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Vodafone response to Ofcom Consultation:

Award of the 2.3 and 3.4 GHz spectrum bands. Competition issues and auction regulations

Executive Summary

Vodafone welcomes the opportunity to provide feedback on Ofcom's proposals for the award of licences to use spectrum in the 2.3GHz and 3.4GHz bands. Vodafone fully supports Ofcom's proposal to implement a 255MHz cap on immediately usable spectrum (Option A) and suggests an additional safeguard cap of 80MHz to prevent the monopolisation of 5G spectrum in the 3.4GHz band.

Vodafone believes three principles are critical when considering the framework and rules for this auction:

This auction should occur as soon as possible, including both bands.

Mobile data demands of UK consumers have grown at a cumulative annual rate of 70% since 2011[1]. Vodafone anticipates this growth will continue strongly in the future and recently reported that data usage increased 81% on New Year's Eve relative to 2015[2]. Vodafone's total data usage reported to Ofcom as part of the Connected Nations project in 2016 was 65% higher than in 2015[3].

Mobile Network Operators (MNOs) will need to make key investment decisions on how to provision additional capacity to support this growth in demand and usage. Future spectrum certainty is key to this and there are clear advantages to auctioning the 3.4GHz band alongside the 2.3GHz spectrum now, to allow optimal decisions on technology investment and base station location and numbers. The auction should include both bands so that operators can make efficient decisions on network capacity enhancement across all available technologies.

Given the complexities of getting the 3.6GHz band to market, it is likely that the 3.4GHz band will be the only available 5G capacity band for some time. Further additional delays would put at risk the UK's vision for global 5G leadership, by jeopordising the UK's ability to launch 5G in 2019. This critical band is already being made available in various European countries which are equally ambitious to launch services. .

Auction rules should promote fair competition and guard against strategic bidding.

All current MNOs will remain credible players regardless of the outcome on 2.3GHz auction. Ofcom is prudent in guarding against extreme asymmetry of immediately usable spectrum, while not effectively reserving spectrum for operators that did not seek to acquire spectrum in previous auctions. It was the view

[1] Consultation at 1.7
[2] Mobile News, "Vodafone records busiest festive season for data use", http://www.mobilenewscwp.co.uk/2017/01/03/vodafone-records-busiest-festive-season-data-use/
[3] Vodafone response to S.135 request for Connected Nations Report Question 17, June 2015 consumption ✂, June 2016 consumption ✂.

of the European Commission[4] during its merger investigation that neither Three nor Telefonica are suffering from a spectrum deficit that could result in a loss of credibility.

However, given BT-EE's significant 4G spectrum holdings and market position, it is understandable for Ofcom to take precautions against acute asymmetries in immediately usable spectrum. There could be a risk that BT-EE has an incentive to secure 2.3GHz spectrum merely to prevent others gaining access to it, a risk that was raised by the CMA in considering the BT-EE merger[5].

Consequently, Vodafone supports Ofcom's proposals to implement Option A for the 2.3GHz auction. Options B or D in the Consultation would prevent Vodafone from bidding its intrinsic value for 2.3GHz, and Option E would force Vodafone to choose between investing in 5G spectrum or bidding its intrinsic value for 2.3GHz. These options are incompatible with Ofcom's duties to ensure the efficient use of spectrum and would enable others to potentially acquire spectrum below its true market value.

A 5G monopoly should be prevented.

Vodafone agrees with Ofcom that asymmetry of spectrum holdings should not be considered a danger in and of itself – this holds true for both the 2.3GHz and 3.4GHz bands.

However, Vodafone does believe that Ofcom needs to be alert to acute asymmetry in the 3.4GHz band, i.e. the creation of an absolute or *de facto* monopoly for the initial rollout of 5G services. Without rivalry between multiple 5G players, there would be significantly less incentive for a single player to engage in the early development and promotion of new 5G services at competitive rates to consumers and enterprises. This in turn puts the UK's vision of securing 5G leadership at risk.

Vodafone does not support Option C as stated, as it targets asymmetry of overall holdings rather than specifically addressing the risk of an initial 5G monopoly. However, the use of Option A, with an additional safeguard spectrum cap on the amount of 3.4GHz spectrum an individual operator could acquire, would safeguard against this eventuality. For technical reasons (including the impact of the incumbent assignments in the band) we suggest this limit is set at 80MHz. This would ensure that there could be at least two operators initially competing in the launch of 5G services.

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[4] European Commission "CASE M.7612 - HUTCHISON 3G UK / TELEFONICA UK MERGER PROCEDURE REGULATION (EC) 139/2004" Recitals 775 *("it cannot be reasonably predicted that Three's ability to compete would materially deteriorate due to capacity constraints over the next two to three years"),*
2131 (*"the Commission concludes that....Three will not be capacity constrained"*)
and 2296 ("*The Commission has found no evidence...O2 would...lack the ability to continue influence to a significant extent the competitive dynamics of this market*")
influence to a significant extent the competitive dynamics on this market
http://ec.europa.eu/competition/mergers/cases/decisions/m7612_6415_10.pdf

[5] CMA, "A report on the anticipated acquisition by BT Group plc of EE Limited" Para 12.37,
https://assets.publishing.service.gov.uk/media/56992242ed915d4747000026/BT_EE_final_report.pdf

Contents

1. Introduction

Vodafone welcomes the opportunity to respond to Ofcom's consultation on competition issues and auction design relating to the Award of 2.3GHz and 3.4GHz spectrum bands.

The auction of this spectrum has been subject to understandable delays, and we urge Ofcom to proceed at the very earliest opportunity to get this spectrum into the market. In the consultation paper, Ofcom sets out a number of competition concerns and reflects on the most appropriate ways to deal with them; the rest of this response addresses this:

- Section Two discusses Auction timing,
- Section Three comments on potential competition concerns that Ofcom identified,
- Section Four comments on the options to deal with them,
- Section Five provides feedback on some of Ofcom's Auction rules, and
- Section Six comments on other related spectrum issues.

2. Auction timing and scope

Vodafone agrees with Ofcom that the auction should proceed at the earliest opportunity, and include both 2.3GHz and 3.4GHz spectrum.

Individual customers are using more mobile data, and more customers are using mobile data. Increasing the amount of spectrum available to the market through the auction of these spectrum bands will enable UK consumers and businesses to continue to be able to rely on improving mobile connectivity.

- 71% of adults in the UK own a smartphone[6], and their demand for data means that that average data bundle for Vodafone customers is 4.1GB of data, up 75% year-on-year[7].
- Ofcom's latest information suggests a tenfold increase in data usage over the last five years[8] and
- Vodafone's response to Ofcom's Connected Nations report indicated an increase in data consumption in 2016 of ✂compared to 2015[9].

✂[10][11]. This reinforces the need for capacity spectrum bands, to service this demand in areas of high population density. ✂. Such informed decisions require certainty on possession of the rights to use spectrum (or indeed lack of such rights).

As observed by Ofcom, the 2.3GHz band is already supported in some high-end handsets and is therefore suitable to be used immediately to provide higher-speed mobile services and more capacity. Getting this spectrum into the market allows operators to implement the band in their networks to the immediate benefit of UK consumers.

These bands were originally scheduled to be auctioned some 18 months ago, so the delay to awarding them has pushed back the roll out of higher speed data access, or potentially pushed operators into making inefficient choices to deploy additional network sites in major cities, rather than utilising the additional spectrum that should have been available.

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[6] Ofcom Fast Facts, https://www.ofcom.org.uk/about-ofcom/latest/media/facts
[7] Vodafone internal data
[8] Ofcom Connected Nations Report, https://www.ofcom.org.uk/__data/assets/pdf_file/0035/95876/CN-Report-2016.pdf, Figure 23
[9] Vodafone response to S.135 request for Connected Nations Report Question 17, June 2015 consumption ✂, June 2016 consumption ✂.
[10] ✂
[11] ✂

Having made the decision to allocate these bands for mobile usage, it is right to bring them to the market as soon as possible. We see no reason to delay the auction of these bands any further and would urge Ofcom to proceed without delay. Further delays to the auction will deliver no possible benefit and will only cost UK consumers: costs resulting from uncertainty and delays to service improvements.

Furthermore, whilst not impacting Vodafone itself, Vodafone nevertheless notes that the Ministry of Defence incurred considerable costs in clearing the spectrum, and the Government should have an interest in realising a return on this at the earliest opportunity.

The 2.3GHz and 3.4GHz bands should be auctioned together, now.

Ofcom's obligation to ensure spectrum efficiency

Both spectrum bands give network operators the means to make strategic enhancements to their future mobile data network capacity and speed. For operators to have the choice between further enhancing their 4G offering, and pushing ahead with 5G roll out, they need to be able to compare the costs of each and, with spectrum costs determined by auction, it is essential that both the 2.3GHz and 3.4GHz bands are auctioned simultaneously. Developing 5G standards point towards an approach of shared 4G/5G equipment with dynamic capacity allocation between the technologies; this requires spectrum certainty across the 4G and 5G bands in order to optimise site developments.

Failure to auction both bands together may result in inefficient allocations of spectrum. Each network operator may have a different preference between using 2.3GHz and 3.4GHz spectrum, and auctioning the two bands separately will prevent operators from making an effective trade-off and hence result in inefficient allocations of spectrum and network plans.

Being a 5G world leader requires spectrum certainty now

The UK Government has an ambition of being a leader in 5G by launching services by 2019. The Government's industrial strategy[12] identifies 5G mobile network technology as one of the Eight Great Technologies that will underpin the UK's future economic growth. In his autumn statement, the Chancellor of the Exchequer made clear his ambition for the UK, stating:

"Our future transport, business and lifestyle needs will require world class digital infrastructure to underpin them. So my ambition is for the UK to be a world leader in 5G. That means a full-fibre network; a step-change in speed, security and reliability."

This was reinforced by the announcement of funding to support 5G trials, being made available this year.

Being a world leader means leading on every front and in particular in the allocation and award of spectrum.

3.4GHz is a key pioneer band for 5G technology, with the European Commission's Radio Spectrum Policy Group (RSPG), in which Ofcom plays a key role, stating that[13]:

"The RSPG considers that the 3400-3800 MHz band to be the primary band suitable for the introduction of 5G -based services in Europe even before 2020, noting that this band is already harmonised for mobile networks, and consists of up to 400 MHz of continuous spectrum enabling wide channel bandwidth. This band has the possibility to put Europe at the forefront of the 5G deployment."

Artificially delaying the award of 3.4GHz band would deliver no benefit and would undermine the attainability of the UK's ambition to be a 5G world leader. Other European countries already have advanced plans:

- Ireland is underway with an auction of the entire 3.4-3.8GHz band;
- Italy and the Czech Republic are planning auctions this year;
- Romania and Hungary have already auctioned the spectrum over the last couple of years; and
- Spectrum in this band is already assigned to mobile operators in Spain, Germany and several other EU Member States.

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[12] HM Government Green Paper, "Building our Industrial Strategy", January 2017, p30 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/585273/building-our-industrial-strategy-green-paper.pdf

[13] "Radio Spectrum Policy Group Strategic Roadmap Towards 5G For Europe: Opinion on spectrum related aspects for next-generation wireless systems (5G)", http://rspg-spectrum.eu/wp-content/uploads/2013/05/RPSG16-032-Opinion_5G.pdf, p3.

Market participants need certainty to plan and build networks

Successful bidders elsewhere have included operators such as Vodafone and Telefonica that have a presence in multiple markets: with a finite investment pool, the UK risks being prioritised behind 5G launches in other markets where firm plans can be put in place, based upon spectrum certainty.

Delays in the award would have a direct effect on the timing of service launch. Network planning and deployment can only be put in place once spectrum certainty is achieved; whether awarded new spectrum or not, networks operators need spectrum certainty into order to mobilise trials, network build and deployment.

The 3.4GHz band has interim uses

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There is no benefit in waiting for 3.6GHz

The PSSR frequencies form only part of the primary band identified by RSPG for use in 5G deployment, with the 3.6-3.8GHz bands representing the remainder. As Vodafone commented in our recent response to Ofcom's consultation on that band[14], our preference is that the 3.6GHz band is made available at such a time that it is usable in-line with the 3.4GHz band. In an ideal world, we would be seeing a combined award covering the 2.3GHz, 3.4GHz and 3.6GHz bands.

However, we recognise that there are considerable policy issues to be addressed by Ofcom in the 3.6GHz band, not least whether existing satellite users (many of which are in urban and suburban areas where the band will be needed for 5G mobile use) will be allowed to use the spectrum and, if so, for how long. We note that this consultation drew a wide range of responses[15], including that incumbent usage continue, that 5G usage be allowed regardless of the impact on incumbent users, that usage should be driven by geolocation databases, and that there should be an incentive auction to resolve the issue. Clearly Ofcom will face challenges in reaching a consensus outcome. Hence, we acknowledge that it isn't realistic to expect that the 3.4GHz and 3.6GHz bands will universally be available for usage at the same time, and for the clear reasons stated above, we cannot support any idea that the award of the 3.4GHz band be delayed so that it could be awarded alongside the 3.6GHz band.

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[14] Vodafone response to Ofcom consultation "Improving consumer access to mobile services at 3.6GHz to 3.8GHz", December 2016. https://www.ofcom.org.uk/__data/assets/pdf_file/0031/96916/Vodafone.pdf

[15] Ibid, responses from the BBC, Ericsson, Nominet, BT-EE respectively.

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For all of these reasons, the auction should proceed as quickly as possible, including both the 2.3GHz and 3.4GHz bands.

3. Competition Concerns expressed by Ofcom

3.1 Background - the role of spectrum in market competition

Spectrum availability has some impact on the services provided to consumers as it drives the headline speeds which can influence purchasing behaviour, but it also alleviates congestion resulting from greater data usage. The CMA noted[16] that, at loaded sites, contention from simultaneous users slows down the speeds experienced by users to below the theoretical peak speeds. Adding more spectrum is a means of relieving congestion on these sites, thus allowing users to enjoy higher speeds, as well as download more data.

It is inescapable that there is considerable spectrum asymmetry in the UK marketplace, whatever analysis method is used to quantify this. In our response to the Competition and Market Authority (CMA) provisional findings into the acquisition of BT by EE, we highlighted that, ✂:[17]

"make a contribution to capacity expansion much faster than the other categories of spectrum."

This said, providing connectivity via licensed spectrum is but one tool in the arsenal of mobile operators. Globally, more than half of mobile data was off-loaded onto Wi-Fi in 2016[18], and it is predicted that this will increase to 60% by 2019[19]. In some locations, as 3G networks became congested prior to the introduction of 4G, the proportion of Wi-Fi offload rose to as high as 80%[20]; it is plausible that this could be repeated if 4G networks do become capacity constrained. Operators can thus pursue strategies other than acquiring more licensed spectrum. Vodafone notes that Telefonica in particular has made great efforts to widen its Wi-Fi coverage[21] (hence reducing its dependency on licensed spectrum) and prior to its acquisition of EE, BT was

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[16] CMA Provisional Findings Annex G para 13 https://assets.publishing.service.gov.uk/media/56339560e5274a59dc00000c/BT-EE_-_Provisional_findings_report_Appendices_and_Glossary.pdf

[17] ✂

[18] Cisco VNI Mobile Forecast (2015 – 2020), http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html *"Mobile offload exceeded cellular traffic for the first time in 2015. Fifty-one percent of total mobile data traffic was offloaded onto the fixed network through Wi-Fi or femtocell in 2015"*

[19] Juniper Research, "Wi-Fi to carry up to 60% of mobile data traffic by 2019", https://www.juniperresearch.com/press/press-releases/wifi-to-carry-60pc-of-mobile-data-traffic-by-2019

[20] Fierce Wireless "Wi-Fi offload for mobile networks", http://www.fiercewireless.com/special-report/wi-fi-offload-for-mobile-networks-20-traffic-and-counting, *"In some of the dense traffic areas of Hong Kong, some 80 percent of data traffic is traveling over Wi-Fi"*

[21] Telefonica has 13,000 Wi-Fi hotspots; almost as many as it has mobile masts. See http://www.o2.co.uk/connectivity/free-wifi

pursuing an "inside out" strategy that used licensed spectrum only as a safety net where there was no Wi-Fi[22]. Also, technical developments such as LTE-LAA[23] will allow increased usage of unlicensed spectrum under the control of licensed spectrum bands. In short, not all demand needs to be met via licensed spectrum.

Even in licensed spectrum, operators can make choices between deploying more spectrum (either via refarming existing bands or acquiring new) and utilising technical measures (e.g. more masts, more sectors, MIMO). Although we note that the approach of deploying a denser network can be problematic in the short term due to issues around planning consent and landlord negotiation, usage of additional spectrum is not trouble-free either - for example not every band is supported in every handset, so constraining the utilisation of additional bands[24]. It is also not uncommon to have to renegotiate landlord agreements when an extra spectrum band is added to a mast. Evidence to the CMA suggests that operators are adopting a combination of these choices[25]. The European Commission noted that Three[26]:

"outperformed its rivals in 2014 and 2015 in relation to both 3G and 4G network performance, despite owning the least amount of spectrum and the lowest amount of sites".

Hence, availability of spectrum is important to mobile providers, but it is far from being the only enabler of network capacity, whilst desirable, additional capacity bands are far from essential.

In any case, consumer behaviour reflects that network capacity is not central to buying decisions: a YouGov poll for Ofcom[27] concluded that price and coverage were the most important factors when choosing provider, being ranked as "most important" by 63% of those polled. Factors which are driven by the availability of spectrum, such as connection speed, and unlimited data bundles proved to be only secondary factors, being ranked "most important" by only 19%.

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[22] See for example http://www.coverage-maps.co.uk/guides/bt-to-offer-4g-mobile-coverage.php
[23] Long Term Evolution – Licensed Assisted Access. See for example https://www.qualcomm.com/invention/technologies/lte/laa
[24] For example while Vodafone and Three have obtained licences to utilise the 1400MHz band, this has not yet been deployed at any scale as mainstream terminals are not yet available.
[25] CMA Provisional Findings, Annex G para 60-62, "*all operators…have significant plans to invest in their networks*"
[26] European Commission CASE M.7612, Recital 668
[27] YouGov poll cited in 2015 Ofcom Communications Market Report Figure 4.7, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/14116/uk_4.pdf

In summary, additional licensed spectrum is not the only answer to the question of capacity, and in any case it cannot be stressed highly enough that consumers regard speed and unbundled packages as secondary drivers compared to price and coverage. This is borne out by Three and Telefonica, the operators with lowest spectrum share, increasing their market share over recent years.

In the consultation document, Ofcom sets out a number of competition concerns relating to spectrum availability: on the one hand it flags the risk of asymmetry as a result of one party holding too much spectrum, and separately flags a concern that the market is left without four credible wholesalers. Ofcom is right to consider the impact on the market of possible outcomes of the auction, but should be cautious about intervening in order to engineer one or more particular outcomes, and only do so as a last resort to ensure that a harmful outcome is avoided, rather than seeking to engineer a preferred outcome.

3.2 Competition concern #1(i) – risk of asymmetry in overall share of spectrum

Vodafone agrees with Ofcom: in the UK market there is asymmetry of overall share of spectrum, but assessment on this basis ignores the fact that only a subset of this is usable spectrum that impacts competitive positioning.

✂

Therefore, we agree with Ofcom's distinction between spectrum that is immediately usable, versus that which will only be usable in coming years when a suitable ecosystem develops and we agree that Ofcom is absolutely correct to focus on immediately usable spectrum. Conversely, that does not mean that future-looking 5G spectrum holdings can be totally ignored – we have some concerns around inadvertent creation of a 5G monopoly, that we discuss further below.

3.3 Competition concern #1(ii) – risk of asymmetry in immediately usable spectrum

Vodafone agrees that it would be a concern if the level of spectrum asymmetry in immediately usable spectrum reached such an imbalance that it had an impact on the market as a whole.

2.3GHz spectrum is available for usage now. In contrast, although there is some scope for 3.4GHz spectrum to be used as expansion for 4G/LTE networks, the main use case will be for early deployment of 5G networks – it does not fall within the category of "immediately usable" spectrum.

Ofcom is right to be concerned about *extreme* asymmetry: the prospect of an operator holding a very high share of usable spectrum so is able to offer superior services that cannot be matched, having a significant influence on the market. Vodafone supports Ofcom's concerns about BT-EE's position in this regard.

BT-EE's incentives

✂[28293031].

There is a risk that BT-EE could well have an incentive to acquire 2.3GHz spectrum, even though it may not need it given its current spectrum holdings. This is because BT-EE may prefer to prevent others from having the spectrum, and continue to make considerable marketing play on the superior speeds offered by its network. Such a strategy would not represent efficient use of the spectrum, and would deprive other networks from the ability to catch up with BT-EE. Even if BT were to acquire just 20MHz of the 2.3GHz band, it would still have at least 50% more spectrum than its nearest competitor[32]. If BT-EE bid aggressively for spectrum in the 2.3GHz band, they could have as much spectrum as the rest of the market put together✂"[3334]

As set out in Section 3.1 of this response, the service characteristics that are delivered by access to licensed spectrum – headline speeds and the ability to provide large data allowances – are not primary drivers of customer behaviour and are most important to only a minority of customers. Even within that subset of customers, it is unclear whether when stating a preference for high data speeds, the respondents desire the highest speed available in the marketplace, or actually a speed which is commensurate with the applications that they wish to use. There is little evidence, then, as to the proportion of customers that would move away from an operator with low spectrum stocks solely on the basis of factors driven by this: it is likely to be a small minority.

✂[3536]

Although the volumes of customers driven to change provider by such factors is limited, the high proportion of diversions likely to target to BT-EE, coupled with the potentially significant profit margin from these customers, suggests that Ofcom could be correct to be concerned that BT-EE's incentive to bid strategically outweighs the potential costs.

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28 ✂
29 ✂
30 ✂
31 ✂
32 ✂
33 ✂
34 ✂
35 ✂
36 ✂

Furthermore, even if the risk is small and BT-EE does not have the incentive to bid for the entirety of 2.3GHz spectrum, then the cost of putting in a regulatory cap to ensure that BT cannot bid beyond a certain level is relatively small. As such, we conclude that Ofcom may well be prudent to set auction rules that mitigate against this possibility.

Vodafone's incentives

With regard to applying rules more widely and beyond BT-EE, the perceived benefits of doing so are vastly outweighed by the distortionary impact on competition. Ofcom is quite right in concluding at paras 5.42-5.44 of the consultation that the prospect of strategic bidding applies only to BT-EE and not to Vodafone.

✂. Contrary to what has been claimed in the media[37], Vodafone has shown efficient husbandry of spectrum stocks and does not "hoard" spectrum. Our current spectrum deployment is illustrated in Table 2 below. ✂

Vodafone has paid a market price for this spectrum based upon the intrinsic value to Vodafone's business. ✂.Contrary to hoarding, Vodafone is investing in a network which is fit for the future, in particular dimensioning the radio access network to cope with medium term growth.

Table 2: Vodafone Spectrum Utilisation

Band	Approximate number of masts enabled at end of FY17
800MHz	✂
900MHz	✂
1800MHz	✂
2100MHz	✂
2600MHz FDD	✂
2600MHz TDD	✂

Secondly, the hypothesis of strategic bidding by Vodafone relies upon an assertion that if Three and Telefonica were to be deprived of spectrum, Vodafone would be the beneficiary (at least to the extent of covering the cost of that strategic bidding). However, if a customer were to hypothetically leave Three or

[37] "Three accuses EE and Vodafone of hoarding airwaves to stifle mobile competition", The Telegraph, 6th September 2016, http://www.telegraph.co.uk/business/2016/09/06/three--accuses-ee-and-vodafone-of-hoarding-airwaves-to-stifle-mo/

Telefonica and move to an alternative provider, then the data in Table 1 and analysis above shows that Vodafone would not be the main beneficiary, should their choice of new provider follow current migration patterns.

✂

It therefore follows that, conservatively, the supposed benefits to Vodafone of bidding strategically would flow at a level *at least* twice as high towards BT-EE – a major competitor – than it would to Vodafone itself.

✂[38]

Therefore whilst Vodafone's spectrum holding is higher than both Telefonica and Three, Vodafone does not find itself in the unique position of BT-EE where it:

- has by far the market leading share of spectrum,
- would by winning the whole 2.3GHz band have a holding 49% of immediately usable spectrum
- is capable of bidding strategically to retain this position to the detriment of consumers in the UK and
- is not concerned with any knock on effects to other markets.

Vodafone, does not have a market leading spectrum holding, and even if it won the 2.3GHz band it would still have less spectrum than BT-EE: there is no value to Vodafone in strategic bidding.

Whilst the supposed benefits to Vodafone of strategic bidding are not backed up by commercial analysis, establishing a precedent that auction design will prescribe an outcome and/or specifically overturn previous auction outcomes would be a significant cost to the market; what is the purpose of innovation and investment when regulation can be expected to underpin failure? ✂

38 ✂

3.4 Competition concern #1(iii) – risk of asymmetric 3.4GHz holdings

An auction design which allows a 5G launch monopoly to develop should be avoided.

As Ofcom points out, there is nothing intrinsically concerning about asymmetric holdings of 3.4GHz; indeed Vodafone would go further and assert that asymmetric outcomes are to be expected, given different competitive strategies, and should be embraced. ✂

As such, allowing for the potential need for guard bands, a symmetric outcome would not allow the market to provide 5G services that were highly differentiated from 4G.

✂

Such a symmetric outcome would be reasonable if it occurred because all four operators desired early entrance into the 5G marketplace, bid accordingly, and were willing to pay the price of consequential network rearrangements. It should not, however, become the outcome due to specific regulatory intervention.

On the other hand, an auction outcome where the initial allocation of 5G spectrum is awarded to a single market player should be avoided. Experience of 4G has shown that having only a single operator with the necessary spectrum to launch services impacts upon competition for a protracted period, and does not achieve any goal of making the UK a world-leader. The National Infrastructure Commission notes[39]:

"The UK performs poorly in comparison to other countries when looking at the availability of 4G – a metric that captures how much of the time a phone is able to connect to the 4G network"

...noting that the UK lies 54th out of 78th countries assessed with respect to 4G availability. Whilst Vodafone may not agree with this analysis, it is clear that delays to spectrum auctions and the subsequent dominance of early 4G services by one operator has not made the UK a leading 4G nation.

It would be an extremely poor outcome for the UK market if this situation was to be repeated by the 3.4GHz auction resulting in one operator securing all of the available 5G spectrum (or resulted in such small spectrum holdings by other players that no other player could launch compelling competitive 5G services).

EE was able to roll-out 4G services using its very large existing assignment of contiguous 1800MHz spectrum in advance of those operators reliant upon deploying 800MHz from scratch. Not only did the sole position of

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[39] Connected Future, National Infrastructure Commission, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/577906/CONNECTED_FUTURE_ACCESSIBLE.pdf, Executive Summary page 7

EE in early 4G service launch reduce its incentives to roll out its services compared to the case if everyone had been in a similar spectrum position, but ✂. Ofcom needs to be careful to ensure that the outcome of the 3.4GHz auction doesn't again allow a single player to control the necessary spectrum to launch 5G services.

✂[40]

✂– the cost to consumers of such an outcome emerging would be significant. For example:

- A monopolist does not guarantee early deployment. A monopolist would have the commercial luxury of deciding when to deploy 5G services. It may decide that it would prefer not to carry out an early deployment but rather deploy just ahead of subsequent auctions, particularly if it has a lead on 4G services. However if two or three parties are awarded 3.4GHz spectrum, there would be an urgency on each of the parties to commence deployment.
- The timing of alternative spectrum availability is uncertain. The operators not obtaining 3.4GHz spectrum could have a protracted wait for further spectrum. Whilst 700MHz will be available in 2020 (weather permitting[41]), it is a poor substitute for 3.4GHz, as it is best suited to coverage rather than capacity. The timing for the 3.6GHz band is less clear, and even when it becomes available the band could to some degree be "contaminated" with incumbent users: depending upon the outcome of Ofcom's current policy activity on the 3.6GHz band, existing satellite users may be afforded protection from mobile usage, either temporarily or on an ongoing basis. The monopolist would then be incentivised to delay the release of additional spectrum whether via legal challenges or otherwise[42]. In the meantime, it would have the luxury of assured spectrum with which to plan its network.
- First mover advantages persist even when spectrum becomes available. ✂There is every reason to suppose that as with 4G, a first moving 5G monopolist would be able to sustain its coverage advantage significantly beyond the availability of spectrum to competitors: but unlike BT-EE's 4G

[40] ✂

[41] The 2020 date for 700MHz availability for mobile usage is contingent upon Arqiva being able to erect temporary television transmission masts during 2017. Should there be bad weather, the whole programme could be subject to delay and Ofcom has built in a review point at the end of this summer.

[42] Especially if they were an incumbent user of the 3.6GHz band.

lead where the timing of the Combined Award was reasonably well known, for 5G the timing of alternate suitable spectrum is far from clear, thus limiting "second wave" operators' ability to react.

- Early 5G services may favour long-term agreements. Even when additional spectrum allows coverage and spectrum holdings to be normalised between the first mover monopolist and stifled competitors, it will take a significant period for market shares to similarly normalise, because of customer inertia and two year agreements which are typical for mobile contracts. Indeed, this is likely to be even more significant for 5G services, because for example Internet of Things (IoT), industrial applications and public sector (smart cities) agreements which will be the drivers of scale are likely to be long term strategic contracts rather than individual consumer relationships.

In conclusion, Vodafone is of the view that the benefits of ensuring there are at least two 5G players in a position to roll out early 5G access are significant, whilst the cost of preventing one player from getting all of the 3.4GHz spectrum would be minimal. For these reasons, we urge Ofcom to consider a safeguard cap, which could prevent this worse case outcome without constraining bidders with reasonable ambitions.

3.5 Competition concern 2 – risk of there not being four credible wholesalers

It is ironic that in planning the event that brings more spectrum into the market, we are discussing whether one or more parties has sufficient spectrum in order for there to be four credible wholesalers. This award of spectrum increases the opportunity for every party to remain a credible wholesaler and that is why the auctions should proceed as soon as possible. The auctions give participants every chance of increasing spectrum holdings and should they feel that they are at risk of not being credible wholesalers, then we would expect this to be reflected in their own intrinsic valuation and bidding strategy.

Having said this, we agree that the analysis presented by Ofcom demonstrates that even absent Three or Telefonica acquiring 2.3GHz spectrum, they would remain credible players, having 10-11% of spectrum (as indeed the analysis presented by Ofcom in the previous consultations on this matter similarly concluded).

Additional spectrum is not the only way to deal with high utilisation of existing holdings. Vodafone evaluates or uses a variety of techniques to manage capacity demand and supply, and would expect others to do so too. Such solutions include:

1. Adjusting data pricing to encourage more efficient consumption of data capacity – i.e. by ensuring that marginal pricing is better related to marginal cost (including the pricing of "all you can eat" tariffs).
2. Adjusting which target segments are prioritised and how services are packaged or each respective segment (not all customer segments value capacity above price and coverage).
3. Network expansion measures, such infilling, greater use of cell sectorisation and the introduction of MIMO.
4. Greater use of Wi-Fi offload and LTE-LAA.

In any case, Ofcom's research[43], and the European Commission[44], both see that price is generally the primary factor influencing customer choice (and therefore competition), ahead of network performance.

Three

Vodafone acknowledges that Three's spectrum holdings are smaller than those of Vodafone's and BT-EE's. However, even if Three's spectrum is more heavily utilised than other operators, this does not necessarily

[43] YouGov poll cited in 2015 Ofcom Communications Market Report Figure 4.7
[44] Case M.7612 recital 221

imply that it has insufficient spectrum to remain a credible player. On the contrary, it suggests a well-utilised network. When considering the issue, the European Commission concluded that Three[45]:

"outperformed its rivals in 2014 and 2015 in relation to both 3G and 4G network performance, despite owning the least amount of spectrum and the lowest amount of site".

and concluded[46]:

"it cannot be reasonably predicted that Three's ability to compete would materially deteriorate due to capacity constraints in the next two to three years"

Moreover, Ofcom finds that on a MHz/subscriber basis Three actually has much more spectrum than many operators in comparator countries[47]. Most importantly, Three's currently high spectrum utilisation is a result of its own commercial decisions and thus could be reversed by making different commercial decisions, either in the auction or in setting its market strategy. Obviously Three knows its business better than any other party: it is best placed to determine its intrinsic value of spectrum such as the 2.3GHz band in accordance with its commercial ambitions. Assuming that Three would bid rationally in an efficient auction, its success would and should depend on its intrinsic value relative to other bidders.

We conclude that Three is therefore a credible operator and will remain so, with or without access to 2.3GHz spectrum.

[45] Ibid recital 668
[46] ibid recital 775
[47] Consultation Figure A6.27

Telefonica

Telefonica also has a smaller amount of spectrum than BT-EE and Vodafone.

As with Three, Telefonica participated in the Combined Award and purchased paired 800MHz spectrum at considerable cost. If Telefonica feels that it is capacity-constrained then the forthcoming auction would provide ample opportunity to address this. There is no reason to suggest that they would require or merit special treatment in the auction to facilitate that purchase, indeed if they are truly constrained then they will presumably value the spectrum more highly than other bidders.

Like other operators, Telefonica uses non-licensed spectrum methods of handling mobile data traffic: as noted in Section 3.1, Telefonica has already focussed on its Wi-Fi offload capability and has options such as:

- It could further increase the volume of Wi-Fi sites, or
- It could utilise further unlicensed bands at these sites as Ofcom liberalises the 5GHz band[48], including LTE-LAA.

We conclude that Telefonica is therefore also a credible operator and will remain so, with or without access to 2.3GHz spectrum.

Both Three and Telefonica will remain credible competitors on the whole regardless of whether they secure 2.3GHz spectrum, and it would seem highly unlikely that they would not be able to continue serve most, and probably all, segments. Therefore, all four national wholesalers will remain credible, regardless of whether they obtain 2.3GHz spectrum.

[48] "Improving spectrum access for consumers in the 5GHz band" https://www.ofcom.org.uk/consultations-and-statements/category-1/5-GHz-Wi-Fi

3.6 Conclusion on Competition Concerns raised by Ofcom

Distinction between immediately usable and longer term spectrum

We agree that Ofcom is correct with the distinction between spectrum that is immediately usable versus that which is more suited to longer term deployment. Neither should be ignored, but it would be an error to consider all spectrum as being equal.

Immediately usable (2.3GHz) spectrum

We agree with Ofcom's assessment that none of the national wholesalers' future credibility would be in jeopardy. Ofcom should set auction rules only to guard against the inefficient allocation of spectrum: there is a risk that BT-EE could acquire an excess of immediately usable spectrum. This risk does not apply to Vodafone as, by every competition measure that Ofcom has previously used, Vodafone's holding in actual and comparative terms means that it could not have any distortive effect on the market, whether or not it acquires 2.3GHz spectrum.

Regulatory intervention beyond a potential cap on BT-EE would distort the market and prevent players from bidding to their intrinsic valuation of the spectrum. Artificially restricting access to the band such that only two players could secure the band between them at the reserve price jeopardises the integrity of future auctions and spectrum management as a whole: we agree with Ofcom's conclusions that this should not be pursued. The competition measures should be targeted to address *solely* the issues identified, and not extend or engineer particular outcomes.

5G (3.4GHz) spectrum

Vodafone fully agrees that there is no need to be concerned about an asymmetric outcome in the 3.4GHz band. However, we are concerned about the potential creation of a *de facto* monopoly for 5G services, which Ofcom could address with minimal additional intervention, as we set out in Section Four.

4. Options to address competition concerns

Having identified only one competition concern that needs to be addressed, Ofcom has presented a variety of approaches to the auctions. Vodafone agree with Ofcom that only Option A proportionately targets Ofcom's competition concerns.

4.1 Do nothing

Vodafone believes in an approach of not intervening in the structure of auctions, and only imposing constraints aimed at addressing competition issues if regulatory intervention can be objectively justified to prevent or remove an inhibitor to competition in the marketplace.

In Vodafone's view, Ofcom has set out those concerns in the consultation paper, and we agree that the auction design needs to take into account that:

- For immediately usable spectrum, a "do nothing" approach could potentially lead to BT-EE possessing as much spectrum as its competitors put together.
- For 3.4GHz spectrum, there risk is the creation of an early 5G monopoly that stifles this key development.

If either or both outcomes were allowed to persist, there is a risk that the marketplace could not be credibly considered to be competitive. Such potential for market failure must be avoided. Therefore, Vodafone agrees that "do nothing" is not a reasonable approach for this auction.

4.2 Option A – Cap of 255MHz (42%) on immediately usable spectrum

Vodafone fully supports the implementation of Option A with respect to immediately usable spectrum. It represents the lightest touch intervention that safeguards against the main competition concerns, whilst not significantly veering from an unconstrained auction.

The effect of the cap is to prevent BT-EE from acquiring 2.3GHz spectrum (unless it divests existing holdings). A cap which prevents BT-EE from obtaining further immediately usable spectrum avoids the danger of an extreme asymmetry in spectrum being realised. It is not realistic to suggest that BT-EE is spectrum constrained in any way, nor that it is likely to be, prior to bands such as 3.4GHz coming on stream - hence, there is no reason why BT-EE needs access to the 2.3GHz band in order to support its operations. As its intrinsic value for the spectrum must therefore be limited; the downside risk of BT-EE not participating in the 2.3GHz auction is minimal to non-existent.

A 42% cap is proportionate because it will achieve the sole objective of preventing extreme asymmetry in spectrum holdings and has no downside risk or impact.

The consultation raises the further option of only applying the competition measures once a threshold price is reached on 2.3GHz. This has some theoretical merit: in Option A, BT-EE would be allowed to bid up to its intrinsic value for the spectrum, but barred from purchasing once the auction price exceeds this. In practice, however, this approach is flawed by the impossibility of ascertaining the correct intrinsic value. If the threshold value is set too low, then BT-EE would be prevented from bidding a fair value (which the auction design was not intended to do), whereas if set too high, there is some scope for the cap not to work and to allow BT-EE to bid above its intrinsic valuation. Ofcom's analysis at Annex 8 of the consultation illustrates the difficulty in determining this threshold value – the best proxy that can be found is imperfect, and relates to spectrum prices achieved in a different band some three years ago. Since then:

1. There has been disruptive M&A activity in the market place (it's notable that the intrinsic value that Ofcom would be seeking to determine for this Option would be for BT as a company incorporating EE, a combined entity that didn't even exist in 2013),
2. LTE services have now been launched (hence changing growth assumptions compared to what would have been envisaged in 2013), and
3. Extra spectrum bands have emerged (and inherently the value put on spectrum depends on the supply of future spectrum available).

Even negating these issues, Ofcom's analysis was unable to reliably ascribe an intrinsic value for BT-EE for the 2.3GHz band. Any error in setting the threshold value could mean that the competition measure mis-fires, either prematurely (and unjustifiably) excluding BT-EE[49], or allowing manipulation of the auction on their part. It would clearly be in BT-EE's interest in this circumstance to portray Ofcom as having understated their intrinsic value, so Ofcom would have little prospect of confirming whether their analysis was correct.

In the event that Ofcom did manage to accurately ascertain BT-EE's intrinsic value, then bringing this information into the auction design would release it to other market players – and this intrinsic value is the most confidential of information. Even if Ofcom tried to obfuscate the threshold price, other bidders could learn it by observing a step change in the reported demand (or in the number of their provisional winning

[49] This could be portrayed to be no worse than outright excluding BT per the core Option A which is inherently setting a threshold of £0, but in reality it would be worse because it would be giving the illusion that they were participants in the auction when practicably they weren't.

bids) during the auction. Vodafone therefore opposes modifying any of the Options to incorporate a threshold.

Notwithstanding Vodafone's support of Option A, we do believe it could be enhanced by a variant of Option C, to address the issues around potential creation of a *de facto* monopoly identified in Section 3.2 of this response: we return to this point in our observations on Option C.

4.3 Option B – Cap of 150MHz (25%) on immediately usable spectrum

Like Ofcom, Vodafone does not support this option, which would be unprecedented and given the competition analysis, totally lacks any purpose or justification. Ofcom's competition analysis has not identified the need for four national wholesalers to have identical, or similar, spectrum holdings in order to be credible.

Option B appears to seek a single outcome where all network operators have equal resources - nothing more, nothing less. This is inconsistent with the market-driven approach to spectrum awards that has been a feature of the market for almost twenty years. It removes the ability of individual network operators to determine their own intrinsic value for the spectrum and risks spectrum being unused if allocated too freely on an 'equal share' basis.

Even if such equality was Ofcom's goal, then this Option would not serve to achieve it. On the contrary, it would entrench BT-EE's spectrum asymmetry because Vodafone, as the second largest spectrum holder, would be excluded from the auction. Any chance of Vodafone closing the gap in immediately usable spectrum holdings would be withdrawn. The cap would simply serve to close the gap between the three operators with least spectrum, leaving BT-EE in front.

Preventing Vodafone from bidding for 2.3GHz spectrum would be perverse; with a spectrum holding of less than 30% of usable spectrum there can be no suggestion that Vodafone has an excessive holding that has any negative effect on the market. There can also be no real suggestion that Vodafone is hoarding spectrum, as Table 1 in Section 3.3 demonstrated. Further, as described in Section 3.3, Vodafone has neither the ability nor incentive to bid on a strategic basis.

Were Ofcom to over-regulate and hence exclude Vodafone, the reality is that bidders for the 2.3GHz spectrum would be limited to potentially just Three, Telefonica, and any new entrant wishing to purchase spectrum. ✂. As a result not only would be spectrum be awarded cheaply, it would also deprive Vodafone from acquiring spectrum that would serve to maintain competitive intensity in the market.

Inherently, this means that Three and Telefonica will have been rewarded for their low spectrum holdings, which is due to their approach to previous auctions. We note that in its analysis of the Combined Award, the National Audit Office concluded[50]:

> *Our evaluation of Three's bidding strategy suggests that it was designed to ensure that Three never paid more than the reserve price for spectrum packages that had been reserved for it or new entrants to the market. Three knew early on in the auction that it was the only bidder for the reserved spectrum. In our opinion it is very unlikely that the reserve price was equal to its true value to Three's business.*

✂[51]

An auction structure which offers spectrum under favourable conditions distorts the established market-based approach and sends all the wrong messages – it would be a reward for past failure, and will remove the cost of failure, creating an acute moral hazard problem for the future. With such a precedent, nobody would ever have an incentive to bid to their true valuation in an auction, because they could rely on regulatory support at a subsequent auction.

Ofcom sets out a variation on Option B whereby BT-EE would be outright excluded, and Vodafone restricted to acquiring 20MHz of 2.3GHz spectrum. The objective justification of such an approach is not explained. We can only assume it is intended to ensure that spectrum is allocated to Three or Telefonica, however there can be no justification for any intervention to ensure that these operators are automatically guaranteed spectrum and guaranteeing that only one secures spectrum makes even less sense. With no objective justification, this approach cannot be pursued.

A further variation suggested is to use threshold values to exclude first BT-EE then Vodafone from the 2.3GHz spectrum, set at their respective intrinsic values. As set out in our observations on thresholds under Option A, this is impracticable as well as quite artificial and should not be considered any further.

4.4 Option C – Cap of on immediately usable spectrum (42%) combined with overall spectrum cap (37%)

Vodafone does not support Option C as described, but a variation on it could address the concerns we have expressed regarding the potential creation of a *de facto* 5G monopoly.

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[50] 4G radio spectrum auction: lessons learned, https://www.nao.org.uk/wp-content/uploads/2015/03/4G-radio-spectrum-auction-lessons-learned.pdf, p6

[51] ✂

Ofcom's concern should not be asymmetry, but a situation where one operator dominates spectrum holdings. A safeguard cap, applied solely to 3.4GHz spectrum, would prevent this happening – there is no need to involve other spectrum holdings because these are irrelevant to the question of whether an individual operator dominates 5G services. Also, setting the level of the cap based upon a percentage would be flawed, because it would imply that there was some significance to a particular percentage figure (and worse, that this could be applied in subsequent auctions) – what matters is that once the largest successful bidder takes their blocks, there is sufficient spectrum available for there to be a second credible 5G competitor and an early monopoly is not established.

Vodafone considers that an absolute minimum of ✂MHz of spectrum would be required to be a credible 5G competitor and, allowing for the potential need for guard bands on either side[52], this translates to ✂MHz of spectrum being required. This would imply a cap of ✂MHz for any single bidder in the 3.4GHz band. However, we note that, with 150MHz available, the UK BroadBand (UKBB) holding effectively splits the 3.4GHz band into two blocks of 70MHz and 80MHz in size (and absent concrete information that UKBB will participate in the assignment phase of the auction, a prudent assumption is that this split will persist). ✂

It may be that no monopolist emerges during the auction – if that is the case, then the cap will be of no consequence and Ofcom will have lost nothing by putting it in place. However, if a monopolist does emerge and no safeguard cap was put in place as a precautionary measure, then we will find that a single operator will dictate the pace of 5G rollout in the UK. ✂

As set out in Section 3.4, if the outcome of the 3.4GHz award is asymmetric but usable spectrum holdings (as opposed to a monopoly), this is not a concern as future auctions will offer more spectrum to the market. Indeed, it is almost certainly preferable to have a degree of asymmetry in the context of longer term spectrum efficiency (i.e. avoiding unnecessary fragmentation). Further, nobody can second-guess individual network operator 5G plans, hence their consequent requirement for spectrum. An aggressive cap aimed at preventing asymmetry would mean that any operator with plans to be a global leader in 5G would be deprived of the required spectrum, whilst spectrum would be inefficiently left in the hands of operators with no concrete 5G roadmap (or, at worst, left unsold).

In the event that Ofcom was concerned about asymmetry in the award of 3.4GHz, Option C as set out is still not an appropriate way to address it. The spectrum bands currently held by operators will not be usable for 5G services in the short-medium term (although we don't rule out refarming in the longer term). Therefore,

[52] ✂.

to restrict the quantity of 5G spectrum that an operator can acquire based upon their existing 4G-ready holdings does not make sense, unless Ofcom was seeking to address asymmetry of overall holdings - which it has concluded is not a concern.

Examining overall holdings would mean that Ofcom is content for an operator with low existing spectrum holdings to dominate 5G spectrum, but has a problem if that dominating operator already possesses larger 4G spectrum holdings. This can only be logical if 4G and 5G services are directly substitutional – i.e. the constrained operator that possesses 4G spectrum can somehow compensate for poor 5G services via their 4G offering – but there is little evidence that this would be the case.

4.5 Option D – Reserve two lots of 2.3GHz spectrum

Like Ofcom, Vodafone does not support this option. This option is essentially Option B phrased differently, the nuance being that this prevents either Three or Telefonica obtaining the entirety of the 2.3GHz band.

✂

Further, even if ✂Three or Telefonica managed to obtain the entire 40MHz, it is unclear what Ofcom's objection would be to that - what justification could there be to utilise competition measures to prevent an operator with <15% of usable spectrum from obtaining 7% more in order to close the gap with the two operators with superior spectrum holdings?

This option would deprive Vodafone, an operator not possessing excessive spectrum stocks, from bidding for the 2.3GHz band; Ofcom would in effect be giving Three and Telefonica spectrum below the market price, rather than allowing the auction to set the right price for the allocation of the spectrum This would reward failure to invest sufficiently in past auctions, while allowing BT-EE to maintain its spectrum advantage over its nearest competitor (in spectrum terms). This would be wholly without justification.

4.6 Option E – Tight (30%) overall spectrum cap

Vodafone rejects this option as a rationale and proportionate solution to the market analysis and competition problems identified by Ofcom. Ofcom's analysis, with which we agree, is clear that there is no problem with asymmetry of spectrum holdings as a whole: instead, what matters is viability of operators today, i.e. based on spectrum usable today.

Overall spectrum holdings are neither here nor there and even if it was correct to point to them rather than usable holdings, the choice of a 30% cap is unhelpful for a free market. This implies that inherently every operator would need to hold between 20% and 30% of spectrum. Like Option B, this is veering perilously

close to a centrally planned allocation rather than a market based process which efficiently allocates spectrum according to each operator's customer base, service ambitions and appetite to invest. Such an approach would limit an operator's ability to acquire higher spectrum stocks to deliver on its network investment or business strategy, because of an arbitrary 30% cap. Conversely, an operator with smaller market share could be inefficiently sat on excess spectrum stocks, because the system would mean they hold a minimum amount of spectrum (possibly acquired at a distorted price) even when their business plans didn't warrant it. There would be no ability for operators to signal material different intrinsic worth for spectrum in terms of their investment plans, customer numbers, customer mix and customer propensity to pay for enhanced services.

Operators that had in good faith paid for spectrum at market rates in previous auctions would be disadvantaged, because regulatory action to cap spectrum holdings would devalue this spectrum.

✂[53]

It would also mean that BT-EE was effectively barred from the 3.4GHz auction, hence from launching 5G services. Their only options would be to divest spectrum (which is unlikely to be feasible before an auction in 2017, and, if it is, could not be at realistic market value), or to refarm existing spectrum holdings (which we do not consider is feasible in the short-medium term). It is for BT-EE to defend its position, but we can see little justification for excluding BT-EE from the provision of 5G services.

Adopting this option would contradict a market-based approach, be discriminatory and completely change not just spectrum investment in the UK, but investment in the sector as whole. It would send the message that if an operator fails to invest adequately in an auction, they can then be considered the underdog and get special treatment in subsequent auctions.

[53] ✂

5. Auction rules

5.1 Withdrawal

Vodafone broadly supports Ofcom's revised proposals, which address the majority of the concerns we set out in our previous responses.

Ofcom's proposal to allow a bidder which withdraws to subsequently be allocated a licence for the withdrawn spectrum (subject to a 100% penalty fee) is preferable to the spectrum going unsold. The 100% fee to obtain the spectrum is very onerous, although the logic that the marginal cost for the withdrawn bidder of accepting the spectrum should be the winning bid is understood (the withdrawal penalty is in effect a sunk cost at this stage). We do question whether this is onerous to the point that the withdrawn bidder would not reasonably pay the extra to obtain the licence, in which case the provision would have no effect. We are also concerned that, given the high penalty, the only reason why a bidder might try to take advantage of this provision is to circumvent the auction eligibility rules, and possibly also to circumvent a spectrum cap. Finally, it seems unbalanced to offer the withdrawn spectrum back to the bidder – potentially in violation of eligibility and/or cap rules – without giving the same opportunity to other bidders.

As an alternative suggestion, we draw Ofcom's attention to provisions in other SMRAs (for instance those run in Germany in 2010 and 2015, and in Greece in 2011 and 2014) to allow a secondary auction for unsold lots, starting again at the reserve price, but open to all bidders who have won spectrum in the main auction, and with no withdrawal rule this time. A secondary auction was in fact used in Greece in 2014, and was concluded immediately after the completion of the main auction (on the same day), with the previously unsold lots being successfully sold. Generally such secondary auctions can be run quickly, using the same software as the main auction.

We note that the regulations as currently phrased means that the withdrawn bidder is able to decide whether to proceed at the end of the Principal stage, i.e. presumably is then able to participate in the Assignment stage. We question whether this is appropriate, or whether an alternative may be to exclude the withdrawn lots from the Assignment stage (so that the withdrawn bidder's requirements are the last to be taken into account once everyone else's requirements are satisfied). Such an exclusion could also apply if Ofcom decided to hold a secondary auction for unsold lots, but was for some reason not able to do so immediately after the completion of the Principal stage; instead the secondary auction could follow the completion of the Assignment stage of the original auction (and so would not delay the issuance of licences).

Although accepting the proposal, we further query the logic of insisting that a withdrawn bidder in both the 2.3GHz and 3.4GHz accepts a licence and pays the penalty on both bands, or neither.

Notwithstanding these concerns, Vodafone is comfortable to proceed with the auction rules as set out.

5.2 Other comments to the auction regulations

Vodafone continues to believe that the publication of information following each round of the Principal stage remains curious, i.e. that bidders are not informed where there is no excess demand and instead this is portrayed that there is excess demand of at least zero and less than 20MHz (lack of excess demand will be detectable by the fact that the round price has not increased; excess demand of exactly 20MHz will be reported as less than 40MHz). However, in the interests of not delaying the auction any further we are comfortable to proceed with the rules as set out.

Vodafone has no further comments on the detailed auction regulations.

6. Other matters

6.1 Fragmentation of the 3.4-3.8GHz band

In our response to Ofcom's consultation on the 3.6-3.8GHz band[54], Vodafone stressed the importance of getting this band to market as soon as possible, ideally in a time-frame to make it usable concurrently with the 3.4-3.6GHz band. We are concerned about the complexity of this – although it may be feasible to secure the first deployments in-line with the lower band, in practical terms, there will need to be coexistence with incumbent users for a period of time, which will make it less valuable for 5G usage in the medium term.

The 3.6-3.8GHz band cannot be considered for auction until the coexistence policy issues are resolved, and the timing for ubiquitous usage are absolutely known and codified. It is inconceivable that this can occur in time to allow it to be included in the PSSR auction during the first half of this year.

✂

Absent this, the UK will lag the deployment of 5G services in other countries. Therefore, it is unrealistic to consider that the 3.4-3.6GHz and 3.6-3.8GHz awards be combined; we must proceed with the 3.4-3.6GHz band in isolation.

This two-phased approach does however raise the spectre that the 3.4-3.8GHz band will be fragmented, with operators holding spectrum from both awards. The 5G standards are designed to exploit contiguous spectrum allocations. We are hopeful that market mechanisms will deal with this fragmentation, by way of spectrum swaps to build contiguous blocks. However, Ofcom should monitor the situation, potentially intervening should market mechanisms not result in efficient spectrum utilisation.

6.2 Developing standards

The nature of the UK's desire to be at the leading edge of 5G deployment means that standards are being finalised in parallel to spectrum rights being awarded in order that networks can be planned. This is quite right – holding up the spectrum award until all technical standards have been finalised would introduce unnecessary delay and leave the UK behind other nations that are carrying out the activities in parallel.

However, a necessary consequence of this is that Ofcom will need to be flexible with the technical conditions associated with the award, in order to align them with the relevant international standards. In particular, the

[54] Vodafone response to Ofcom consultation "Improving consumer access to mobile services at 3.6GHz to 3.8GHz", December 2016.

3.4-3.6GHz technical conditions laid down by Ofcom set out Permissive and Restrictive masks which are oriented around TDD-LTE technology, which may be inappropriate. ✂ Once the licensees are known, we suggest that a User Group is established to agree where variations to the technical licence terms are appropriate to align with the developing 5G standards.

Vodafone UK
January 2017