licences whilst failing to provide the means of their delivery risks unsold spectrum and regulatory failure.

(b) Access to high quality and competitively priced fibre

- Access to spectrum for improved availability of mobile services heightens the need to access high quality and competitively priced backhaul. Fibre backhaul will play a vital role in the development of 5G by helping to ensure high quality and continuous network coverage throughout the UK enabling consumers and businesses to benefit from higher speeds and increased network capacity. However, fibre remains scarce, with few sources and with most deployments focussed on the requirements of FTTP, with shared/contested passive infrastructure. Competitive access to dark fibre will be key to ensuring that the future backhaul needs of mobile sites can be met and provide an economically viable path to small cell deployment.

(c) Freedom for the industry to determine the best approach to infrastructure sharing and co-investment

- MNOs have proven themselves capable of sharing infrastructure effectively. The own-initiative network sharing arrangements currently in place in the UK are evidence that industry is best placed to determine the risks and opportunities of investment and whether such investment is best made separately or jointly. The most efficacious way of ensuring requisite building of and investment in

infrastructure is for Ofcom to focus on removing barriers to investment in rural areas. Attempting to force end-to-end competition, rather than permitting co-investment may not lead to the best outcome for either customers or operators as it could require operators to divert funds from improving mobile services in other ways e.g. increased capacity in high demand areas.

- Ofcom must ensure that it does not structure future auction rules in a way that would preclude parties from entering into infrastructure sharing agreements and co-investment opportunities that could facilitate increased efficiency of rollout and result in greater benefits for consumers. This is particularly important when such arrangements reduce the costs of deployment and therefore reduce the negative impact on spectrum values that such obligations create. If Ofcom is serious about reducing the regulatory risk of unsold spectrum, the auction rules themselves should not foreclose opportunities for operators to share.

- Whilst 5G promises a range of benefits, we should be clear that these won't be achieved without collective investment and collaboration. That means complete customer-focused alignment from operators, public service providers, local authorities, landlords and technology companies to explore new opportunities for better connectivity and better coverage.

(d) Deployment of 5G based on international standards so as to ensure the widest possible compatibility of equipment and devices

- Technologies and standards must only be chosen once they have been rigorously tested, and deployment must come after requisite technologies have been proven to work. This is especially important given the uncertainty as to demand for 5G services. Ofcom should resist unwarranted prescription of deployment and certain approaches which could restrict rollout. Deployment must be based on the commercial viability of services and the recognition that some areas will need public investment.

III. COVERAGE OBLIGATIONS

9. Ofcom correctly highlights that there is a risk that setting coverage obligations that are too onerous. We agree that obligations that could require costs materially higher than £300m to meet would be unlikely to be proportionate[2] and could undermine one of Ofcom's key statutory duties – the ability to secure the optimal use of the spectrum. Overly onerous obligations could also result in spectrum going unsold. It is therefore vitally important that coverage obligations are proportionate and reasonable.

[2] §3.36. of the consultation

10. Ofcom's proposed premises obligation envisages a further 60% of 200,000 premises being connected, but assumes that between now and the 700 MHz award c.100,000 additional premises will be captured by expansion of today's networks. Given that such expansion is at the margins of profitability, we see a very real risk that Ofcom's proposals are already undermining the case for further coverage expansion. There is little to be gained for an investor in coverage at the margin today if the business case is to be undermined by imposition of an obligation on a rival tomorrow.

11. There is a very real risk that the scale of the obligation is not in relation to 60% of 200,000 premises, but more likely closer to 60% of the c.300,000 premises Ofcom forecasts to be covered in total. This has grave implications for both timing of compliance and proportionality of the obligation. This is something that Ofcom will need to assess nearer the time, but the chilling effect on rural coverage investment is likely already in play.

12. In the consultation, Ofcom states that its initial analysis suggests that an investment of less than around £300m would enable an operator to provide good coverage inside and around 60% of about 200,000 rural premises (residential and SME) which it expects to be unserved at the time of the award. It also states that its high-level modelling suggests that it would similarly cost no more than £300m for an operator to increase geographic coverage to at least 89- 90% by building 500-700 new base stations and operating them for 20 years, and that several other factors are likely to allow operators to deliver at least a further 2-3% (reaching the 92% coverage target proposed in the consultation) coverage within the indicative £300m cost estimate.

13. Telefónica has conducted its own initial modelling to assess the anticipated costs that would be required in order to meet Ofcom's proposed obligations, both geographic and premises. Our findings suggest that costs would in fact exceed £300m and we believe the obligations would require substantially more than 500-700 new base stations to be deployed in order to meet both obligations. As such, we are concerned that Ofcom's initial proposed coverage obligations may be disproportionate and could result in unsold lots if it proceeds with its current proposals.

14. A significant assumption is made in relation to the placement of mobile sites at optimal locations – in practice, our first-hand experience tells us that this is a vastly problematic area as many sites are often refused the necessary permissions to be installed or connected to the required backhaul, especially in more rural areas. These deployments have to therefore be replanned, starting from scratch to identify alternative locations, which may or may not be approved, requiring technical re-planning and loss of efficiencies as well as increased costs.

15. We are also not able to accurately estimate the costs as the 60% of currently uncovered premises, based on Ofcom data, which relates to the number of premises that are expected to be unserved at the time of the spectrum award. Our modelling today is based on 300,000+ premises of which we do not know which are expected to be served in the future. This makes accurate cost assessment very difficult owing to the uncertainty as to which premises (that are currently unserved) will be served at the time of the award.

16. Based on our extensive first-hand experience of network rollout, there are several factors which are often encountered which result in additional costs and we are concerned that Ofcom's initial high level modelling may not have taken this into consideration when arriving at cost estimates. These factors include the following:

    - Real world deployment will be less efficient than the planning model's optimised site placement. Planned sites are often unable to be secured, either due to planning law issues, local community objections, unreasonable "ransom" rents, or lack of suitable backhaul or power at the site; thus alternative, more costly and less optimal sites are required.
    - Costs for site build, backhaul and power may often be higher as a result of geographical constraints which require more complex solutions to deliver in rural locations.
    - Additional maintenance capex may be needed within the 20 year time period that is used for the cost estimates.
    - It is not clear what level of inflation has been considered.
    - It is not fully clear how Ofcom would technically measure the obligation. We will need full details of the model parameters, not just signal thresholds, in order to determine how many sites would need to be deployed.

17. We would like to understand how Ofcom arrived at its cost estimates and would welcome engagement with Ofcom on this to work through assumptions, cost stacks and cost factors.

18. We are concerned that Ofcom's high level assumptions rely on a number of factors which are uncertain. For example, Ofcom says that Government is currently in the process of building more than 250 base stations to extend the Emergency Services' communication network, and these sites will be built in a way that would allow operators to use these sites in the future, resulting in much lower capital costs to access coverage from these sites (in the order of tens of thousands of pounds, as

opposed to hundreds of thousands). Ofcom's belief is that a material proportion of these sites could be suitable for expanding geographic coverage. Therefore, the availability of these sites could significantly reduce the costs of expanding coverage. Ofcom's view that these sites will allow operators to use them is presumptive at best; there is no certainty that this will be the case and thus reliance upon such an assumption possesses an obvious risk.

19. Given all the practical and commercial challenges that we have highlighted, unless some of the current barriers to rollout can be removed, we do not believe that Ofcom's proposal of delivering the obligations by 2022 takes sufficient account of the demands of delivery. Additional time needs to be given in order to provide a more realistic achievable target.

20. Clearly these network build costs are only initial assessments. Further detailed analysis will be required by Ofcom and the mobile operators in order to arrive at a more reliable and informed assessment of the likely costs of deployment that would be required to meet the proposed coverage obligations.

21. Until such time that we have greater clarity on how Ofcom arrived at its estimates and we have confidence that everyday barriers which are likely to increase costs have been taken into consideration, we are concerned that Ofcom's costs estimates do not reflect the likely real world cost to meet the proposed obligations.

IV. INFRASTRUCTURE SHARING

22. Mobile services work a bit like a patchwork quilt; they need a high level of collaboration to hardwire the technology into our cities' infrastructure. The danger is that we treat collaboration as an afterthought, when in fact, given its importance to consumers and business, it needs to be planned in now. We need a world where connectivity is as prized as an energy performance certificate by home buyers and sellers, where connectivity is checked off by building regulations, and where digital infrastructure has equal billing with physical infrastructure.

23. Telefónica has first hand experience of how an outcomes focused model works through our partnership with the City of London and our project in Aberdeen. Collectively focusing on the outcome of better mobile connectivity led to us deploying networks of small cells across existing infrastructure that will future proof both cities, paving the way for 5G when it arrives. If we could replicate this level of

collaboration and access to sites across the UK, we could collectively reduce the UK's running costs to make every pound work harder and smarter for its citizens. Going forward, regulators, operators, vendors, landlords and industry need to align on the prized outcome of great mobile coverage and 5G connectivity and move forward with Government and local authority support to unblock these hurdles to better connectivity

24. Network sharing agreements have been successful without regulatory intervention and have delivered considerable benefits and efficiencies. Ofcom needs to carefully structure the auction rules so as to not preclude parties from entering into (network) sharing agreements.

25. We note Ofcom's proposal that in order to facilitate infrastructure sharing, it may be appropriate for operators to make information about the location of new sites in rural areas available to the other operators at least 30 days in advance of a planning notification. We strongly agree with Ofcom that earlier sharing of information about new rural sites can maximise benefits for consumers. Telefónica believes that sharing of information on a commercial basis can help in this respect Ofcom can play an important facilitating role by encouraging (and allowing) operators to share advanced deployment plans on a commercial basis and highlighting the benefits to consumers that such information sharing can bring.

26. We need to move to an assumption that site sharing should be the default option. Sharing new mobile infrastructure between mobile operators can significantly reduce the costs of deployment, whilst also bringing the benefits of new coverage to a wider set of customers. Contrary to Ofcom's concern that sharing opportunities may not always be a priority for mobile operators as they focus on deployment, Telefónica places great significance on sharing opportunities to deliver better services for our customers. We can envisage commercial models that will make infrastructure sharing in rural areas the default model, for example, there could be common site design templates for macro, micro and in-building sites to facilitate this

27. As we have already highlighted, it is vitally important that industry has the freedom to determine the best approach to infrastructure sharing and co-investment. MNOs have proven themselves capable of sharing infrastructure effectively. The own-initiative network sharing arrangements currently in place in the UK are evidence that industry is best placed to determine the risks and opportunities of investment and whether such investment is best made separately or jointly. The most efficacious way of ensuring requisite building of and investment in infrastructure, is for Ofcom to focus on removing barriers to investment.

V. AUCTION DESIGN

28. As Ofcom recognises in its decision to raise this topic in this consultation, any approach that it adopts for attaching coverage obligations to 700 MHz licences may have a significant impact on auction design. Telefonica is concerned that Ofcom's initial proposal to attach coverage obligations to individual 2x5 MHz lots will unduly constrain its design options, leading it to adopt a sub-optimal auction format for this award. Moreover, we believe that there are alternative approaches, which de-couple bidding for spectrum and coverage obligations, fulfil the goal of expanding coverage, and are more consistent with Ofcom's statutory duties, including non-discrimination between operators and promoting the efficient use of spectrum. Such approaches also have lower risks of regulatory failure – unsold lots.

29. In this section, we set out our initial comments on the following auction design issues:

- **Attaching coverage obligations to paired 700 MHz** – We put forward the case that coverage obligations should not be attached directly to individual lots, but instead allocated in a separate bidding stage.

- **Lot size** – We propose that the paired lots are allocated in units of 2x5 MHz (unencumbered by coverage obligations) and unpaired lots in units of 10 MHz.

- **Spectrum caps** – We believe that Ofcom has an obligation to maintain the overall cap of 37% of useable spectrum on all participants. We see no case for a low frequency cap; instead, we propose a common cap of 2x15 MHz on all bidders for paired 700 MHz only.

- **Auction format** – We request that Ofcom consult on a range of potential auction formats for the 700 MHz award. Our strong preference is that Ofcom adopt a non-combinatorial, multi-round format, such as the hybrid clock-SMRA format successfully used for the recent PSSR award.

- **Information policy** – Whichever auction format is selected, it is particularly important that there is some degree of transparency with regard to demand revelation over multiple rounds. This is necessary to support price discovery and address common value uncertainty.

30. We conclude this section by setting out an **alternative model for assigning coverage obligations** that decouples their award from bidding for 700 MHz lots. In

this model, bidders first compete for 700 MHz spectrum without any coverage obligations. Once the allocation and assignment stages are complete, all parties that own sub-1 GHz spectrum (including those without 700 MHz spectrum specifically) are then invited to participate in a third bidding stage: a reverse auction for coverage obligations. This will determine the amount of money to be refunded to operators in return for taking on non-commercial obligations. Provided the obligations are not so onerous that their cost exceeds the intrinsic value of the spectrum, the starting prices can be set at a level such that the maximum level of refunds is below the expected revenues raised in the auction. In order to ensure that coverage obligations are awarded, there may also be certain obligations on winners of 700 MHz spectrum to bid for these obligations at the starting price.

Attaching coverage obligations to paired 700 MHz

31. Telefonica is supportive to Ofcom's general goal of increasing coverage of mobile across the UK. In 2013, we demonstrated our commitment to expanding coverage by bidding for and securing the 2x10 MHz of 800 MHz spectrum sold with a requirement to provide mobile coverage to 98% of the UK population. We subsequently fulfilled this obligation, establishing our company as the market leader in terms of population coverage.

32. We are still seeking opportunities to further expand our coverage but, as Ofcom recognises, there must be a commercial rationale to support this investment. We also agree that 700 MHz (like 800 MHz and 900 MHz) is suitable spectrum for expanding geographic and premises coverage, and that this award provides a further opportunity for the UK Government to work with licensees in providing the sort of ambitious additional coverage levels proposed by Ofcom. This can be achieved by using money that operators might pay to Ofcom for 700 MHz licences to fund roll-out of services to geographies and premises that would otherwise be unviable.

33. To date this approach has seen regulators accept an implicit reduction in auction revenue by encumbering spectrum with coverage obligations – making some spectrum licences implicitly less valuable than others. [✂]. In contrast to the 800 MHz obligations, the obligations put forward in the 700 MHz award have costs that are higher by an order of magnitude and so we believe it is much more likely that the coverage obligations will affect the price paid for all spectrum in the award, encumbered or not.

34. At paragraph 4.7, Ofcom proposes to attach coverage obligations to three of six available 2x5 MHz lots in the 700 MHz paired band. This implies that there would be three categories of 700 MHz paired lots in the auction:

- Standard 700 MHz lots (no obligations): 3 lots
- Geographic coverage obligation lots: 2 lots
- Premises coverage obligation lots: 1 lot

35. Unfortunately, there is a flaw in this approach to introducing coverage obligations: it assumes that the most efficient users of 700 MHz spectrum must also be the parties that can most efficiently fulfil the coverage obligations. There is no basis to assume this will be the case. In principle, the coverage obligations could be fulfilled by any operator with access to sub-1 GHz spectrum, including 800 MHz and 900 MHz. The factors that will determine a bidder's valuation for acquiring 700 MHz may be quite different to those that will determine its costs in fulfilling a particular coverage obligation.

36. The proposal to combine the bidding processes for 700 MHz spectrum and coverage obligations could have a number of negative consequences:

    - **It constrains auction design options.** As Ofcom recognises at paragraphs 4.7 and 4.8, the approach of attaching coverage obligations to individual 2x5MHz lots could increase aggregation risk and introduce the possibility that valuable spectrum goes unsold. This is because an individual operator may not have a viable business case to buy a single 2x5 MHz lot if it is encumbered by a coverage obligation. Ofcom proposes to address these issues through auction design, but – as we discuss below – this may lead Ofcom to adopt an auction format with other problems. In particular, as we discuss below, Telefonica is concerned it may lead Ofcom to adopt a combinatorial auction format rather than the clock/SMRA format that worked well for the UK award of 2.3 and 3.4 GHz.

    - **It may lead to an inefficient allocation of 700 MHz.** If coverage obligations are integrated into lots, the winning bidders will not necessarily be the operators that can make the best use of 700 MHz nor the ones that could most efficiently meet the coverage obligations, but rather those that have the highest combined (net) value. This could be far from the best outcome for the United Kingdom. For example, suppose that two operators without much sub-1GHz spectrum each want 2x10 MHz and have the highest values for 700 MHz spectrum based on urban in-building quality, but the weakest business cases for extending coverage. Inclusion of coverage obligations may lead to one of these operators not winning any spectrum.

- **It is discriminatory across operators.** This approach may discriminate against operators that have a high value for 700 MHz spectrum but higher costs of meeting coverage obligations, as their likelihood of winning is reduced. Alternatively, it may discriminate against bidders that could, at lowest cost, fulfil the coverage obligations but have lower value for 700 MHz spectrum – such as operators with substantial sub-1GHz holdings. Who will lose out is ambiguous, as the valuations of bidders are not public, but it is more likely than not that the outcome is inefficient and unfair to at least one party.

- **It constrains the scope for defining coverage obligations.** Ofcom has somewhat arbitrarily proposed three obligations, each of which combine obligations for deployment nationwide and at the level of the four Nations. This approach appears to be driven by a desire not to encumber more than three lots, thus leaving scope for at least one bidder to buy an unencumbered lot. This is a very inflexible approach. There are significant differences between the networks and market positions of the four operators in each Nation. Hence, for example, the operator that is best placed to fulfil a coverage obligation in Northern Ireland is not necessarily best placed to fulfil an obligation for Scotland. An approach that decoupled obligations from specific lots could allow Ofcom to allocate a broader range of regional obligations – more precisely it could allow bidders to deliver obligations at the lowest cost which would be the most efficient outcome.

37. In the consultation, Ofcom compares the costs of the proposed obligations with the prices paid in a small number of European 700 MHz auctions[3] in order to assess proportionality. This is not an adequate test given the risk and size of the regulatory failure if spectrum encumbered with a coverage obligation, such as the premises coverage lot, goes unsold.

38. Across Europe, there is typically a fairly even distribution of spectrum between MNOs in a particular country market. In contrast, the UK exhibits substantial asymmetries in overall holdings and sub-1GHz holdings. Historically, Ofcom has made the argument that this may be a source of differentiation in the market[4] and has only intervened to try and reduce asymmetry at the extreme.

39. The specifics of the UK spectrum distributions are particularly relevant to issues (2) and (3) above. Some bidders may have high demand for 700 MHz spectrum, but

[3] Footnote 26.
[4] See, for example: Ofcom, 2.3 GHz and 3.4 GHz award: competition issues and auction regulations, Consultation, 21 November 2016, §1.21.

also high costs of deploying additional network to provide coverage (if their rural network is generally less developed). Conversely, other operators may have relatively low marginal values for additional sub-1GHz spectrum owing to their existing holdings, and these marginal values would be lower than those expressed elsewhere in Europe, all other things being equal. The asymmetry in UK spectrum holdings means it is likely that these risks will work to reinforce each other, thus increasing the risk of unsold lots and regulatory failure if coverage obligations are combined with spectrum lots.

40. In the next consultation, we urge Ofcom to explore designs that decouple the award of 700 MHz spectrum from the coverage obligations in order to avoid the risk of unsold lots that we identify here. By first allocating and assigning spectrum and then awarding coverage obligations, Ofcom is much more likely to achieve an efficient allocation of rights and obligations. This approach would also be more transparent, generating separate market prices for the value of spectrum and costs of fulfilling specific obligations. We outline a possible approach at the end of this section.

Lot size

41. At paragraph 4.3, Ofcom says that it "*could divide the paired 700 MHz spectrum into six lots of 2x5 MHz; and the unpaired SDL spectrum into (up to) four lots of 5 MHz*." It says that this approach of using small lots, based on the typical base units of spectrum deployed for LTE, "*would provide the maximum flexibility for operators to bid for spectrum rights that they value*". It is implicit in Ofcom's comments that the lots would be sold on a generic basis, such that winning bidders would be guaranteed contiguous assignments within bands.

42. Telefonica generally supports the principle of selling lots in smaller units and using the auction design to allow bidders to aggregate spectrum on a contiguous basis, as was the case, for example, in the PSSR award. However, lots should not be so small that they introduce unnecessary aggregation risk for bidders or make switching between bands unduly difficult, as such issues may introduce otherwise avoidable constraints on the auction design.

700 MHz paired lots

43. We agree that 2x5 MHz blocks are the appropriate unit of supply for the 700 MHz paired band, as, for example, this would give bidders the flexibility to target blocks of 2x5 MHz, 2x10 MHz or 2x15 MHz. It is possible that some bidders may have a minimum demand of 2x10 MHz, and such bidders could face some degree of

aggregation risk (depending on the auction format). For lots unencumbered by coverage obligations, this should probably not be a major concern for Ofcom for two reasons. Firstly, there is evidence that a standalone block of 2x5 MHz has substantial value, based on bids made for the equivalent amount of spectrum in the UK 4G auction for 800 MHz. Secondly, a 2x5 MHz block would have a high resale value and Ofcom could manage the assignment round rules to ensure that any bidder winning only 2x5 MHz is positioned in the middle of the band, so has maximum resale options.

44. The imposition of a coverage obligation on single paired lots, however, complicates this analysis. Such obligations reduce the value of an individual 2x5 MHz block, quite likely to the point that it not viable on a standalone basis. Secondly, the obligation may devalue the lot to the point that other parties are not interested in acquiring it in the secondary market, or at least reduces the number of parties that might be willing to take on these obligations. For this reason, it would be much better if all 700 MHz paired lots are initially sold unencumbered by coverage obligations, with a follow up process to assign obligations. (Indeed, as we discuss below, in any outcome where at least two bidders won 2x10 MHz or more, Ofcom could exempt a bidder that won only 2x5 MHz from the obligation to bid to acquire a coverage obligation.)

700 MHz unpaired SDL lots

45. For the 700 MHz unpaired SDL band, we think that the base unit of supply should be 10 MHz blocks, not 5 MHz lots as suggested by Ofcom. A 10 MHz lot would be the same size in MHz as a 2x5 MHz lot, which could allow for a common eligibility point weighting across all lots and thus easier switching of demand between the two bands. This is important given that 700 MHz SDL is potentially a substitute (albeit an inferior one) for 700 MHz paired. Moreover, a 5 MHz block is almost certainly too small to support a viable business case. If Ofcom allowed bidders to bid in such small units, it would have to consider steps to mitigate the risk that a bidder won only 5 MHz of SDL spectrum when it wanted spectrum large block, such as use of a spectrum floor. This approach would also introduce a risk that only 15 MHz is sold, with 5 MHz going unsold.

Spectrum caps

46. At paragraphs 4.9-4.10 of the consultation, Ofcom introduces the subject of spectrum caps:

"4.9 When auctioning spectrum we will consider whether there is a case to include competition measures such as spectrum caps in order to promote competition. This could for example lead us to include a cap on the overall amount of spectrum, and / or a cap on the amount of low frequency spectrum, that any operator can hold as a result of the auction.

"4.10 Our approach to setting the scale of individual obligations is likely be compatible with a low frequency cap, should we decide that it is appropriate to include such a cap. This is because we do not think it likely at this stage that any low frequency cap that we might apply in the auction would prevent any bidder from acquiring at least 2x10 MHz of paired 700 MHz spectrum. We will consult separately on spectrum caps later this year." [Our emphasis].

47. Whilst Telefonica recognises that in §4.10 Ofcom states that it will consult on spectrum caps later in the year, it also makes a statement in §4.9 that procedurally we must address now.

48. Furthermore, Ofcom has also sought initial views on auction design as they relate to coverage obligations. We believe there is a connection between spectrum caps and implementing Ofcom's stated objective with regard to coverage obligations. Therefore we thought it helpful to set out an initial view based on the contents of this consultation.

Overall spectrum cap

49. In the recent 2.3/3.4GHz award[5] Ofcom decided to place an overall cap of 37% of useable spectrum on all participants. In implementing this cap, Ofcom took account of all spectrum to be awarded at 700 MHz[6]. Both BT and H3G tested the legality of

[5] https://www.ofcom.org.uk/__data/assets/pdf_file/0022/103819/Statement-Award-of-the-2.3-and-3.4-GHz-spectrum-bands-Competition-issues-and-auction-regulations.pdf

[6] ibid 1.38 for example *"we have decided to set a cap of 340 MHz in the Auction on the overall amount of mobile spectrum a single operator may hold. This represents 37% of the mobile spectrum that we expect to be useable within the same timescales as the 3.4 GHz band, including the 190 MHz available in this Auction plus the 80 MHz in the 700 MHz band that we plan to award in 2019."*

this cap in their appeals. The High Court found that Ofcom could exercise its powers in such a way. The Court of Appeal refused H3G permission to appeal.

50. The basis for, and the substance of, the overall cap is clear in the decision relating to 2.3 and 3.4 GHz. Ofcom through its actions has relied on that decision in making Regulations and placing them before Parliament. It has conducted an auction with these caps embedded in the rules. The overall cap decision was made by the Ofcom Board and has also been defended by Ofcom in the High Court. The overall 37% cap was applicable to all bidders, including Telefonica UK, in the 2.3 and 3.4GHz award.

51. Ofcom expected to apply the guiding principle of the 37% cap to the 700MHz award. If Ofcom has not identified a change in circumstances since the decision relating to 2.3 and 3.4GHz award, then it would be irrational and unlawful to depart from the 37% cap.

52. In material terms the cap would only bite on BT, restricting it to 45MHz of spectrum in the proposed 700 MHz award.

Sub-1GHz cap

53. We welcome the indication that Ofcom has yet to decide on any sub-1 GHz cap at §4.10 (see emphasis). The imposition of a sub-1 GHz cap in the 2013 award was highly contentious and Ofcom had to make a number of attempts at justifying it.

54. The basis for the caps in the 2013 award[7] was described as follows at §1.10 bullet 7:*"we also consider that it would be appropriate and proportionate to impose limits on the amounts of spectrum that each bidder can acquire in the Auction, such that their overall holdings of 'mobile spectrum' in general, and sub-1GHz 'mobile spectrum' in particular, do not exceed certain safeguard caps. This is in order to mitigate the risk of highly asymmetric spectrum holdings after the Auction leading to lower competitive intensity."*

55. Later in that statement, at §4.238, Ofcom refers the reader back to the 2012 consultation[8] (see §§8.11- 8.26 of Annex 6[9]) for the justification of these "safeguard caps".

[7] https://www.ofcom.org.uk/__data/assets/pdf_file/0031/46489/statement.pdf
[8] https://www.ofcom.org.uk/__data/assets/pdf_file/0025/55276/combined-award-2.pdf
[9] https://www.ofcom.org.uk/__data/assets/pdf_file/0021/58314/2nd_condoc_annex_6.pdf

56. At Table 5.16 in Annex 6 of the 2012 consultation Ofcom identifies the competition concern that led to the imposition of a sub-1GHz cap (and also the reservation of either 800 MHz or 2600 MHz for a "fourth national wholesaler"):

"Fourth national wholesaler not credible because insufficient share of spectrum & no sub-1 GHz spectrum, & no spectrum for early route to LTE or high peak data rates with early LTE" [Our emphasis].

57. The result of the 2013 award left both H3G and BT/EE with sub-1GHz spectrum. Therefore it is not open to Ofcom to rely on this justification for a similar cap in the proposed 700 MHz award. Likewise, we see no case for any operator to be reserved spectrum at 700 MHz (with or without coverage obligations), given that all four operators will enter the auction with spectrum holdings that make them credible national wholesalers. Given the effort required by Ofcom to implement both the cap and reservation in the 2013 award, we would urge Ofcom to consider most carefully any pre-conceptions in might have with regard to competition remedies for 700 MHz award.

58. The application of a sub-1 GHz cap in the context of a CCA also created an extreme asymmetry between bidders in the UK 4G auction that contributed to the strange outcome in which EE won much more spectrum than its rivals. Specifically, EE and H3G were advantaged because they could express a high incremental value for 800 MHz lots they did not win, an option unavailable to Telefonica UK and Vodafone (see discussion of CCA under auction format below). Ofcom should not repeat this error for the 700 MHz auction.

Securing two winners to achieve the stated objective for the coverage obligations

59. In the current consultation Ofcom has a stated preference for there being two distinct winners of geographic coverage obligations[10]: *"These two geographic obligations need to be acquired by different operators to add value."*

60. Each of those winners must have enough spectrum to make delivery of such costly obligations a viable proposition. Indeed, as we state above, if there are risks that winners might win just one encumbered 2x5MHz lot, it might reduce demand in the award and lead to unsold encumbered spectrum. Our strong preference is that coverage obligations must only be mandatory on operators winning at least 2x10

[10] §3.25 of the consultation.

MHz of 700 MHz spectrum, a position consistent with the 2013 award.[11] In this consultation Ofcom presents no technical evidence to explain why the higher level of quality that it seeks through these new obligations can be delivered in half the spectrum it decided was necessary in 2013.

61. In order to ensure sufficient winners with sufficient spectrum, therefore, Telefonica proposes a cap in this award of 2x15 MHz of 700 MHz paired spectrum per bidder. This is not unduly burdensome or hard to administer. The cap is self-consistent with the stated objectives of the obligations consulted on in this document. Such a cap would also have the benefit of relieving Ofcom of the burden of departing on a new and novel justification for a sub-1GHz cap. No one operator can gain a disproportionately large holding owing to the effect of this band specific per bidder cap.

62. Finally, as the overall cap constrains BT to 45 MHz in total, it could bid up to the FDD cap and still acquire half of the available SDL spectrum (assuming two 10 MHz lots). We do not believe that in combination these two caps are overly restrictive on BT.

Auction format

63. Although Ofcom does not discuss the choice of auction format for the next award directly, Telefonica is concerned that Ofcom's proposal to attach coverage obligations to specific lots will unduly constrain the choice of format. The approach of having multiple categories of 700 MHz paired lot will make the auction more complicated than necessary. In particular, as Ofcom recognises, it may introduce aggregation risk for bidders and make it more likely that lots go unsold. Ofcom says that these risks can be mitigated through auction design (§4.7 and §4.8). However, formats that are most effective at addressing aggregation risk or unsold licence risk may raise other concerns, such as vulnerability to strategic bidding or introduction of governance risk for bidders. It would be much better if Ofcom could design an auction with a single category of six 700 MHz paired lots, thereby largely eliminating aggregation and unsold lot risk as a constraint on auction design.

[11] See https://www.ofcom.org.uk/__data/assets/pdf_file/0025/55276/combined-award-2.pdf §5.11 second bullet and at §5.59 *"Seven responses argued that this would not be an adequate bandwidth to deliver a 2Mbps service across a cell. Everything Everywhere, H3G and a confidential response suggested a 10 MHz channel would be required. Our technical work since the March 2011 consultation supports this view. Therefore, we propose to design the spectrum auction to ensure that the coverage obligation attaches to a licence with at least 2x10 MHz of 800 MHz spectrum." [our emphasis]*

64. In its consultation of the PSSR award, Ofcom said that:

"*Our statutory duties are more likely to be achieved through the following additional objectives:*

- *The design should be simple where possible, without unduly compromising the efficient outcome of the auction.*
- *The outcome of the auction should be perceived by all participants and stakeholders as fair and legitimate, and bidders should not feel that they would have bid differently when they see the final result*."[12]

65. Ofcom further stated that these objectives "*are consistent with the feedback we received in the context of our 2013 auction and in the responses to our consultations*."[13]

66. Telefonica strongly agrees that these were important lessons from the UK 4G award, and that they were and are appropriate objectives for the PSSR award and for future awards, including 700 MHz.

67. For the 700 MHz award, we are particularly concerned that Ofcom's concerns about aggregation risk resulting from its proposal to attach coverage obligations to specific lots may lead it to propose a combinatorial auction format, such as the CCA or CMRA. Such formats are good at addressing aggregation risk and also limit scope for unsold lots. However, they introduce other problems and are challenging formats for bidders, both with respect to bidding and governance. The CCA has also been associated with some very peculiar auction outcomes, with respect to spectrum allocation (e.g. the UK 4G auction), high prices (e.g. Austria 4G and Netherlands 4G) and asymmetric prices (e.g. Switzerland 4G and Canada 700 MHz). Meanwhile, the CMRA has only been used once (in Denmark) and is not well understood or documented in the academic literature.

68. Recent theoretical research shows that the CCA provides incentives for bidders to bid strategically to drive up rivals' prices. For example, Janssen and Karaymchev (2013) demonstrate that if bidders have a primary preference for achieving a low price, and a secondary preference for raising their opponents' costs, they will bid

[12] Ofcom, PSSR: Award of the 2.3 GHz and 3.4 GHz bands, Consultation, 7 November 2014, §6.13.
[13] Ibid, §6.14.

aggressively in the clock rounds and submit spiteful bids in the sealed bid round.[14] Janssen and Kasberger (2015)[15] and Levin and Skrzypacz (2016)[16] provide theoretical evidence suggesting that this may lead to highly inefficient equilibrium outcomes in the CCA. Marsden and Sorensen (2017)[17] provide explanations as to why bidders in CCAs may bid strategically in ways that could inflate price outcomes rather than bid straightforwardly based on valuations. A recent econometric study by Koutroumpis and Cave (2017)[18] supports these observations as it finds that the CCA is associated with higher prices than other auction formats.

69. The presence of such risks may weaken participation, especially amongst operators with more sub-1GHz spectrum. Lower participation increases the risks of unsold encumbered coverage lots which are of marginal value to other bidders.

70. Telefonica's first preference is that Ofcom adopt an auction design for the 700 MHz award based on the clock and/or SMRA formats. For example, the hybrid clock-SMRA format that Ofcom used for the PSSR award could readily be adapted for an auction of 700 MHz paired and unpaired lots. This format worked very well for awarding the 2.3 and 3.4 GHz spectrum, supporting a competitive bidding process, prices that transparently reflect the market value of the spectrum and an allocation outcome that appears efficient given the pre-auction positions of the bidders. When looking at the bid data, we see no evidence that the outcome was significantly affected by strategic bidding. A similar approach at 700 MHz is more likely to increase participation than falling back to a CCA.

71. This positive outcome for the PSSR award compares very favourably with the result of the UK 4G auction, which used a CCA format. That award resulted in EE (which was later allowed to combine its spectrum holdings with BT) acquiring significantly more spectrum than its rivals, including Telefonica UK. It is hard to believe that this outcome was efficient, given that – five years after the award – a significant

[14] Janssen and Karamychev, 2016, "Spiteful Bidding and Gaming in Combinatorial Clock Auctions", Games and Economic Behavior, Elsevier, vol 100(c), pages. 186-207.
[15] Janssen and Kasberger. 2015, "On the Clock of the Combinatorial Clock Auction.", working paper. https://homepage.univie.ac.at/maarten.janssen/working%20papers/CCAclock0911.pdf
[16] Levin and Skrzypacz, 2016, "Properties of the Combinatorial Clock Auction", American Economic Review 2016, 106(9): 2528–2551.
[17] Marsden and Sorensen, 2017, Strategic Bidding in Combinatorial Clock Auctions – A Bidder Perspective, in Bichler and Goeree (editors), Handbook of Spectrum Auction Design, Cambridge University Press.
[18] Koutroumpis and Cave, 2017, Auction Design and Auction Outcomes, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2958745

proportion of BT/EE's spectrum remains either unused or under-deployed. In contrast, when Telefonica acquired 2.3 GHz spectrum in April 2018, we initiated deployment immediately. In responses to previous consultations, both with respect to the PSSR award and ALF, Telefonica (and other operators) have submitted a large volume of material explaining how the 4G auction was likely distorted by strategic bidding. For example, we have explained how Telefonica UK was unable to express its true incremental value for 2.6GHz spectrum, owing to a (large but material) budget constraint and extreme uncertainty over the price of 800 MHz. At the least, it is apparent that the CCA design for the UK 4G auction failed Ofcom's own test that "*bidders should not feel that they would have bid differently when they see the final result"*. Given the controversy over bids in the UK 4G auction and the likely inefficiency of the outcome, Ofcom should be very cautious about using the CCA again.

72. We urge Ofcom to take a holistic approach to both spectrum packaging and the auction design. Put differently, the auction design should not be driven by a decision upfront to associate coverage obligations with specific lots, when there may be better ways to allocate coverage obligations. That would be the tail wagging the dog. Ofcom should consult on a full range of auction formats, both combinatorial and non-combinatorial. The final format should be as simple as possible for bidders, subject to meeting Ofcom's objectives for the award. As we set out below, we think that Ofcom's goals can be best achieved by separating bidding for spectrum and coverage obligations into different stages of an award, allowing relatively simple auction formats to be adopted for each stage.

73. As an aside, if Ofcom does again adopt the hybrid SMRA-clock format, we would urge one small change. We think that all winning bidders in the same category should pay the same price per lot, which should be the lowest standing high bid amount. In the 2.3 and 3.4 GHz auction, the rules allowed for a bidder to end up paying either the current or the previous round price for all lots in the same band. In the 3.4 GHz band, Telefonica ended up paying a higher price per lot than other winning bidders solely because we lost out in a random tiebreak in the penultimate round. This was arbitrary and unfair. This issue could easily be addressed through tweaking the auction rules.

Information policy

74. One of the most important aspects of any auction design is the information policy, both with respect to the information revealed directly to bidders and the information

that can be inferred from this. Bidders in auctions for mobile spectrum typically have a substantial common value component. Relative outcomes between operators also matter. Accordingly, price discovery is very important, both to help bidders solidify their valuations and support internal approval processes.

75. Telefonica's general preference is for transparency. For example, we support Ofcom's policy of identifying all bidders (and their backers) before an auction and publishing all auction data after the award. It is also important that bidders receive information about the level of demand after each round of the auction. However, we recognise that there may sometimes be a trade-off between releasing information about bids made during an auction, so to promote price discovery, and restricting some information so as to foreclose options for strategic behaviour. Given the extreme asymmetry in spectrum holdings in the UK prior to the last auction, this was a relevant concern, and led us to support Ofcom's decision to publish round-by-round aggregate demand data as a range for each band. Happily, that auction resulted in a reduction of asymmetry, thus reducing scope for any operator to engage in foreclosure strategies in a 700 MHz auction. Accordingly, the case for such a restrictive information policy appears weaker for the next auction. We urge Ofcom to consult on this topic for the 700 MHz award.

76. More generally, it is important for governance that the auction process provides bidders with good information about the spectrum they could win and the price they could pay if the auction were to close in any particular round. This was the case for the 2.3 and 3.4 GHz auction, where winning bidders won their final round bids at the prevailing prices. In contrast, a major drawback of the CCA is that bidders may go into the supplementary round with little certainty regarding the package they might win and the price they might pay. We understand that the CMRA provides bidders with greater certainty over the price to be paid for any particular package, but no certainty over the package that a bidder might win.

An alternative approach: decoupling bidding for spectrum and coverage obligations

77. We present here a preliminary proposal for allocating coverage obligations, in which bidding from these obligations is separated from the process of bidding for spectrum. Decoupling the bidding processes is less distorting and would allow Ofcom much greater flexibility to fulfil its statutory obligations in relation to both spectrum allocation and coverage. Our mechanism maintains a link between the bidding stages, so as to ensure that coverage obligations are allocated.

78. The auction would be conducted in three stages:

- Stage 1: Allocation of generic 700 MHz spectrum lots
- Stage 2: Assignment of specific frequencies
- Stage 3: Award of coverage obligations

Allocation of 700 MHz spectrum

79. The 700 MHz spectrum would be awarded in two categories: 6 lots of paired (2x5MHz) and 2 lots of unpaired (10MHz). Lots should be sold on a generic basis, so contiguous assignment within bands can be guaranteed. We propose that each lot have the same eligibility weighting, so as to facilitate switching back and forth between the categories in the auction. The reserve prices should be set a level that is below a conservative estimate of market value but sufficient to raise revenues to cover the expected costs of the coverage obligations.

80. An open (multi-round) auction format should be used to allocate the spectrum. To prevent unsold lots, there should be some mechanism for retaining demand. The hybrid SMR-clock auction used for the award of 2.3 and 3.4 GHz could be a good choice of format.

Assignment of 700 MHz spectrum

81. Where there is more than one winner of spectrum in a category, there should be a second bidding stage to assign specific contiguous frequencies to those winning bidders. The sealed bid combinatorial auction used for both used for the 4G award and the 2.3 and 3.4 GHz award could be a good choice of format.

82. At §1.19 in the consultation, Ofcom highlights the potential for network sharing to reduce deployment costs and generate a better outcome for consumers. If winning bidders had more certainty over network sharing, through securing adjacent spectrum, this could also reduce the level of subsidy required to achieve the coverage obligations as deployment costs would be lower[19] – allowing Ofcom to design a more efficient award. As Ofcom notes in Annex 5 (§A5.11), the 2017 UHF decision opens a way for Ofcom to do that when "*authorising the use of*" this spectrum.

[19] See §3.33(d), §3.59 in the consultation.

83. [✂]

- [✂]
- [✂]

Award of coverage obligations

84. Following the conclusion of the assignment round, there would be a third stage of bidding, conducted using a reverse auction, to determine how the coverage obligations are allocated to operators. In a reverse auction, bidders compete downwards the subsidy paid to them to take on non-commercial obligations.

85. Participation would not be restricted to winning bidders of 700 MHz spectrum but could be open to any bidder that has mobile spectrum in a sub-1 GHz band (i.e. in the 700, 800 or 900 MHz bands). This approach would ensure that coverage obligations are awarded to the operators that can implement them most effectively, rather than awarding them only to winners of 700 MHz paired spectrum. This is much more likely to deliver the public policy objective Ofcom seeks to pursue in the consultation and is definitely more likely to succeed than a process that may lead to unsold encumbered lots.

86. Ofcom would have great flexibility to define the number and geographic extent of coverage obligations. With this approach, there is no auction design constraint limiting the number of obligations to three, as obligations are not tied directly to spectrum lots. For example, Ofcom might award separate obligations for each of the Nations. It might also consider breaking up England into a number of geographic areas. It could still have separate obligations for geographic coverage and for premises coverage. This approach should allow for a more plural and potentially more efficient allocation of coverage obligations across operators. In turn, this would reduce the required level of subsidy.

87. To avoid the risk of coverage obligations going unsold, there could be an obligation on bidders than won 700 MHz lots to bid for certain coverage obligations at the starting price. Such obligations would only be attached to all winning bidders that won at least 2x10 MHz of 700 MHz spectrum, for the reasons stated above.

88. The starting price for each coverage obligation should ideally be sufficient to encourage broad participation by the mobile operators. Obligations should not be so

onerous that Ofcom needs to offer a minimum price above its expected proceeds from Stage 1, such that prices paid out are always less than expected revenues. Notwithstanding this point, Ofcom could market test more onerous obligations but in this case it would not be reasonable to compel winning bidders of paired 700 MHz to bid for these higher obligations.

89. As in the assignment round, we urge Ofcom to consider allowing operators to bid jointly for coverage obligations. It may be more efficient for operators to take on an obligation jointly than for one bidder to do so. For example, if bidders have bid jointly for their assignment position, they would then have the option to bid for subsidy (jointly) in the final stage.

90. We envisage that the reverse auction would be conducted using a descending clock format, similar to that used for the UK electricity capacity auction and the reverse part of the US Incentive Auction. Identical coverage obligations would be sold simultaneously. Otherwise, there could be sequential reverse auctions for each obligation. The order in which obligations by Nation are sold should not matter much, as there should be negligible synergies across regions. A geographic obligation should be sold before a premises penetration in case there are synergies from taking on both.

91. In a descending clock auction, there is a price that ticks down. Bidders have the option to accept the new price or drop out. If they drop out, they can submit an exit bid at the lowest payment they are willing to accept. The auction closes at a clearing price when the number of remaining bidders equals the number of obligations. This process established a transparent market cost for meeting each coverage obligation.

92. The coverage obligations themselves could presumably be delivered using any frequency band. As a practical matter, they could be implemented either as part of a newly awarded licence for 700 MHz spectrum or as an amendment to an existing 800 or 900 MHz licence. Payments to fulfil coverage obligations need not necessarily be made upfront but could be staged based on achievement of build targets.