Three’s response to Ofcom’s consultation on Public Sector Spectrum release.

Non-confidential

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1. Three suggests a number of modifications to Ofcom's auction design proposals

Hutchison 3G UK Ltd (Three) welcomes the opportunity to respond to Ofcom's consultation on Public Sector Spectrum Release: Award of the 2.3 GHz and 3.4 GHz bands ("the Consultation"). The frequencies being awarded comprise 40 MHz of spectrum within the 2.3 GHz band (2350-2390 MHz) and 150 MHz of spectrum within the 3.4 GHz band (at 3410-3480 MHz and 3500-3580 MHz).

We agree with Ofcom that a market based mechanism – such as an auction process – is the best way to allocate spectrum. However, we have concerns regarding Ofcom's proposed auction design. In the Consultation, Ofcom describes two auction formats – a Simultaneous Multiple Round Ascending Auction (SMRA) and a Combinatorial Clock Auction (CCA). Ofcom believes that:

"… both formats, in the detailed implementation we propose, are robust approaches for our award and would meet the objectives we have identified…. However, we believe the SMRA has some important advantages given the specific circumstances of this award".[1]

Three disagrees with this assessment. We consider that the proposed SMRA (Ofcom's preferred approach) has a number of serious flaws and therefore is not fit for purpose. We have commissioned auction experts, Power Auctions, to systematically review Ofcom's proposals and make recommendations. Power Auction report is provided in Annex 1. Its main points are summarised below.

Withholding of aggregate demand information undermines efficiency and transparency.

The most critical flaw in both the SMRA and the CCA rules proposed by Ofcom is that they withhold all demand information from bidders, even in aggregate between bidding rounds. The greatest advance in spectrum allocation in the past two decades has been the use of dynamic auction methods, and Ofcom has adhered to this trend in its past auctions. However, the current consultation document proposes to go backward and to replace successful dynamic auction methods with essentially sealed-bid auction processes.

The Consultation would have bidders participate in a lengthy, but almost entirely opaque multi-round procedure, eliminating the standard benefits of dynamic auctions. This would undermine the key objectives of efficiency and transparency in spectrum allocation. In addition, the

[1] Ofcom's Consultation, para. 6.6, page 28.

paucity of information would not only exacerbate the Winner's Curse but make it difficult for senior management to understand what the company is likely to win, making bidding governance unduly challenging.

Ofcom's proposed SMRA rules introduce a number of half-way measures that are dominated by the full CCA format, which has performed well in a number of recent auctions.

Three considers that the SMRA rules presented by Ofcom contain a large number of *ad-hoc* changes that effectively make the SMRA more like a CCA. These modifications include:

- A bidder-selected Minimum Spectrum Requirements and a withdrawal rule, partially re-creating the CCA's lack of an exposure problem;
- Bidders must raise their prices on all lots in a category they wish to win in order to raise their price on any lot, partially replicating the workings of a clock auction;
- Generic lots, as in a CCA; and
- An assignment round, as in a CCA.

Some of these modifications potentially have unintended consequences, such as:

- Bidders may be able to use the Minimum Spectrum Requirements to impose externalities on others without paying the cost or even to exclude smaller rivals from the 2.3 GHz band;
- Withdrawals permit total relaxation of eligibility, which could be used to exclude others from the spectrum, and create unnecessary strategic complexity; and
- The pricing rule may result in prices too high or too low relative to what would create the best incentives for truthful bidding and an efficient outcome.

First, Three considers that, given these unintended consequences, a CCA is preferable to Ofcom's proposed SMRA. With only a few more modifications, the SMRA proposed by Ofcom would become a full-fledged CCA—and without the unintended consequences. The additional modifications needed are:

- Including an optimization for winner determination and nearest-Vickrey pricing eliminates bidders' incentive for strategic demand reduction and, hence, any perceived need to withhold aggregate demand information;

- Utilising an incrementing rule that makes no distinction between provisionally-winning bids and provisionally-non-winning bids expedites the progress of the auction while providing feedback to bidders on the demand at more price levels;
- Introducing full package bidding eliminates exposure altogether, eliminating any need for ad hoc measures such as a bidder-specified Minimum Spectrum Requirements while creating better incentives for truthful bidding;
- Introducing full package bidding also remove undesirable features such as bid withdrawals; and
- Adding a supplementary bids round for expressing demand for all possible packages, not just ones that include the previous round's standing high bids, better serves Ofcom's objectives of encouraging efficiency and minimising undersell.

Second, CCAs, using state-of-the-art rules, have performed exceedingly well in the UK and other jurisdictions. For example, in the 2013 UK 4G Auction, it successfully produced an efficient allocation and avoided undersell[2] Meanwhile, Canada's recent 700 MHz auction could be considered a rousing success, accomplishing all of the following:

- It resulted in negligible undersell—all but 0.03% of spectrum was allocated;
- It raised very high revenues (CA$5.27 million), without any apparent damage to efficiency; and
- It adhered to full disclosure of aggregate demand after every round (except for the final clock round).

Therefore, Three would recommend that Ofcom should implement the CCA disclosing aggregate demand after each clock round.

If the CCA is perceived to be too complex, a clock auction is a better option than a SMRA

If a CCA is perceived to be too complex for the PSSR, Three considers that a clock auction, similar to the one proposed by the Federal Communication Commission for the US Incentive Auction for 600MHz planned for 2016, would be a better option.

[2] The UK 4G auction's use of an activity rule that was based purely on eligibility points, its incomplete integration of a competition constraint into the standard CCA rules, and gaps in the education of bidders how the CCA works may have made bidding unnecessarily complex and may have made the 2013 auction unnecessarily prone to surprise outcomes. However, the current proposals to withhold demand information, as well as for withdrawals, penalties, and eligibility points unrelated to licence value, would make the next auction more complex and more prone to surprise outcomes.

The Incentive Auction's proposed forward auction is intended to be the clock auction design that is closest to the SMRA. Spectrum licences that are close substitutes are grouped together as generic spectrum. In every round, the auctioneer announces prices for each category of generic spectrum, and bidders respond by bidding the quantities of lots in each category that they desire. Following standard clock auction protocol, there are no Standing High Bidders selected after each round. Instead, every bidder is free to reduce its quantity to the extent that aggregate demand is greater than supply, and no bidder is permitted to reduce its quantity to the extent that it would cause aggregate demand to become less than supply.

As such, this clock auction will run considerably faster than an SMRA and bidding will be simpler than in an SMRA. The auction will run faster because, whenever there is excess demand, the price of every licence in the band will increase. Bidding is simplified because bidders are permitted to name the prices at which they drop demand or switch bands ("intra-round bids"), rather than needing to decide among discrete increments. Moreover, truthful bidding is facilitated, as bidders only pay the intra-round price at which supply equals demand, not the end-of-round price. In addition, various strategic aspects of the SMRA, such as whether or not a bidder should raise its Standing High Bids, as well as waivers and withdrawals, are completely stripped out of the auction design. Finally, there is a natural measure of aggregate demand to report to bidders after every round—and the proposed Incentive Auction rules include such disclosure as the information policy adopted.

A plain-vanilla SMRA is also preferable to Ofcom's proposed SMRA.

Finally, Three considers that, if contrary to our recommendations, a preference is given to an SMRA, it would be better to implement plain vanilla SMRA rules. Besides the disclosure of demand information, the key difference between a 'plain-vanilla' SMRA and Ofcom's proposed SMRA is that the 'plain-vanilla' SMRA treats every lot as unique. As such, bidding for one lot never requires placing a bid on another lot, so bidders are never required to raise their own Standing High Bids. By contrast, Ofcom's proposed SMRA includes the requirement that a bidder wishing to submit any bids at a new price level must raise all of its Standing High Bids to the new price level.

The US AWS-3 auction (currently in progress) illustrates the lack of any need to withhold aggregate demand:

- It uses plain-vanilla SMRA rules;

- It has accumulated a record-breaking US$45 billion in revenues after the 157th round of bidding, despite offering only the 1700 MHz and 2100 MHz bands and despite the absence from the auction of one of the four large US operators; and
- It has adhered to full disclosure of aggregate demand after every round.

Summary of our recommendations

Three recommends that auction rules should always include full disclosure of aggregate demand information.

The recommended approaches to auction format are ranked in descending order below:

1. A CCA, in which aggregate demand is disclosed after every round[3] (except for the final clock round);
2. A clock auction, in which aggregate demand is disclosed after every round[4];
3. A plain-vanilla SMRA, in which aggregate demand is disclosed after every round[5].

Three considers that (2) and (3) are quite similar and are likely to lead to very similar results, but (2) is expected to run much faster and be a much superior experience for bidders than (3). Thus, in our view, (2) dominates (3).

There are also a number of narrower auction design issues, which are discussed in detail in Annex 1. The main issues are:

- It would be best to avoid allowing bidding waivers, which introduce bidding complexity and offer no real benefit. It is better to use round extensions, as in past UK auctions, in their place.
- Since bidder-defined Minimum Spectrum Requirements may allow bidders to impose externalities on others without paying the cost or even to exclude rivals from the 2.3 GHz band, the largest bidder-defined minimum quantity should be reduced from 20 MHz to 10 MHz.
- Eligibility points are optimally set in proportion to the items' values. Ofcom's proposal of attaching equal eligibility points for two different spectrum bands believed to be substantially different in

[3] Similar to the Canadian 700 MHz or 2500 MHz auction
[4] Similar to the auction rules proposed in December 2014 for the forward auction of the FCC's Incentive Auction programme,
[5] Similar to the rules of the current US AWS-3 auction.

value establishes an environment where bidders have strong incentive to engage in "parking", which will increase the strategic complexity of the auction, further decrease transparency, and likely diminish the efficiency of the auction outcome. Therefore, we propose that Ofcom adopt somewhere between a 2:1 and 4:1 eligibility point ratio between spectrum blocks in the 2.3 GHz and 3.4 GHz bands.

2. We strongly support Ofcom's proposal to impose spectrum caps

Three broadly agrees with Ofcom's competition assessment and the proposal to impose caps on total spectrum holdings in the auction.

We support Ofcom's conclusion that highly asymmetric spectrum holdings are likely to harm consumers and competition because

> "*Operators with low spectrum shares will tend to have higher marginal costs of adding capacity than operators with high spectrum shares. This is because they will tend to need to build more sites to increase capacity*".[6]

Facing higher marginal costs of additional capacity makes it difficult for operators with insufficient spectrum holdings to compete.

Moreover, Ofcom recognises that

> "*… the reason that an operator has a small spectrum share may be due to strategic investment by rivals in the auction. In this case, it may be unable to obtain additional spectrum and end up with such a small share that it is too expensive for it to expand its network in order to compete effectively*."[7]

Auction spectrum caps are widely recognised as a way of preventing risk to downstream competition. Peter Crampton, a world leading expert on spectrum auctions, notes:

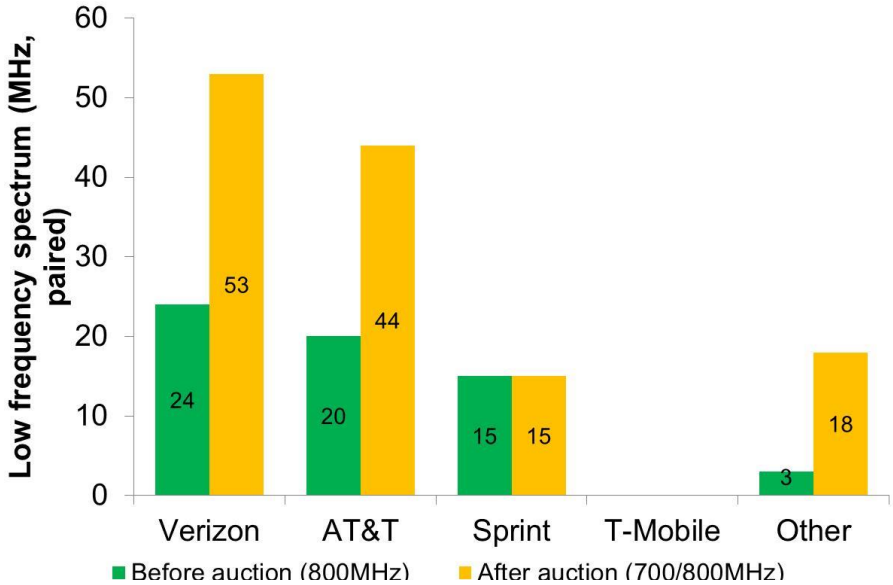
> *" …part of the willingness to pay for the incumbent in the auction comes from the value of deterring new entry, which is bad for overall efficiency…If a regulator decides that it is better to avoid creating a monopoly, then all that is required is a spectrum cap limiting each bidder to a maximum quantity of spectrum"*[8].

Evidence from auctions where no caps were set or caps set too high highlights the risk to competition. A major example is the US 700MHz auction in 2008, the sale of highly valuable low frequency spectrum (equivalent to the 4G 800 MHz band in the UK and rest of the world), where no spectrum caps were applied and no reservation of spectrum for new entrants or smaller operators was made. This led to almost all the 700 MHz spectrum on offer being acquired by the two largest US mobile network operators, AT&T and Verizon Wireless, alongside their existing extensive spectrum holdings, especially in other low frequency bands,

[6] Ofcom, Consultation, para 7.43, page 59.
[7] Ofcom, Consultation, para. 7.42, page 59
[8] P. Crampton et al. "Using Spectrum Auctions to Enhance Competition in Wireless Services", Journal of Law and Economics, vol. 54 (November 2011)

with some smaller operators not bidding at all, knowing their low chance of success. Figure 1 illustrates low frequency spectrum holdings before and after the 2008 700 MHz auction.

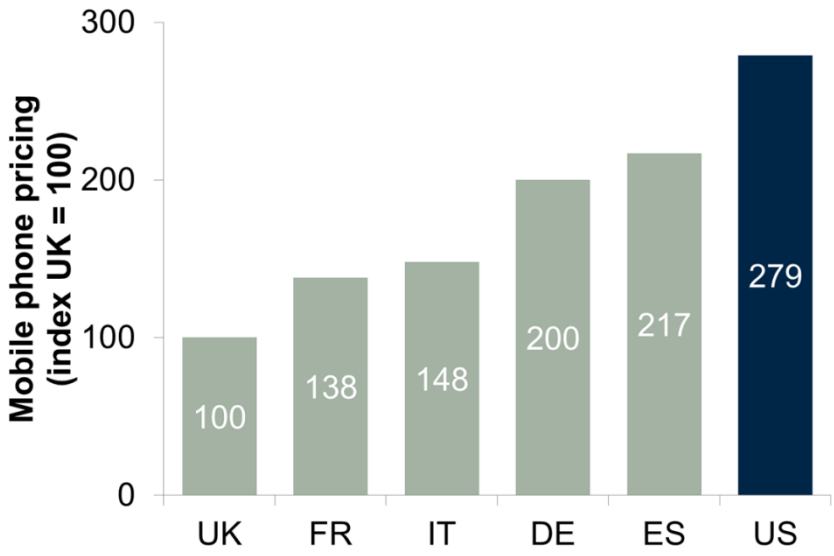
Figure 1: Distribution of low frequency spectrum in the US before and after the 2008 700 MHz auction.



Source: Analysys Mason.

It is increasingly recognised by industry commentators and regulators that this auction outcome has been the main contributor to high mobile network consumer prices in the US, which are almost twice the levels in the EU5 and almost three times the level in the UK (Figure 2).

Figure 2: High mobile prices in the US vs. EU5.



Source: Ofcom International Communications Market Report (2013), Figure 1.13.

Indeed, the US telecoms regulator, the Federal Communications Commission (FCC), has recently entirely reassessed its approach to spectrum auctions. It is now introducing spectrum caps and spectrum reservations in the upcoming incentive auction:

> *"Access to spectrum, particularly low-band spectrum, is essential for the provision of mobile wireless services…If a proposed transaction would result in a wireless provider holding approximately 1/3 or more of available [and/or low-band] spectrum, that transaction will trigger a more detailed, case-by-case competitive analysis".*
>
> *"To promote competition, the <FCC> rules establish a market-based reserve of no more than 30 megahertz of spectrum targeted for providers that hold less than 1/3 of available low-band spectrum in a license area"[9].*

This example clearly demonstrate that, in auctions with no spectrum caps (or with very high spectrum caps), smaller operators typically fail to acquire valuable spectrum. This subsequently has implications for competition in the market, manifesting itself in higher average prices and less intense competition.

[9] "FCC adopts revised mobile spectrum holdings policies to preserve and promote a competitive wireless marketplace", http://www.fcc.gov/document/fcc-adopts-revised-mobile-spectrum-holdings-policies

Therefore, Three strongly supports Ofcom in its proposal to impose a cap on spectrum holdings in the 2.3 GHz and 3.4 GHz auction.

Spectrum bands relevant for the cap

We agree with Ofcom that the 800 MHz, 900MHz, 1800 MHz, 2100 MHz and 2.6 GHz are all relevant bands for the assessment as these bands are already in use by the mobile operators.

We also agree that the 1.4 GHz band is relevant. This spectrum (1452-1492 MHz) is currently held by Qualcomm, which has requested a change of licence conditions to allow the frequencies to be used for mobile broadband[10]. It is likely to be used for supplementary downlink and is expected to be sold to a mobile operator in 2015, prior to the 2.3 GHz and 3.4GHz auction.

We agree that the 2.3 GHz should also be included. This band is very similar in its characteristics to the 2.6 GHz TDD band, has already been deployed in a number of countries worldwide and has a well-developed ecosystem.

However, we do not agree with Ofcom that 3.4 GHz spectrum should be part of the same spectrum cap. We are of the view that the 3.4 GHz spectrum band should be considered separately as it has inferior propagation characteristics to the sub-3 GHz spectrum and "<t>he 'ecosystem' for user devices in the 3.4 GHz band is some years behind the 2.3 GHz band in terms of development"[11]. Moreover, there is considerable uncertainty over the use of this band. It may be primarily used for backhaul and for small cells, therefore, not necessarily adding capacity in the same way as the sub-3 GHz spectrum does.

Therefore, we recommend that Ofcom impose two caps in the auction – one cap for total sub-3 GHz spectrum holdings and one for the 3.4 GHz spectrum.

We also support tighter caps than Ofcom's preferred option – 33% rather than 37% (i.e. Option 3 rather than Option 2). This is equivalent to 210 MHz of sub-3 GHz spectrum and c. 50 MHz of 3.4 GHz spectrum. These caps would ensure that the two national wholesalers with small spectrum holdings (Three and Telefonica) as well as the sub-national operators

[10] Three has stated our position on the 1.4GHz spectrum licence variation in our response to Ofcom's consultation. Three believes that the Mobile Trading Regulations should be amended to include the 1.4GHz spectrum before the licence variation is granted. We also disagree with Ofcom that a trade of the 1.4GHz spectrum prior to the 2.3 GHz and 3.4 GHz auction would not raise competition concerns.

[11] Ofcom, Consultation, para 7.57

and potential new entrants have better chances of acquiring additional spectrum in the upcoming auction.

The caps would constrain EE's ability to purchase 2.3 GHz spectrum as EE already holds 210 MHz of sub-3 GHz spectrum. However, EE would still be in a position to buy up to 50 MHz of 3.4 GHz spectrum. Therefore, its ability to acquire spectrum for backhaul and small cell deployment is not affected.

We have addressed the specific questions raised by Ofcom in this consultation in Section 3 below.

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3. Responses to Ofcom's specific consultation questions.

Question 4.1: Do you agree with our proposals for categories and lot sizes in the auction? If you disagree please provide evidence for your position.

Three UK agrees with Ofcom's proposal for 5 MHz lot sizes for 2.3 GHz band.

However, Three UK believes that 10 MHz lot sizes should be considered more suitable for the 3.4 GHz band as there is much more spectrum available. It is likely an operator would be interested in acquiring larger lot sizes (e.g. multiples of 10 MHz) than multiples of 5 MHz which seem inappropriately small given there will be 150 MHz of spectrum available for auction in this band.

We would like to highlight the disproportionately high amount of investment an MNO would require to deploy just 5 MHz worth of spectrum; thus it is logical to conclude that it would make better sense to deploy a minimum of 10 MHz of spectrum acquired in the 3.4 GHz band.

Question 4.2: Do you have any other comments or views relating to the overview of the spectrum?

No other comments. Three agrees with Ofcom's overview of the spectrum.

Question 5.1: Do you agree with our proposals for achieving contiguity, and if not please provide further explanation.

Yes, we agree.

Question 6.1: Do you agree with our recommendation for an SMRA? If not, please explain why.

No, we do not agree. We have serious concerns regarding Ofcom's proposed SMRA. They are discussed above in Section 1 and in more detail in Annex 1.

Question 6.2: Do you agree with our proposals for the SMRA (including withdrawals, minimum requirements and waivers)? Do you have any other comments or views on this proposal?

No, we do not agree. We have identified a number of problems with Ofcom's proposed SMRA. They are discussed above in Section 1 and in Annex 1. We make an alternative proposal that rectifies the identified problems.

Question 6.3: Do you agree with our proposals for the CCA? Do you have any other comments or views on this proposal?

We propose some modifications to Ofcom's proposed CCA. More specifically, we do not agree with withholding of aggregate demand information and with equal eligibility points for the two bands. These issues are discussed above in Section 1 and in more detail in Annex 1.

Question 6.4: Do you agree with our proposals for the assignment stage? Do you have any additional views or comments?

Yes, we agree.

Question 6.5: Do you have any other comments on auction design?

Our main concern with Ofcom's proposed auction design is the non-disclosure of aggregate demand. This proposal undermines transparency and efficiency. Please see more details on this point in Section 1 and Annex 1 of this submission.

Question 6.6: Do you agree with our proposals for the reserve prices? If so, where in the range we propose should the reserve price for the 2.3 GHz band be? Do you have any other views or comments?

Yes, we broadly agree with the proposal. However, we believe that the reserve price for 2.3GHz should be at the bottom end of the proposed range (£2.5m). Three notes that there are uncertainties involved in how rapidly the ecosystems for this band would develop, which can affect the price of this spectrum. Therefore, Ofcom should adopt a cautious approach and set a lower reserve price.

Question 7.1: Do you agree with our approach to considering what spectrum is relevant to this competition assessment? Please give reasons for your views.

Yes, we agree.

Question 7.2: Do you agree with our view that spectrum at 800 MHz, 900 MHz, 1.4 GHz, 1.8 GHz, 2.1 GHz (paired only), 2.3 GHz, 2.6 GHz and 3.4 GHz is relevant for this competition assessment? Please give reasons for your views.

We broadly agree. Please see more details on this point in Section 2 of this response.

Question 7.3: Do you agree that very asymmetric spectrum holdings could give rise to competition concerns? Please give reasons for your views.

Yes, we agree. See Section 2 above for more details.

Question 7.4: Do you agree with our proposal to impose an overall spectrum cap in the auction equivalent to the overall spectrum cap in the 2013 auction? If our assessment of what spectrum is relevant is correct, do you agree with the proposal for an overall spectrum cap at 310 MHz? Please give reasons for your views.

We strongly agree that the spectrum caps should be used in this auction. However, we believe that the 2.3GHz and 3.4GHz spectrum bands are considerably different in their propagation characteristics and ecosystem development. Therefore, we propose to use two caps in the auction – one cap for the sub-3GHz spectrum holdings and a separate cap for the 3.4GHz spectrum. In both cases, we advocate a tighter cap than the one preferred by Ofcom – 33% vs. 37%. Please see Section 2 of this response for more details.

Question 7.5: Do you agree with our proposals to amend the Mobile Trading Regulations shortly before the PSSR award so as to include relevant spectrum at 1.4 GHz, 2.3 GHz and 3.4 GHz? Please give reasons for your views.

We agree that the Mobile Trading Regulations should be amended to include 1.4 GHz, 2.3 GHz and 3.4 GHz. However, we strongly believe that the 1.4 GHz band should be included earlier - at the point when Ofcom varies Qualcomm's licence (as explained in our response to the 1400 MHz consultation). We therefore submit that Ofcom must amend these regulations immediately.

Question 7.6: Do you have any other comments on our assessment of competition effects from the award?

No, we do not.

Question 8.1: Do you have any comments on the proposals relating to the duration of the initial licence period, our rights to revoke the licence during this period, the charging of licence fees after the end of the initial period and our additional revocation powers following the initial period?

No, we do not.

Question 8.2: Do you have any comments on our proposals relating to the territorial extent in the award licences?

Three would like to deploy any acquired 2.3 GHz or 3.4 GHz spectrum on a nationwide basis. The 2.3 GHz and 3.4 GHz bands could be aggregated with 2100 MHz and 1800 MHz spectrum in high traffic, mainly in urban areas, to increase future network capacity.

Three would be happy to coordinate with MOD in remote areas with low population densities and would encourage Ofcom to publish its definitive list of areas that might require a coordination arrangement with the MOD for either the 2.3 or 3.4 GHz band as soon as practically possible as this has a direct impact on the valuation of the spectrum.

Question 8.3: Do you have any views on the merits of the proposed approach to information provision; in particular concerning the type of information that may be helpful and any impacts that publication of information might have both on licence holders and the wider spectrum market?

Three has no objections to the provision of information as requested by Ofcom insofar as it is required for Ofcom to discharge its regulatory and statutory duties.

However, Three has concerns about Ofcom intentions to publish site information submitted by licensees in a manner which hitherto has not been disclosed by Ofcom. We would like Ofcom to share further details of the information likely to be shared in the public domain or how Ofcom would envisage the release of this information being beneficial to the public in general.

Question 8.4: Do you have any comments on other proposed non-technical licence conditions and the draft licences at Annexes 8 and 9?

No, we do not.

Question 9.1: Of our two possible options to encourage or mandate synchronisation do you prefer Option 1 or Option 2? Please explain your preference for the option and let us know if you have other comments or suggestions.

Three agrees that full synchronisation option offers higher spectral efficiency and more consistent services. The interference caused by the adjacent band can be significant unless the frame structure is

synchronised. In an un-synchronised network, Three has concerns regarding the uplink (UL) interference from devices in the adjacent band.

According to Three's analysis, in case of the lack of synchronisation between the networks, one of the major interference sources are uplink signals in the adjacent band due to poor out of band (OOB) emissions from the terminals. This situation occurs where the device is located close to the adjacent band and communicating with a distant serving cell at full power. Thus, Three would encourage Ofcom to consider 2.3 GHz and 3.4 GHz band as supplementary downlink (SDL) because both bands could be used as SDL to 1.8 GHz and/or 2.1 GHz bands.

We agree with Ofcom's analysis and summary which outlines the issues associated with different deployment scenarios. It should be possible to have one licensee operating with the preferred TDD configuration and the permissive mask, whilst the neighbour licensee is using the restrictive mask with a different configuration i.e. SDL.

Question 9.2: Do you agree with our proposed frame structure of LTE configuration 2 or equivalent?

Three prefers a higher DL ratio than the Huawei quoted example of 3:1 in the consultation document (para 9.65). By comparison, the DL:UL ratio in the Three UK network is 7:1.

Three UK would also encourage Ofcom to consider licensing 2.3 GHz and 3.4 GHz band as SDL with a restrictive mask. They could both be used in SDL mode for use with 1.8 GHz and/or 2.1 GHz bands. This reduces the potential for uplink interference and increases spectral efficiency due to low uplink traffic requirements.

Ofcom should facilitate open technical discussions on the frame configuration with the spectrum licence holders.

Question 9.3: Do you agree with our proposal that indoor small cells, with power levels up to 24 dBm, do not need to synchronise?

Three agrees with Ofcom's proposal.

Question 9.4: Do you agree with our approach in the Inter-operator Synchronisation Procedure?

Yes, Three UK agrees with Ofcom's approach.

Question 9.5: Do the parameters to be provided in the Inter-operator Synchronisation Procedure give you sufficient certainty at the time of the award for your future deployments? If not can you provide further information on what extra detail information would need to be covered?

Three would be happy with the Inter-operator Synchronisation Procedure and the parameters as outlined by Ofcom.

Question 9.6: Would any of the potential changes to the procedure that we have considered made within the first 12 months following the award have a significant impact to a network that has been deployed in the interim? If so please explain any concerns.

Three has no concerns at this time.

Question 9.7: Do you agree with our approach for power control for femto cells?

We agree in principle that a power control policy should be implemented in femto cells, but that any algorithm(s) mandated should be backed up by evidence which demonstrates its ability to improve the customer experience.

Question 9.8: Do you agree with our position to adopt the new power limits above 2403 MHz?

Three agrees with Ofcom's position for adoption of new power limits above 2403 MHz.

Question 9.9: Do you agree with our position with regard to the out of block levels applicable in UK Broadband's spectrum holding of 3605 – 3689 MHz?

Yes, Three would agree with Ofcom's position regarding out of block levels applicable to UK Broadband's spectrum holding of 3606-3689 MHz.

Question 9.10: Do you have any other comments on the proposed technical licence conditions and the draft licences attached at annexes 8 and 9?

To facilitate SDL deployment of the 2.3 GHz (and/or 3.4 GHz band) with 1800 MHz and/or 2100 MHz, Three would strongly advocate Ofcom consider varying the maximum permissible transmit power of the 2.3 GHz band to be at least 65 dBm / 5 MHz when deployed in this mode.

This would also be consistent with the maximum permissible transmit power for the 3.4 GHz band which is currently proposed in the draft 3.4 GHz licence.