Statement on the making of regulations in connection with the award of the 800 MHz and 2.6 GHz spectrum bands

Statement

Publication date: 12 November 2012

Contents

Section 1

Summary

1.1 This Statement sets out our decisions in relation to the drafting of the statutory instrument which gives effect to the policy decisions we have made in connection with the award of wireless telegraphy licences for the use of the 800 MHz and 2.6 GHz spectrum bands.

1.2 In July 2012 Ofcom published three documents. They were

- The statement setting out our policy decisions in relation to the auction ("the Auction Statement");
- Notice of our proposal to make regulations in connection with the award of the 800 MHz and 2.6 GHz spectrum bands ("the Notice"); and
- Information Memorandum on the award of the 800 MHz and 2.6 GHz spectrum bands ("the Information Memorandum").

1.3 The matters set out in those documents, including the policy decisions in the Auction Statement, were made following consideration of all the responses that were made to the various consultations that had previously been carried out.

1.4 We have carefully considered the responses that have been made to the Notice, and have now made the statutory instrument setting out the award regulations ("the Regulations") and submitted it for registration and publication. It will come into force on 23 November 2012.

1.5 We have decided that the provisional date for the submission of appliocations should be Tuesday 11 December. We will publish the final date and times on our website after the Regulations have come into force. The relevant section of our website is at http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-in-progress/

1.6 We have also published an Update to the Information Memorandum alongside this statement.

1.7 We expect to publish Guidance notes for the auction in the next few days.

1.8 We intend to hold a seminar on the auction rules and procedures for this award before the application date, and mock auctions in the weeks commencing 26 November and 3 December.

Section 2

Introduction

2.1 On 24 July 2012 we published a notice of our proposal to make regulations ("the Notice") which included a draft of the auction regulations (at annex 5) and invited comments on these by 11 September 2012. On the same date we published the Information Memorandum for this award (the "Information Memorandum") and a statement setting out our policy decisions on the spectrum bands ("the Auction Statement").

2.2 This followed two previous consultations relevant to this award:

- "Consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues", published on 22 March 2011 ("the March 2011 Consultation"); and
- "Second consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues", published on 12 January 2012 ("the January 2012 Consultation").

Overview of responses to the Notice

2.3 We received five responses to the Notice. Non-confidential responses were received from BT (although this is confidential in part), Everything Everywhere and Mr D. Titford. These are available on the Ofcom website. The other two responses from [✂] were submitted confidentially.

2.4 Most of the comments in the responses fell broadly into the following categories:

- Reserve prices
- Auction design
- Auction process
- Comments on the wording of the draft regulations

Making and publication of the final Regulations in connection with the award

2.5 Having considered the responses to the consultation we decided to make the statutory instrument relevant to this award ("the Regulations") on 9 November 2012. This will be available on the government's *legislation.gov.uk* website[1]. A copy in draft form is annexed to this statement for indicative purposes, in the form submitted for registration and publication after their making by Ofcom. The government's *legislation.gov.uk* website is the only authorised source for published statutory instruments.

2.6 We have also published an Update to the Information Memorandum alongside this statement. We plan to publish Guidance notes for the auction shortly.

[1] http://www.legislation.gov.uk/

Document structure

2.7 Sections 3 to 7 of this Statement provide further details of our decisions following the Notice.

2.8 Section 8 describes the next steps for the award.

2.9 Annex 1 contains a copy of the Regulations in the form submitted for registration and publication after it was made by Ofcom.

2.10 Annex 2 contains a copy of the Regulatory Impact Assessment for the Regulations in the form placed in the libraries of both Houses of Parliament.

Section 3

Reserve prices

Ofcom 15 July 2012 proposals

3.1 In Section 8 of the Auction Statement we outlined the framework we used in determining our proposals on reserve prices as set out in the draft auction regulations. We also said that we would make a final decision on reserve prices when we make the Regulations, taking into account any representations received on them from stakeholders by 11 September 2012. Table 1 below summarises our proposals.

Table 1: Summary of Ofcom's proposal for reserve prices

Lot Category	**A(i)**	**A(ii)**	**B**	**C**	**D(i)**	**D(ii)**	**E**
	800 MHz 2x5 MHz	**800 MHz 2x10 MHz (with coverage obligation)**	**1800 MHz 2x15 MHz (Divestment)**	**2.6 GHz 2x5 MHz (standard power)**	**2.6 GHz 2x10 MHz (shared low power)**	**2.6 GHz 2x20 MHz (shared low power)**	**2.6 GHz 5 MHz (unpaired)**
Ofcom's proposal	£225m	£250m	£225m	£15m	£3m per bidder, £30m threshold	£6m per bidder, £60m threshold	£0.1m

3.2 In paragraph 8.11 of the Auction Statement (and related sub-paragraphs) we set out the various risks that we took into consideration in determining our proposals. These included:[2]

i) the risk that a potential fourth national wholesaler (or opted-in bidder) is unable to obtain the reserved spectrum in the auction because of an excessive reserve price, when it would have been in consumers' interest for that party to obtain the spectrum ("risk (i)");

ii) the risk that an opted-in bidder obtains the spectrum when it would have been in consumers' interests that the opted-in bidder did not win the spectrum, because it has a much lower intrinsic value than the parties that would otherwise have obtained the spectrum ("risk (ii)");

iii) the risk of inefficiently unsold spectrum because reserve prices are set above the willingness to pay of the marginal bidder for the last lot in any spectrum category ("risk (iii)");

iv) the risk of strategic demand reduction which involves bidders reducing their demand at the margin, to pay less on infra-marginal units won: this may result in an inefficient allocation of the spectrum ("risk (iv)");

v) the risk of tacit collusion among bidders to reduce bids in the auction to lower prices when this results in some spectrum not being acquired by the party that values it most ("risk (v)");

[2] For ease of reference, in the following we will use the numbering of this list to refer to these risks.

vi) the risk that a set of reserve prices that does not reflect the relative value of different bands of spectrum will distort the choice of the package for the reserved spectrum and may also reduce spectrum efficiency ("risk (vi)").

3.3 At paragraph 8.12 of the Auction Statement we noted that some of these risks can be mitigated by setting higher reserve prices (closer to the estimated market value) and some by setting lower reserve prices. For example, the risk of strategic demand reduction or tacit collusion could be mitigated by higher reserve prices. Conversely, the risk of unsold spectrum or the risk that a fourth national wholesaler fails to acquire the reserved spectrum could be mitigated by lower reserve prices. We explained that our approach sought to strike a balance between these contrasting risks when setting reserve prices, and that some of the risks are more important for certain spectrum categories than others. For example, at paragraph 8.36 we considered that the potential for costly spectrum inefficiency (e.g. arising from the competition constraint or the risks of strategic demand reduction or tacit collusion – risks (ii), (iv) and (v)) is concentrated in the 800 MHz band, because of its substantial intrinsic value. Whereas at paragraph 8.71 we stated that for the 2.6 GHz band we place particular weight on the risk of choking off efficient demand and leaving spectrum unsold (risk (iii)).

Stakeholders' responses and Ofcom's assessment of the issues raised

3.4 We received comments on our proposed reserve prices from Everything Everywhere and two confidential respondents [✂]. In the following sub-section we summarise the issues raised and set out Ofcom's response.

3.5 Some of the concerns raised were about the proposed methodology we employed and as such are relevant to different spectrum bands, while other issues raised by respondents were frequency band-specific. Below we deal with the issues raised in the following order:

- methodological concerns
- issues related to the reserve price of 800 MHz spectrum
- issues related to the reserve price of 2.6 GHz spectrum

Methodology – Balancing of risks

3.6 [✂] generally agreed with Ofcom's policy objectives and said that it understands that Ofcom wants to strike a balance of contrasting risks. However, this respondent considered that in light of the large economic benefits from a four-player market Ofcom should disregard risk (ii); it also considered that any gain in intrinsic value due to a failure to attract a fourth national wholesaler would accrue only to the operators, not to consumers.

3.7 The same confidential respondent also considered that opted-in bidders are prevented by the design of spectrum floors and Minimum Portfolio Packages (MPPs) from engaging in strategic demand reduction or tacit collusion, so that the argument for higher reserve prices only applies to reserve prices paid by non-opted-in bidders.

3.8 Furthermore, [✂] considered that strategic demand reduction is more likely to occur in simultaneous multiple round auctions ("SMRA") and other auctions that effectively

have close-to-uniform prices, but is unlikely to occur in combinatorial clock auctions ("CCA"). It concluded that Ofcom does not need to set high reserve prices to offset strategic demand reduction. The respondent suggested that if Ofcom is concerned about strategic demand reduction it could set dual reserve prices (in other words differentiated reserve prices for non- / opted-in bidders) or consider partially refundable reserve prices for opted-in bidders.

Ofcom's response

3.9 We note [✂]'s general support for our approach. We explained in the Auction Statement (paragraph 8.12) that some risks are more important than others for different bands. While we acknowledge that there is an inevitable element of judgment in weighting the contrasting risks, we disagree with the confidential respondent's assessment for the following reasons.

3.10 We consider that it is incorrect to say that the risk associated with an opted-in bidder with a low valuation should be disregarded. First, we consider that such a bidder might not be able to provide the competitive benefits that we highlighted in our previous documents and to which the confidential respondent refers. Second, we consider that the benefits would not accrue entirely to the operators: for example, the additional spectrum that would have otherwise been awarded to the opted-in bidder may enable consumers to experience higher service quality, may provide capacity for innovative services and may enable operators to deploy a network with lower costs (and hence potentially offer services at lower prices).

3.11 While it is true that the design of spectrum floors and the operation of the competition constraint prevents opted-in bidders from reducing their demand to a level other than zero, they may have an incentive to reduce demand from a larger package to demand for a MPP (whilst remaining eligible to win an MPP), which could still result in inefficient allocation of the spectrum. Furthermore since strategic demand reduction is less likely to occur in our CCA than in an SMRA but is not necessarily eliminated (see paragraph 8.11.4 in the Auction Statement), we consider that it would be inappropriate to completely disregard such a risk.

3.12 We do not agree with [✂]'s suggestion for dual reserve prices. We set out in paragraph 6.99 of the January 2012 Consultation that in our view implementing differentiated reserve prices would be highly complex, and that we did not therefore intend to develop a set of auction rules that implement different reserve prices for reserved and non-reserved spectrum. On this basis we did not propose differentiated reserve prices in the Auction Statement. For the reasons we have previously set out, our view on this remains unchanged, and we have therefore decided not to put in place differentiated reserve prices. With respect to partially refundable reserve prices, we consider that these are essentially differentiated reserve prices where the differentiation is achieved at a later time, and consequently suffer the same problems.

Methodology – Failure to apply the estimated market value but with a discount

3.13 Everything Everywhere argued that we have not brought out clearly the distinction between "*market value estimated in a conservative way*" and "*estimated market value but with a discount*", and considered that the latter would have to be set at a lower level than the former. It also commented that, more generally, the auction itself should facilitate price discovery and setting reserve prices potentially in line with market value could leave a marginal bidder indifferent on whether to participate or not, which would in turn hinder the allocative efficiency of the auction.

3.14 Everything Everywhere also argued that Ofcom failed to apply the "*estimated market value but with a discount"* methodology it consulted upon in January 2012, since in the Auction Statement it *"progresses directly from a discussion of value to proposed reserve prices, without any explanatory logic and in particular without proper discussion of what 'with a discount' should amount to*." It concluded that "*the implications are that the proposed reserve prices for 800 MHz are too high*", and may also prevent bidders from expressing valuations for larger amounts of 800 MHz spectrum.

Ofcom's response

3.15 We disagree with Everything Everywhere that our proposals fail to apply the methodology we consulted upon. In the Auction Statement we explained that different methodologies are relevant to different risks: determining reserve prices as a conservative estimate of market value relates in particular to risk (iii) (paragraph 8.5.2), whereas determining reserve prices with reference to market value but with a discount relates in particular to risks (i) and (ii) (paragraph 8.8). We also set out in paragraph 8.12 that our approach aims to strike a balance between contrasting risks, some of which are more important for certain spectrum categories than others.

3.16 At paragraph 8.27 of the Auction Statement we said that our proposals focus on the benchmark range for small bidders to reflect in particular the mitigation of risks (i) and (ii) set out above. This approach implies a discount on the market value (as that could be estimated with reference to all bidders, including large bidders). The discount of the small bidder range to the large bidder range for 800 MHz is shown in Table 8.2 of the Auction Statement. Hence we consider that Everything Everywhere is wrong in characterising our use of the small bidder range as a reasonable approach to producing a conservative estimate of market value. We consider instead that consideration relates to risk (iii) in particular and affects the choice of reserve price relative to the small bidder range.

3.17 In relation to Everything Everywhere's suggestion that the proposed reserve prices may prevent bids for larger packages, at paragraph 8.37 of the Auction Statement we stated that we are mindful that, in the presence of decreasing marginal valuations, demand for larger blocks of spectrum (for example 2x15 MHz) might be inefficiently deterred if we were to set the reserve price too high. We consider that our reserve prices are unlikely to deter bids for larger blocks of spectrum for the following reasons:

- With respect to opted in bidders, we set the reserve price at a lower level than the consultants considered would be the appropriate price in isolation[3] to take this risk (inter alia) into account. We also noted in footnote 178 of the Auction Statement that the absence of sub-1 GHz spectrum in the existing holdings of a fourth national wholesaler in the UK supports the view that there is a relatively small risk that the proposed reserve price would deter an efficient prospective opted-in bidder.

- With respect to other bidders, we note that our proposed reserve price lies below the benchmark range for large bidders and a steep decrease in marginal valuations is required to deter demand for larger blocks. In light of this, we consider that the risk of unsold spectrum is low.

[3] That is, the price the consultants considered "appropriate" before taking account of a specific risk of unsold smaller packages of spectrum, which we decided to mitigate in a different way (by reducing the reserve price for 2.6 GHz).

Methodology - Inconsistency between 800 MHz and 2.6 GHz

3.18 Everything Everywhere argued that there is an inconsistency in the methodology for 800 MHz and 2.6 GHz, in that the proposed reserve price for paired 2.6 GHz spectrum includes a discount on the conservative estimate of market value of 70%, while the 800 MHz reserve price does not include any discount on the market value. Everything Everywhere considered that this would affect the way that the competition constraint identifies the most efficient MPP to award to an opted in bidder.

3.19 Everything Everywhere proposed that Ofcom could take the estimates of market value from the consultants' report and apply a discount consistently across the different categories of lots.

Ofcom's response

3.20 We disagree with Everything Everywhere's representation of our approach. We stated in paragraph 8.70 of the Auction Statement that we were concerned that there is a risk that the consultants' recommended reserve price for paired 2.6 GHz may deter efficient demand from a fourth national wholesaler or more generally result in unsold spectrum. Hence our proposed reserve price is lower in part as a result of our view of the potential for a lower market value than suggested by the consultants.

3.21 Everything Everywhere suggested that a consistent application of Ofcom's proposed methodology would apply a uniform discount factor across the different categories of lots. We disagree with this suggestion: as long as the balance of risk differs across frequency bands (as explained in paragraph 8.12 of the Auction Statement), we consider that it would be inappropriate to apply a uniform discount. We believe that our proposals strike a better balance than could be achieved with an "average" uniform discount: paragraphs 8.36 and 8.71 of the Auction Statement explain the key risks we took into account for 800 MHz and 2.6 GHz spectrum respectively.

3.22 We disagree with Everything Everywhere's claim that a uniform discount applied to all frequency bands could potentially improve the efficiency of the MPP awarding process. The MPP awarded to an opted in bidder is determined in the auction through competition between the opted-in bidder(s) and other bidders, taking into account the relative level of bids expressed by both types of bidder for the different types of spectrum on offer.[4] This is efficient if bidders can express their relative value for different MPPs in their bids and we consider that in practice it is unlikely that they will not be able to do so given the reserve prices we proposed.

800 MHz – Cost of DTT co-existence not included in the reserve price

3.23 Everything Everywhere argued that the reserve price for the 800 MHz spectrum is too high because Ofcom has not taken account of the mandatory £30m payment to MitCo per 2x5 MHz of 800 MHz spectrum.

Ofcom's response

3.24 We acknowledged that the intrinsic value of 800 MHz spectrum may be affected by usage limitations and obligations imposed on licensees of the spectrum (paragraph 8.38 of the Auction Statement). We also noted at paragraph 8.39 that there is a risk that the upper bound of the benchmark range overestimates the value of 800 MHz

[4] That is, the set of winning bids maximises total value (as expressed in bids) subject to the competition constraint being met (e.g. see paragraphs A5.112-A5.115 in the July 2012 Statement).

spectrum in the UK. Furthermore, we clarified at paragraph 8.44 that our proposed reserve price is in the top half of the benchmark range for smaller bidders but not at the upper end to account for the potential effect of DTT co-existence mitigation costs on bidders' valuations. We consider therefore that we took reasonable account of the arrangements for DTT co-existence in our proposed reserve prices.

800 MHz – Ofcom underestimated the cost of the coverage obligation

3.25 [✂] supported our decision to set the reserve price for the A(ii) lot, i.e. 800 MHz with coverage obligation, at a discount against the reserve price for an equivalent amount of spectrum in A(i) lots, i.e. 800 MHz without coverage obligation. However, it considered that the coverage obligation set out in the Auction Statement is more onerous than Ofcom suggests as it includes a 95% coverage requirement in every nation (in addition to the requirement for 98% coverage of the UK population). [✂] argued that the cost of such obligation will be significantly higher than the £200m used by Ofcom.

3.26 [✂] estimated benefits from the coverage obligation to additional households in the range of £6-9bn. Because of the substantial asymmetry in cost and benefits, [✂] concluded that "*a multi-year delay resulting from the coverage obligation going unsold would be a major lost opportunity*" and urged Ofcom to exercise caution and set the reserve price of £180m as recommended in the consultants' report.

Ofcom's response

3.27 [✂] did not provide us with detailed evidence to support its claim that £200m is a significant under-estimate of the cost of meeting the coverage obligation as it is still assessing the exact cost of achieving the required level of coverage.

3.28 In any event, even if [✂] was correct as to their own costs of meeting the obligation, we consider that a single operator's estimate of the costs of extending its coverage would not necessarily mean that we should change the reserve prices. As we stated in paragraph 8.54 of the Auction Statement, it is desirable that there is at least one player interested in acquiring the spectrum subject to a coverage obligation, to assist in the efficient allocation of the 800 MHz spectrum. We have not seen any evidence that the costs of all operators were materially above the proposed £200m difference in reserve prices.

3.29 We consider that we took sufficient account of the risk of unsold spectrum in our proposed reserve price for the A(ii) lot.[5]

2.6 GHz – Level of the reserve price

3.30 [✂] stated that it supports our decision to set the reserve price at £15m per 2x5MHz, but it also criticised some aspects of the consultants' methodology.

3.31 A second confidential respondent, [✂], commented that it is concerned that reserve prices for paired 2.6GHz spectrum are too high and should be reduced to at least

[5] We have not taken a view on the accuracy of the confidential respondent's estimate of the benefits of the coverage obligation except to note that, whilst the respondent refers to paragraph 6.43 of the March 2011 Consultation for its assumption that only 87% coverage would be provided in the absence of the coverage obligation, that paragraph merely noted 87% of the population as the level of coverage of 3G networks. This was not a prediction of 4G coverage using 800 MHz in the absence of a coverage obligation and we note that 3G networks (at that time) were provided using higher-frequency spectrum at 2.1 GHz.

below the value in the 2010 German auction on the grounds that Germany is the most directly comparable market. More specifically, [✂] proposed a reserve price of 75% of the German auction price scaled to the UK population size, namely £9m per 2x5 MHz.

3.32 [✂] also commented that the reserve price for 2.6 GHz TDD spectrum is appropriate.

Ofcom's response

3.33 We note that [✂] was supportive of our proposal for the reserve price of paired 2.6 GHz. For this reason we consider that it is not necessary for us to respond in detail to its concerns over the consultants' methodology.

3.34 We disagree with [✂]'s suggestion that our proposed reserve price for paired 2.6 GHz spectrum should be below the level of average prices in the German auction, for two reasons:

- First, we consider that there is a risk of regulatory failure in placing too much weight on a single observation. We believe that there are benefits in looking at a wider sample of outcomes from other competitive European auctions, since the auction data have been made comparable (for example, adjusting for licence duration, population, purchase power parity, licence fees, etc).

- Second, even if we were satisfied to focus on a single auction, there is some evidence that the German auction was not competitive with respect to 2.6 GHz spectrum. For example, the consultants considered that the lack of differentiation between the price of paired and unpaired spectrum suggests that there was not competition in this band and bidding was merely driven by "parking strategies". The confidential respondent disagreed with this assessment but did not provide any evidence to the contrary.

[✂]

3.35 [✂].

3.36 [✂].

3.37 [✂].

3.38 [✂].

Ofcom's response

3.39 [✂].[6]

3.40 [✂]

3.41 [✂].[7]

3.42 [✂].

[6] [✂].
[7] [✂].

Ofcom's final position

3.43 We have explained above respondents' concerns and set out our response to those concerns.

3.44 We have also checked whether further relevant evidence from international benchmarking has become available since the publication of the Auction Statement.[8]

3.45 In light of the issues raised by respondents we do not see any reason to revise our proposed set of reserve prices, summarised in Table 1 above, and we confirm these as the final reserve prices (other than the figure for 1800 MHz since such spectrum will not be included in the auction). Our final decision on the reserve prices is given effect to in the Regulations.

[8] We note that the Romanian multi-band auction concluded in September 2012, and that this resulted in unsold spectrum, with 2x5 MHz of 800 MHz and 2x40 MHz of 2.6 GHz FDD spectrum being unsold. We have compared the Romanian reserve prices that resulted in unsold spectrum with our own reserve prices. We adjusted the Romanian reserve prices for population and length of the licence (but not purchasing power parity) to make them comparable to our UK reserve prices. This resulted in UK-equivalent reserve prices of around £100m for 2x5 MHz of 800 MHz (subject to a coverage obligation) and around £11m for 2x5 MHz of 2.6 GHz spectrum. These values are not dissimilar to our reserve prices of £125m for an equivalent 2x5 MHz lot of 800 MHz subject to coverage obligation (albeit we recognise the coverage obligations may not be equally onerous) and £15m for 2x5 MHz of 2.6 GHz FDD spectrum. However, we note that there are very significant differences in income per capita between Romania and the UK. According to the World Bank, GDP per capita in 2011 expressed in current US dollars was $8,405 in Romania and $38,818 in the UK (see: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD). In light of this significant difference in income per capita, we consider that the evidence from the Romanian auction does not lead us to change our view on the risk of unsold spectrum or reserve prices.

Section 4

Auction design

Background

4.1 The purpose of the Notice was to enable interested parties to comment on the form of the draft regulations. This followed from our competition assessment and decisions taken on the design of the auction. It was not intended to be a further opportunity to comment on policies which had previously been consulted on, or our assessment of their impact.

4.2 Nevertheless, stakeholders made a number of comments in relation to the design of the auction. We address these comments, and their relevance at this point in the preparation for the auction, in the paragraphs which follow.

Concerns in relation to bids for low power lots

4.3 [✂].

4.4 [✂].

4.5 [✂].

Ofcom's response

4.6 [✂].

4.7 [✂].

4.8 [✂].

Technical concerns in relation to spectrum assignments

4.9 [✂] expressed concern about the risks of intermodulation issues in uplink bands where spectrum is assigned to network sharing partners. [✂] acknowledged that, at the assignment stage of the auction, bidders can submit additional bids to secure specific frequencies, but observed that there is no means by which network sharers can share information about the frequencies which each has been assigned, without breaching rules intended to prevent collusion.

Ofcom's response

4.10 The issue was acknowledged in the Auction Statement where we noted that we had taken care to design an auction such that frequency preferences can be expressed by bidders. Furthermore, spectrum trading, after the auction has been concluded, may be used to achieve an outcome which is closer to optimal.

Risk of strategic bidding to increase competitors' costs

4.11 [✂].

Ofcom's response

4.12 In our view a bidding strategy aimed at raising the prices paid by rival bidders, carries significant risks for a bidder pursuing it. Any bid made during the auction can potentially win and the strategy described would involve placing bids that are above the value the bidder places on the package. Unlike in the potential scenarios that led us to remove the Final Price Cap[9] we had proposed in an earlier consultation, the bidder cannot be sure that its inflated bids will not win. Events since the publication of the Auction Statement do not change this fact.

4.13 [✂][10].

4.14 [✂].

4.15 [✂].[11]

The impact of optional MPP on payments

4.16 [✂] offered broad support for our auction design, in particular our decision to move from applying reserve prices to packages to applying them to individual lots. However, it identified a pricing anomaly resulting from our decision that the 800MHz lot that includes the coverage obligation (lot A2) is an optional rather than mandatory opt-in bid. [✂] argued that the decision to opt in to this lot can increase the price paid for an identical winning package. [✂] argued that this was because the bidder effectively ends up competing against its own opt-in bids. This may deter bidders from opting in to the coverage lot even when they value it more than the reservation price.

4.17 As a solution [✂] proposed an "override rule" whereby if an opted-in bidder wins an MPP-compatible package, and if it would have won this package regardless of its decision on the optional opt-in bid, it can never pay more than if it had not selected the optional opt in bid.

Ofcom's response

4.18 We accept that the pricing anomaly identified by [✂] can occur, although the bidder in question would find it difficult to predict the risk with any accuracy when making its opt-in decisions. However, we think the effect is better characterised as a bidder paying too little if it fails to opt in to the coverage lot. In the examples we have identified, not opting in to the optional lot reduces the set of possible outcomes that are permitted by the competition constraint when calculating the opportunity cost of the opted-in bidder's winning package. Some rival bids may therefore be excluded where they would otherwise play a role in determining the opportunity cost.

4.19 With regard to the proposed override rule we note that even if it does mean a bidder is no longer deterred from opting in to the optional lot, it may also distort bidding during the auction. Specifically, a bidder may construct its bids so that the optional

[9] The Final Price Cap, which we removed in the Auction Statement, required that supplementary bids could not exceed the final bid made on Final Primary Packages (i.e. packages bid in the final round of the primary bids round) by more than the difference in value measured at final round prices. The removal was discussed in paragraphs 7.7 to 7.11 of the Auction Statement.
[10] See paragraph 4.152 of the Auction Statement.
[11] See paragraph 4.205 to 4.214 of the Auction Statement

opt-in appears (incorrectly) not to affect the winning package in order for the override rule to lower the price paid.

4.20 The most effective way of encouraging truthful bidding would be to accept an unsold A2 lot as satisfying the competition constraint (and valued at reserve prices) when calculating winning bids and opportunity costs, regardless of whether an opted in bidder selected it. Clearly, the downside would be the risk that an unsold A2 lot is part of the value maximising outcome and that the auction does not therefore ensure four credible national wholesalers. Given this risk, we do not consider it would be an appropriate solution.

4.21 Our decision to make the A2 lot an optional opt in bid was based on a desire not to deter new entrants from considering opted in status. Because of this we believe it is still appropriate to leave the A2 lot as an optional opt in bid rather than a mandatory one.

Identity of opted-in bidders

4.22 [✂] asked us to clarify that we intend to identify the opt-in bidders as well as their number, claiming that failure to do so would create an unfair informational advantage for opted-in bidders.

Ofcom's response

4.23 We have decided not to release information about individual bids during the auction. Although an opted-in bidder, by virtue of knowing its own bids, may be better placed to infer the identity of the other opted-in bidders any advantage would be slight and would in our view be unlikely to affect the efficiency of the auction. It would also create greater information asymmetries to accept [✂]'s suggestion.

Information on excess demand

4.24 [✂] sought clarification about the information which will be provided in respect of excess demand between bidding rounds.

Ofcom's response

4.25 We confirm that information in respect of excess demand will be limited to whether there is or is not excess demand overall.

Section 5

Auction process

5.1 Stakeholders responding to the Notice made a number of comments in relation to the processes associated with the auction (as distinct from the design of the auction).

5.2 The process issues commented on included the following:

- Deposits (and their alternatives);
- Bidding processes, including scheduling of bidding rounds, bid increments and Ofcom's discretion to modify these processes in exceptional circumstances;
- Provision of information about bidders; and
- Auction software

Deposits – level

5.3 [✂] argued that the deposit requirements for opted-in bidders are excessive. This stakeholder noted that because all bidders are required to make a deposit of 50% of their highest primary bid, this could result in an opted-in bidder being required to put up a disproportionate sum relative to its final payment, as the winning opt-in bidder will pay substantially less for its spectrum than the current round prices. To address the concern, this stakeholder proposed that a simplified version of the Competition Credit (previously consulted on) should be applied to opted-in bidders. Two potential solutions were offered.

5.4 [✂] also proposed that reduced deposits should apply to the spectrum lot with the coverage obligation, in line with its lower reserve price. This stakeholder argued that the deposit required for this lot (180% of the starting price), may deter bidders who may find it difficult to raise such a deposit. This stakeholder proposed that bidders should be offered other deposit choices.

5.5 Conversely, [✂] argued that high value deposits (150%) could be obtained from those bidding for large 800 MHz packages, in conjunction with other measures, to deter predatory bidding.

5.6 [✂] proposed that, in view of the high value of the deposits required and the fact that interest payments will not be made in respect of deposits held, bank guarantees should be obtained in place of cash deposits.

Ofcom's response

5.7 We disagree with [✂] that the deposit requirements during the primary bid rounds are excessive for opted-in bidders. It is important to realise that any bid made during the principal stage of the auction is a potential winning bid, and that if it is, the base price payable may be anything up to and including the full amount bid. It is open to an opted-in bidder to stop bidding if it considers that the deposit requirements are too high.

5.8 As regards the link between deposits and eligibility points for the opt-in round, we acknowledge that an opting-in bidder that wishes to make an optional opt-in bid for

the 2x10MHz lot with the coverage obligation in the 800MHz band (i.e. A2) may be required to make a deposit larger than the reserve price for the A2 lot. However, we note that there is no effective cost imposed on such an opted-in bidder if that bidder also wishes to bid in the auction for 2x10MHz of 800MHz without a coverage obligation (i.e. two lots of A1). For example, the bidder might wish to have the option of substituting between the A2 lot and two lots of A1 depending on their relative prices. The respondent that raised this point suggested that a more complex system of eligibility could be implemented whereby (in effect) the eligibility required to bid for the A2 lot would in some circumstances be adequate to bid for two A1 lots but in other circumstances would not. We have considered this suggestion but consider that it would add further complexity to the auction design which we consider disproportionate to the risk of the problem identified. Therefore, whilst we recognise the possibility that the relevant opted-in bidder might wish to bid for A2 but not for two lots of A1, given the practical complications, we have decided to retain the straightforward link between deposits and eligibility points for the opt-in round in the Regulations.

5.9 On the other hand, other than in the circumstances discussed above, we do not accept that it is appropriate to require any bidder to make a deposit in excess of the amount which it bids and, therefore, can be required to pay. This would in our view serve no purpose in relation to securing an efficient auction outcome and might deter bidders who are unable to fund deposits which are larger than the sum which they have budgeted to acquire spectrum.

5.10 In response to the suggestion that we should obtain bank guarantees, the detailed provisions of any bank guarantee would need very close consideration by Ofcom before being accepted, and these would be likely to vary between guarantees offered to different bidders, presenting Ofcom with a risk that different potential bidders face different qualifying conditions to participate in the auction. The security of the guarantee offered by different financial institutions might also vary. Finally, we note that section 14 of the Wireless Telegraphy Act 2006 provides an express power to Ofcom to require an applicant to pay a deposit to Ofcom, but makes no express provision in relation to the acceptance of bank guarantees in place of cash deposits. For these reasons, we have decided not to allow bidders to provide bank guarantees in place of cash deposits.

Deposits – processes

5.11 Everything Everywhere warned that the deposit rules set out in the draft regulations are over elaborate with too many instances where deposits have to be topped up throughout the bidding process. Everything Everywhere agreed with the principle of an initial deposit with the application to participate supplemented by a further deposit before the opt-in round and the first primary bid round, but questioned the need for further deposits to be made in the circumstances set out in draft Regulations 52, 59 and 63. Everything Everywhere noted, in particular, that the wording of draft Regulations 59 and 63, unlike the wording of draft Regulation 52, does not provide discretion for Ofcom not to ask for these deposits. In the view of Everything Everywhere, the need to stop the auction while these further deposits are obtained will cause unnecessary delay and could add unwanted administration and transaction costs. Everything Everywhere proposed that draft Regulations 59 and 63 should be omitted and the scope of draft Regulation 52 extended to give Ofcom discretion to stop the auction at any point and ask for deposits to be topped up if bid amounts have gone much higher than deposit levels.

5.12 Conversely, [✂] expressed concern about the breadth of discretion that draft Regulation 52 appears to give Ofcom to choose to require some bidders, but not necessarily all bidders, to increase their deposit to cover 50% of its highest primary round bid to date. In this stakeholder's view, the discretion should be applied without discrimination to all bidders, and should vary only where a bidder has previously failed to submit a required deposit increase.

5.13 Everything Everywhere questioned whether draft Regulation 59, as drafted and in conjunction with draft Regulations 53 and 63, would work as intended. Specifically, Everything Everywhere sought clarification of the timing of the deposit required by draft Regulation 59, noting that if the payment was required before the start of thesupplementary bids round, the amount of the deposit (to be calculated with reference to the highest supplementary bid) could not be known at that time, but if it was to be paid after the supplementary bids round it would serve little purpose because a further deposit is required for the final principal stage which would be payable immediately after the supplementary bids round.

5.14 Everything Everywhere also argued that the number of deposit payments means that there are many potential default situations for which rules have to be specified, which add to the complexity of the Regulations and the potential for unintended consequences. In particular, Everything Everywhere asked what would be the status of the auction if the winner determination and pricing has been calculated at the point where the default occurs, and whether there would be scope to re-run the winner determination and pricing calculation. Should this not be possible, spectrum might be left unsold (despite there being demand for this at the reserve price) and winning bidders might end up paying more than would be the case had the defaulting party not engaged in that stage of the auction.

5.15 A similar point was made by [✂] which proposed that there should be provision for, at least, a re-run of the price determination if a bidder is excluded after determination of winning bids and prices. This stakeholder also asked for clarification that, if a bidder fails to increase its deposit as required prior to the supplementary bids round, all of its bids will be declared invalid and excluded from the winner and price determination. This stakeholder asked that in these circumstances all bidders should be informed of the identity of the defaulting bidder, including whether he was an opt-in bidder, and that Ofcom should republish demand data for all primary rounds with the invalid bids removed so that other bidders can take this into account when preparing their supplementary bids.

Ofcom's response

5.16 We do not intend to stop the auction when further deposits are required. As set out in Regulations 59 and 66 (draft Regulations 52 and 59), where a bidder fails to make a required deposit by the deadline set by Ofcom, that bidder's eligibility limit in any subsequent primary bid round will be zero and, where the required deposit relates to the supplementary bids round, the bidder will be excluded from the award process. The requirement to increase the level of deposits made at various points during the auction will not, therefore, cause delay.

5.17 While the Regulations provide Ofcom with a degree of flexibility in applying the requirements in relation to deposits, we would have to exercise that discretion in accordance with our statutory duties and ordinary principles of administrative law. As such, an arbitrary or unduly discriminatory exercise of that discretion would be unlawful.

5.18 In relation to Everything Everywhere's specific question about the timing and calculation of the deposit payable under draft Regulation 59 (now Regulation 66), the deadline for payment will be after bids have been submitted in respect of the supplementary bids round but before those bids are validated. As such, bidders will know their "highest valid supplementary bid" (which determines the level of deposit required) and payment of this deposit will still have relevance for the continuing auction process.

5.19 We confirm that the Regulations make no provision for rerunning the winner determination and pricing calculation if a winner is excluded after determination of winning bids and prices. The spectrum would remain unsold pending a further auction, and the question of releasing information necessary to enable bidders to bid again does not, therefore, arise.

Bidding processes

5.20 [✂] made a number of points in relation to the bidding process, and whether sufficient time will be allowed for bidders to engage with their own internal decision making and governance arrangements before deciding whether to continue bidding. This stakeholder proposed that a minimum of three business days' notice should be given of the supplementary bids round, and that there should be a maximum of seven primary rounds per day and a minimum of 30 minutes (not 15 minutes) between primary rounds. This stakeholder also asked Ofcom to publish a provisional round timetable for the next auction day not later than one hour after the close of primary rounds on each auction day. This stakeholder proposed that, although Ofcom might deviate from that timetable by postponing or reducing the number of rounds, Ofcom should never schedule rounds earlier than planned or shorten planned rounds.

5.21 [✂] sought clarification of Ofcom's approach to determining bid increments to help potential bidders track the likely rate of increase in bids and how this relates to internal sign off processes. This stakeholder acknowledged that some flexibility is necessary but proposed that Ofcom should specify an absolute cap on the size of increments.

5.22 [✂] noted that the draft regulations make provision for Ofcom to terminate the primary rounds while there is still excess demand, and asked for examples of the situations in which it might consider doing this.

5.23 [✂] noted that, under draft Regulation 46, Ofcom has discretion to replenish the extension rights of a bidder during a primary bid round where the bidder faced circumstances beyond his control. [✂] asked how quickly Ofcom will decide whether to exercise its discretion in this way, and whether Ofcom has other discretion beyond this rule.

5.24 [✂] observed that under draft Regulation 49 Ofcom has discretion not to expel from the auction bidders that make incomplete or defective bids, provided that Ofcom can ascertain the bidder's intention. [✂] asked for clarification that this discretion may be applied only to bids submitted under the alternative method envisaged in draft Regulation 48 (typically where technical failure means the bidder is unable to submit a bid using the electronic auction system).

5.25 Everything Everywhere was supportive of there being restrictions on Ofcom's ability to close the primary rounds early, but questioned whether the requirement under draft Regulation 28(2) for it to be "unlikely that the information that would be made

available to bidders following any such further primary rounds would change [the outcome of the principal stage]" was too restrictive and would not address a situation where Ofcom has serious suspicions of collusion.

Ofcom's response

5.26 We will publish guidance on the operation of the auction process shortly. This will include information about likely timings of the various stages of the auction and our approach to determining bid increments.

5.27 As set out in Regulations 34(2), 35(2), 36(2), and 37(2), the round price for a type of lot (with the exception of the 2.6 GHz low power lots) shall not be more than twice the amount of the round price for that type of lot in the previous primary bid round. For the 2.6 GHz low power lots, there will be an upper and a lower limit determined in accordance with the Regulations.

5.28 We do not have in mind specific examples of situations where Ofcom might wish to terminate the primary bid rounds while there is still excess demand. However, we envisage that we would use these powers only in very exceptional circumstances.

5.29 In relation to the question from [✂] about the application of Ofcom's discretion to replenish a bidder's extension rights, we confirm that Ofcom will announce its decision before scheduling the next primary bid round. The Regulations do not provide for the exercise of any other discretion in relation to these extensions.

5.30 Regulation 56 (draft Regulation 49), which deals with a scenario where a primary bid form is incomplete or defective, does not distinguish between bid forms submitted using the electronic auction system and bid forms submitted using an alternative method as provided for in Regulation 55 (draft Regulation 48). As such, Regulation 56 (draft Regulation 49) applies to either scenario. However, the electronic auction system is designed to prevent the submission of an incomplete or defective primary bid form.

5.31 Part 6 of the Regulations provides Ofcom with powers to act where, amongst other circumstances, there is evidence of collusion or attempted collusion. In these circumstances, we have powers to halt the auction while we determine whether there is evidence of attempted collusion. If appropriate, we would take action to exclude colluding bidders before restarting bidding. We do not consider it appropriate to use Regulation 28(2) to provide further powers in relation to collusion as this Regulation relates to the normal lawful operation of the auction.

Provision of information to bidders

5.32 [✂] asked for clarification about the information which Ofcom will publish about bidders. This stakeholder noted that Ofcom will publish a list of applicants and their associates, and also a list of qualified bidders, but asked whether the list of associates will be updated if this changes, whether information will be published about the ownership and nature of associate relationships and whether information about deposits and initial eligibility will be published.

5.33 Everything Everywhere argued that the draft regulations do not make clear what information will be made available to bidders during the primary rounds. Everything Everywhere argued that the draft regulations do not even make clear that the round prices will be revealed before each primary round. Everything Everywhere proposed that draft Regulation 51 should be amplified to include similar levels of detail to those

provided in the Auction Statement. In particular, Everything Everywhere proposed that draft Regulation 51 should make clear whether information to be provided by Ofcom at the end of each primary bid round in respect of the total numbers of lots "included in valid primary bids" is the total number of lots in the auction or the most recent primary bid round. Everything Everywhere also asked whether Ofcom will release the total number of lots included in valid bids for each category of lot or aggregated across categories.

5.34 Everything Everywhere also requested clarification of the basis of the information in respect of "excess demand" as referred to in draft Regulation 51. [✂] also asked that the Regulations should specify the minimum information set that will be provided about "excess demand", including the aggregate demand in each lot category when considering all primary bids made in the most recent primary bid round.

Ofcom's response

5.35 We will notify all qualified applicants of the names of all other qualified applicants and the names of their associates. We will also publish the names of qualified applicants on Ofcom's website. This is set out in Regulation 11. We do not intend to publish information about the ownership and nature of associate relationships as we intend that bidders should satisfy themselves about these matters.

5.36 We confirm that we will make available to bidders any relevant updated information about qualified applicants which is provided to us.

5.37 We will publish the information set out in Regulation 71 in relation to winning bidders under the principal stage. We will also publish the information set out in Regulation 111 on completion of the award process. We do not intend to publish information about bidders' deposits and initial eligibility.

5.38 We confirm that, as explained more fully in paragraph A5.74 of the Auction Statement, the aggregate demand information that we publish at the end of each primary bid round will relate to the valid primary bids made in the most recent primary bid round. We have amended Regulation 58 (draft Regulation 51) accordingly.

5.39 Regulation 52 (draft Regulation 46) requires Ofcom to notify each bidder of, amongst other things, the round price for each type of lot.

5.40 As set out in Regulation 58 (draft Regulation 51) , Ofcom will notify bidders after the end of each primary bid round whether there is excess demand. The information provided will simply be whether there is excess demand overall. The method to determine whether there is excess demand and the relevance of "adjusted demand" in this assessment is set out in Regulation 29.

Access to software

5.41 [✂] asked for further information about access to key software and associated data templates that will be used during the auction. This stakeholder requested that winner and price determination standalone software should be made available to bidders at least three months before the auction start, templates for round results and next round prices at least one month before the auction start, and bidder manuals and training sessions as soon as possible.

5.42 [✂] also made specific requests for two "minor" modifications to the software. The first was that the .csv file containing next round prices should also incorporate round

results data, and that the latter should be in the same format as the round results file. The second request was that the system should retain archived copies of both round results and next round prices as .csv files, such that they can be downloaded at any time.

Ofcom's response

5.43 It will not be possible to provide access to standalone software three months before the auction start as this would delay the auction timetable. However, we will provide access as soon as we can. Further information about the timetable for release of auction documentation and provision of auction training will be provided in the guidance notes for the auction which we will publish shortly. We will consider with interested parties any practical concerns that arise during the mock auctions which will be run as part of the training material, but scope to modify the software and templates will be limited.

Section 6

Drafting of the Regulations

6.1 Stakeholders made a number of observations about the clarity of the Regulations and the degree to which these accurately reflect stakeholders' understanding of the intention of each Regulation.

Eligibility points

6.2 [✂] observed that Schedule 6 of the draft regulations defines the number of eligibility points for a "2.6 GHz individual frequency lot" as "n-1", where n is the number of lots selected. This stakeholder contrasted this with the definition provided in the Auction Statement where the number of eligibility points for n lots is n-1.

Ofcom's response

6.3 We confirm that the n-1 eligibility points relate to n lots. We have corrected the Regulations accordingly.

Spectrum caps

6.4 [✂] queried an apparent inconsistency between the explanation in the Auction Statement and the wording of Schedule 3 to the draft regulations in respect of spectrum holdings to be taken into account when determining whether the 210 MHz spectrum cap has been respected. This stakeholder noted that the statement implied that low power 2.6 GHz spectrum lots would not be taken into account, and that only n-1 of the n lots of unpaired 2.6 GHz spectrum would be taken into account. Conversely [BT] said that the draft regulations imply that all lots in the bands listed are relevant to this assessment. [✂] similarly asked that the draft regulations should be amended to make more clear that restricted, low power, lots do not count toward the overall spectrum cap and that all unrestricted lots (including unpaired) do count towards the cap.

Ofcom's response

6.5 We confirm that low power 2.6 GHz lots will not be taken into account when assessing adherence to spectrum caps. We also confirm that all unrestricted lots will be taken into account. Where a bidder wins n of the E category lots (unpaired 2.6 GHz), the lowest frequency block will be subject to usage restrictions, and so will not be included when assessing total unrestricted spectrum holdings. We have corrected the Regulations accordingly.

Spectrum holdings

6.6 Everything Everywhere noted that draft Regulation 5 appears to require applicants to notify Ofcom of the spectrum holdings of their parent companies as well as their own holdings. In Everything Everywhere's view, this is unnecessary and potentially difficult to comply with as spectrum auctions are proceeding in other countries too. Everything Everywhere proposed that the obligation to notify should relate only to UK spectrum holdings.

Ofcom's response

6.7 Our intention is that bidders should be required to notify information only about UK spectrum holdings licensed under the Wireless Telegraphy Act 2006. In our view, this is made clear by the definition of "Existing spectrum holdings" set out in Regulation 4(6) (draft Regulation 5(5)) .

Rounding of round prices

6.8 Everything Everywhere noted an apparent inconsistency between the Auction Statement and the draft regulations in respect of rounding of base prices, with the statement referring to base prices for each winner being rounded up to the nearest thousand pounds and the draft regulations (Schedule 7, paragraph 1(2)) referring to rounding up to the nearest one pound. Everything Everywhere also warned of a possible inconsistency within the draft regulations, acknowledging that draft Regulation 37(1)(h) requires that supplementary bids must be specified in whole thousands of pounds but noting that there appears to be no such constraint on primary round bids. In Everything Everywhere's opinion, this creates a risk that the auctioneer will inadvertently set primary round prices that are not in whole thousands of pounds. As Everything Everywhere noted, an alternative to achieve consistency would be to amend the draft regulations to require that supplementary bids are in whole pounds rather than whole thousands of pounds.

Ofcom's response

6.9 We have amended the Regulations to make clear that base prices will be rounded up to the nearest £1000. We acknowledge that the Regulations do not prevent the auctioneer from setting round prices for second and subsequent primary bid rounds which are not rounded to the nearest £1000, but it is our intention that round prices will be so rounded.

Other issues

6.10 Stakeholders raised a number of typographical errors which we have addressed in the Regulations which we have made. The auction design and process is unchanged, but we also have made a number of drafting changes in the Regulations to increase clarity. The key changes are summarised in the following paragraphs.

6.11 We have made some changes to the drafting on "existing spectrum holdings" and the spectrum cap to add clarity and flexibility for auction participants.

6.12 A new regulation (number 16) now requires Ofcom to record the existing spectrum holdings for each bidder. Applicants and bidders can change holdings before they are recorded. The recorded holdings are the ones which will be taken into account in determining which opt-in selection a bidder is eligible for and for the purposes of the spectrum caps. After recording changes can still be made to holdings, but the bidder may be subject to activity rules in Regulations 112 and 114 if they apply. The activity rules, by way of high level summary, permit a divestment of holdings but not an increase (but participants should read the precise wording in those Regulations rather than rely on this summary).

6.13 There are also amendments which concern the persons in respect of whom existing spectrum holdings are relevant. The list of persons is in Regulation 4(3)(a)(iii).

6.14 The spectrum cap rule has itself been redrafted for clarification.

6.15 The description of opt-in selections (and the list of selections and prices in Schedule 2) has been redrafted and stepped-out for clarity.

6.16 The round prices in the first primary bid round are contained in Regulation 32. The round prices for subsequent rounds for different types of lot have been stepped-out, for greater clarity, in Regulations 33 to 39.

6.17 A further area where there has been substantial redrafting, but no change in underlying design of the award, is in relation to the assignment stage. Chapter 11 now sets out pre-determined frequency assignments, which apply. These are stepped-out in the Regulations much more fully than before and are found in regulations 73 to 87. The procedure for the assignment stage bidding is the same as before (Chapters 12, 13 and 14) but the drafting here has been stepped-out in places to make it more obvious to the reader of the Regulations when they apply and which assignment stage options are available for which bidder.

Section 7

Drafting of the licences

7.1 Draft schedules to the template licences which will be issued after the auction has been completed were attached to the Information Memorandum. Stakeholders made a number of specific points in relation to these drafts. We address those points in the paragraphs which follow.

Licences – obligations to provide technical information

7.2 [✂] questioned the usefulness of the obligation to supply to Ofcom the postcode location of all femtocells, as cells may be moved by the end user without the operator's knowledge (despite contractual obligations intended to prevent this). This stakeholder proposed that holders of 800 MHz and 2.6 GHz licences should be exempted from providing this information, in line with 1800 MHz and 2.1 GHz licensees or, failing that, the requirement should be more clearly specified.

7.3 The same stakeholder also expressed concern, more generally, about the amount of information which holders of 800 MHz and/or 2.6 GHz licensees will be required to gather for Ofcom, including information about "the frequencies that Radio Equipment might be able to use and its technical characteristics".

Ofcom's response

7.4 Postcode information about the location of femtocells is needed to assist with interference management in relation to DTT below 790 MHz and Radar above 2.7 GHz. These are specific concerns that do not arise in relation to 1800 MHz and 2.1 GHz licences. It will be important that licensees take the necessary steps to ensure that they can comply with the obligation to provide accurate information.

7.5 We confirm that technical information should be supplied in relation to the radio frequencies which the radio equipment actually uses, and need not be provided in relation to other frequencies not in use. We also agree that the term "technical characteristics" is not clearly defined and so should be deleted. We have made minor changes to the licences to reflect both of these factors. Revised versions of the template licence schedules are annexed to the update to the Information Memorandum published today.

Licences – co-ordination with radar operators

7.6 [✂] warned that the ongoing co-ordination requirements with radar operators leave open the possibility of disputes, and proposed that Ofcom should specify an arbitration process. The same stakeholder also requested that Ofcom should specify the maximum time interval between updates of the protected radar list.

7.7 Another stakeholder, [✂], noted that the list of radar in Annex 3 of the auction Information Memorandum does not identify where in the band each radar operates. [✂] assumed that Ofcom intends that the whole band should be protected at all radar locations, rather than co-ordinating specific frequencies at specific locations. This stakeholder observed that the overall scale of the co-ordination exercise could be reduced by co-ordinating received out of band emissions at specific frequencies.

Ofcom's response

7.8 We have noted the comments from [✂] on the draft notice of coordination procedures relating to radars in the 2.7 GHz band. We have decided to include an additional paragraph in the coordination procedures setting out the escalation process which will apply where parties are unable to reach an agreement. This is set out in paragraph 2.17 of the IM update. We have not yet determined the frequency of updates to the protected radar list. This will depend on the frequency of changes to the radars on the list. During the period when modifications are being carried out to the radars it is likely that updates will be more frequent (if appropriate, this may be monthly). When modifications have been completed, the list will be updated less frequently (if appropriate, this may be quarterly).

7.9 The thresholds set out in the draft notice of coordination procedures apply to the whole band. This is because radar frequencies at specific locations may change over time, for a range of reasons.

Licences – revocation

7.10 [✂] noted that the licences to be granted through the auction may be revoked for breach of any conditions. This stakeholder proposed that revocation should be confined to "material breach" in line with the terms in the current 2.1 GHz licences.

Ofcom's response

7.11 We note [✂]'s comment, but we do not consider it is necessary to amend the licences, in light of the statutory requirement that any licence revocation be objectively justifiable,[12] as well as our general statutory duties and principles of administrative law.

Licences – technical terminology and data

7.12 [✂] noted that the term "EIRP" is defined as *equivalent* isotropically radiated power in the draft licences but as *effective* isotropic radiated power in the 800 MHz, 1800 MHz and 2.1 GHz licence in force today. This stakeholder proposed that the definitions should be aligned and that the text "(absolute or isotropic gain)" should be removed as it is logically inconsistent.

7.13 [✂] drew attention to an apparent error in the draft licence for the 1800 MHz licence where the Uplink and Downlink frequencies appear to have been transposed.

Ofcom's response

7.14 We confirm that the intended definition is as drafted i.e. "equivalent isotropically radiated power". The alternative definition of EIRP used in the context of the 800 MHz, 1800 MHz and 2.6 GHz licences is that used in the ITU Radio Regulations. The additional text "(absolute or isotropic gain)" is also used in the ITU definition. We plan in due course to amend the definition used in other licences, to align this with the ITU definition. We have not to date seen evidence that this divergence in the definition of the terms has resulted in any practical concerns. As a result, we do not consider it necessary to make any amendments to the draft licence schedules in respect of these points.

[12] Wireless Telegraphy Act 2006, Schedule 1, paragraph 6a

7.15 We confirm that Uplink and Downlink frequencies for the 1800 MHz licence were labelled incorrectly. We note, however, that this spectrum will not now be auctioned as Everything Everywhere has agreed a private sale of this spectrum, so we have not published an amended version of this licence schedule.

Licences – coverage obligations

7.16 Everything Everywhere, in noting the coverage obligation, asked for clarification of the propagation model that was used in assessing the 98% overall coverage and the 95% coverage in the individual nations and whether this was the ITU-R-P1812-2 model or a Hata based model. Everything Everywhere also for information for about the sensitivity of the analysis to propagation model choice.

7.17 Mr D Titford noted that the draft regulations do not include coverage obligations. He further proposed that any new entrant which is not currently a UK licensed MNO should be given additional time to comply with coverage obligations and should have access to arbitration where an existing MNO or site owner acts to prevent him from using an existing cell at reasonable commercial terms.

Ofcom's response

7.18 The "approach 2" analysis that we presented in the Auction Statement was undertaken by Real Wireless using a simplified modelling approach which was based on a Hata propagation model. In order to take account, in a generalised way, of the increased impact of terrain in the locations of the UK required to meet a 98% coverage obligation, an additional empirical offset was applied. Since that time, we have undertaken some additional analysis based on the compliance verification methodology[13] that we published alongside the Auction Statement.

7.19 We have analysed a number of different site portfolios and compared with the equivalent analysis undertaken by Real Wireless. The results from the two methodologies are broadly in line and show good agreement across the whole of the UK. There are some small differences (both improved and reduced coverage) with regard to the coverage achieved in the individual nations, as we would expect given the likely greater impact of terrain on the coverage footprint of the networks in these areas. However without accurate values of radiated power and antenna downtilt for a fully optimised 4G network we are unable at this stage to provide any greater level of accuracy. We have therefore concluded that the Real Wireless analysis that we used in determining the detail of the coverage obligation and which was summarised in the Auction Statement is representative of the results that will be achieved when assessing coverage using the verification methodology that we have published.

7.20 During our recent analysis we have determined certain additional points that we believe provide greater clarity for the implementation of the compliance verification methodology, we have therefore published an update to the compliance verification methodology alongside this statement.

7.21 Specifically, we have made the following amendments:

- Section 4.2 has been updated to include the addition of channel bandwidth as a requested parameter and an amendment to the requested location parameter to specifically request easting and northing to a 1 metre resolution.

[13] http://stakeholders.ofcom.org.uk/binaries/consultations/award-800mhz/statement/4g-lte.pdf

- The steps in Section 4.3 are numbered for ease of reference.
- We have addressed a possible ambiguity in the interpretation of paragraph 4.3.4
- We have added an explicit statement of serving sector power in paragraph 4.3.5.
- We have addressed a possible ambiguity in the interpretation of paragraph 4.3.7
- For ease of implementation the process of assessing multiple carriers has been amended slightly in paragraph 4.3.8.
- Figure 1 has been updated in line with amendments to paragraph 4.3.8.
- We have made some minor drafting changes to ensure clarity.

7.22 In addition, having taken expert advice from dB Spectrum Services Ltd and Signal Science Ltd, we have provided some additional information and clarifications on the use of the propagation model ITU-R Recommendation P.1812-2 in Annex 1 of the updated document.

7.23 The amendments listed in A1.14 to A1.23 of the updated document are to clarify issues that have arisen during implementation of the model. We consider them to be typographical errors rather than material changes to the method set out in Recommendation P.1812-2.

7.24 In response to the points raised by Mr D. Titford, coverage obligations will be specified in the relevant licences as set out in the Auction Statement. Our conclusions on competition issues were set out in the Auction Statement.

Section 8

Next steps

8.1 We made the statutory instrument which sets out the Regulations on 9 November 2012 and it will come into force on 23 November 2012. A copy of this statutory instrument is annexed to this Statement for indicative purposes in the form submitted for registration and publication after it was made. The statutory instrument will be formally published on the government's legislation.gov.uk website in due course.

8.2 We provisionally expect the date for receipt of applications to be 11 December 2012. We will publish the final date and times on our website at http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-in-progress/ once the Regulations have come into force.

8.3 All other relevant information and documents relating to this award of the 800 MHz and 2.6 GHz Spectrum Bands will also be published on the same website.

8.4 Section 7 of the Information Memorandum included some detail of the award process. Further detail will be set out in the bidder guidance which we will publish shortly. The duration of the award process will depend, amongst other things, on the number of primary bid rounds in the auction. We expect the bidding process to begin in January 2013.

Annex 1

Statutory instrument

A1.1 This is published as a standalone file at http://stakeholders.ofcom.org.uk/spectrum/spectrum-awards/awards-in-progress/

Annex 2

Regulatory Impact Assessment

Regulatory Impact Assessment –the Wireless Telegraphy (Licence Award) Regulations 2012

A2.1 In accordance with government practice, where a statutory regulation is proposed, a Regulatory Impact Assessment (RIA) must be undertaken. The analysis presented in this Annex represents a Regulatory Impact Assessment.

A2.2 RIAs provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making and are commonly used by other regulators. In producing the RIA in this document, Ofcom has had regard to such general guidance as it considers appropriate, including Cabinet Office guidance.

The issue being considered and the citizen/consumer interest

A2.3 This impact assessment concerns the award of spectrum in the 800MHz and 2.6GHz frequency bands. Ofcom has been directed by Government[14] to exercise its powers to make regulations to hold an award in respect of these frequency bands. These bands are ideally suited to the provision of mobile electronic communications services including so-called "4G" high speed mobile broadband services.

A2.4 As set out by Ofcom in its concluding statement on the spectrum framework review[15], Ofcom's view is that where possible, citizen/consumer interests are best served through making spectrum available as soon as practical through open, competitive spectrum auctions.

A2.5 Following the publication of Ofcom consultations on 22 March 2011 (the "March 2011 Consultation") and 12 January 2012 (the "January 2012 Consultation"), we set out in the statement published on 24 July 2012 on the award of the 800 MHz and 2.6 GHz spectrum (the "Auction Statement") that Ofcom had decided to award licences by means of an auction subject to specific rules. These publications are all available on Ofcom's website, www.ofcom.org.uk.

A2.6 Ofcom believes that citizens and consumers will benefit from this spectrum award. Consumers and business end-users will directly benefit from the provision of 4G services using his spectrum.

The policy objective

A2.7 We have a principal duty to further the interests of citizens in relation to communications matters and to further the interests of consumers in relevant markets, where appropriate, by promoting competition. Further, in securing these principal duties we are required to secure the optimal use for wireless telegraphy of the electro-magnetic spectrum. Therefore, the objective of the policy is to award the

[14] The Wireless Telegraphy Act 2006 (Directions to OFCOM) Order 2010 (S.I.2010 No. 3024) which can be found at: http://www.legislation.gov.uk/uksi/2010/3024/contents/made
[15] http://stakeholders.ofcom.org.uk/consultations/sfrip/

available spectrum in such a way as to maximum the likelihood that it will secure optimal use of the spectrum, and promote competition in relevant markets.

Identification and assessment of options and the impacts on stakeholders

Decision to hold an auction

A2.8 The Government direction to Ofcom referred to above required Ofcom to exercise its power to hold an auction for spectrum in the 800MHz and 2.6GHz frequency bands. In light of this, Ofcom has not considered other options for the release of this spectrum.

A2.9 The Government direction also required Ofcom to complete an assessment of likely future competition in markets for the provision of mobile electronic communications services before holding an auction for the relevant frequencies.

A2.10 Ofcom set out its completed competition assessment in the Auction statement.

A2.11 Ofcom also set out its decisions including on the auction rules and other aspects of the auction design.

A2.12 The Auction Statement set out our decisions on the auction design and our proposals for reserve prices to apply to the 800 MHz and 2.6 GHz award. In both cases we took into account the responses to the March 2011 Consultation and January 2012 Consultation and considered the impacts on stakeholders of the options on which we had consulted in the March 2011 Consultation and the January 2012 Consultation.

A2.13 In the statement published on 12 November 2012 accompanying the final auction regulations and this RIA, Ofcom set out its final decisions on the reserve prices to apply in the auction.

Competition Assessment

A2.14 Ofcom considered likely future competition in markets for the provision of mobile electronic communications services. In light of this assessment, Ofcom considered (i) whether or not to promote competition by seeking to ensure that there was at least a minimum number of credible national wholesalers in the market in the UK after the auction, (ii) whether or not to reserve some spectrum in the auction, and (iii) if so, how much spectrum to reserve.

A2.15 For the reasons set out in the Auction Statement, Ofcom decided to promote competition by seeking to ensure that there were at least 4 credible national wholesalers in the market in the UK. Ofcom considered that this was an appropriate minimum, given its view that competition between the four existing national wholesalers operating in the UK currently delivers a wide range of benefits for consumers of mobile services and that as a matter of policy, Ofcom would be concerned if as a result of the auction fewer operators had access to sufficient spectrum to compete credibly at the wholesale level in the future than is currently the case in the UK, as in our view this is likely to lead to a reduction in competitive intensity to the detriment of consumers.

A2.16 We considered whether we should go further and take measures to promote more than four national wholesalers. We considered that there could be greater benefits

to consumers and citizens through increased competitive intensity with five national wholesalers compared to fewer but this would in our view also carry a greater risk of inefficiency. We did not receive any clear evidence of interest from stakeholders in becoming a fifth national wholesaler. Taking this, and the relative scarcity of the spectrum concerned, into account (in particular the amount of spectrum that a fifth wholesaler would be likely to need to win in the auction to be capable of being a credible national wholesaler), we did not consider that it would be objectively justified and proportionate to seek to promote more than four national wholesalers.

A2.17 We decided that we should reserve some spectrum in the auction. We considered the position of the existing national wholesalers in the UK market, and concluded that there was a material risk that neither H3G nor a new entrant would acquire a sufficient amount of spectrum in the auction to be able to compete credibly at the wholesale level in the future. We considered whether any of the other existing national wholesalers might not acquire sufficient spectrum in the auction to be able to compete credibly at the wholesale level in the future, and decided that we did not have the same level of concern in regard to Everything Everywhere, Telefónica or Vodafone, even though they may well be able to offer better or a wider range of services and compete more aggressively if they acquire additional spectrum through the auction. We therefore decided that it was appropriate to reserve some of the available spectrum in the auction for a fourth national wholesaler, by which we mean a bidder other than Everything Everywhere, Telefónica or Vodafone.

A2.18 We considered a number of options as to the amount and nature of spectrum that we should reserve, and decided to reserve the following portfolios (dependent on whether the 1800MHz spectrum would be included in the auction):

Portfolio	**800 MHz**	**1800 MHz**	**2.6 GHz**
1	2 x 15 MHz		
2	2 x 10 MHz		2 x 10 MHz
3	2 x 5 MHz	2 x 15 MHz	
4		2 x 15 MHz	2 x 20 MHz

A2.19 We considered that any one of these portfolios would be likely to be sufficient for a fourth national wholesaler to be capable of being a credible competitor.

A2.20 We also decided to apply certain spectrum caps in the auction, to limit the amount of spectrum that any one bidder could win. We considered the following options in our January 2012 consultation:

Sub-1 GHz (800 MHz and 900 MHz) holdings	Option 1: 2x22.5 MHz Option 2: 2x27.5 MHz Option 3: no cap
Overall holdings	Option 1: 2x105 MHz Option 2: 2x120 MHz Option 3: no cap

A2.21 We decided to impose the following safeguard caps:

- sub 1GHz safeguard cap of 2x27.5 MHz (option 2); and

- overall spectrum cap of 2x105 MHz (option 1).

A2.22 We considered these particular caps to be the minimum necessary to avoid very asymmetric distributions of spectrum, taking account of existing spectrum holdings.

A2.23 Full details of our reasons for making each of these decisions, including more detailed consideration of the effects of different options on stakeholders, are set out in our Auction Statement, and the January 2012 Consultation.

Auction rules/design

A2.24 In the Auction Statement we set out our final decisions on the design of the auction.

A2.25 There are a number of different auction formats available, which may be suitable for the award of multiple lots of spectrum frequencies. In selecting the appropriate format for this auction, it is helpful to consider three key choices in design.

- Simultaneous or sequential sale of lots;
- Single round (sealed bid) or multiple rounds (ascending bids); and
- Bidding for individual lots or packages (combinations) of lots.

A2.26 The advantages and disadvantages associated with each of these three choices in auction design are set out in the table below.

Option	**Advantages**	**Disadvantages**
Simultaneous rather than sequential sale of lots	For most categories of bidder, a range of lots are potentially close substitutes meaning that bidders' preferences will be affected by the relative prices of individual lots. Most bidders are likely to bid for multiple lots, meaning the lots are complementary. Simultaneous award can reduce bidders' substitution and aggregation risks.	Award process more complex than a single round award, but not so great as to justify using a significantly less efficient auction format.
Multiple round (ascending bids) rather than single round (sealed bids)	In the absence of competition concerns, considered to produce more efficient outcomes as bidders can learn from observing behaviour of competitors over the course of the auction – particularly important where the spectrum can be used to support new downstream services where there is greater uncertainty. Allowing bidders to respond to relative prices reduces substitution and aggregation risks	Award process more complex than a single round award, but not so great as to justify using a significantly less efficient auction format.
Use of package	Could enhance the efficiency of the auction, particularly where there are strong	Can make the auction more complex and less

(combinatorial) bidding	complementarities amongst lots, and the pattern of complementarities vary by bidder. Removes risks of stranded lots where bidders are left with unwanted lots at the end of the auction. Reduces the risk that there could be unsold lots as a result of "step changes" in demand (which can occur in SMRAs where withdrawals are allowed).	transparent, but offset by the expected efficiency advantages.

A2.27 We considered two main options for auction design in light in particular of the above considerations: (i) a combinatorial clock auction, and (ii) another form of SMRA auction. We set out our assessment of the different impacts of each design in our March 2011 Consultation.

A2.28 We considered advantages and disadvantages relating in particular to:

- letting bidders make bids for spectrum packages they value;
- aggregation risks/stranded lots;
- the reduction in common value uncertainty;
- encouraging truthful bidding;
- reducing the opportunities for strategic bidding behaviour; and
- complexity.

A2.29 In our Auction Statement we decided on a combinatorial clock auction. This design in our view strikes an appropriate balance in relation to each of the above factors.

Reserve prices

A2.30 We considered two broad options in relation to the setting of reserve prices: (a) to set low but non-trivial reserve prices, or (b) to set higher reserve prices in light of specific factors relating to this auction.

A2.31 The advantage of low but non-trivial reserve prices is that they may be sufficient to deter frivolous bidding. The disadvantage is that they may be relatively low compared to the value of the spectrum.

A2.32 Some advantages of higher reserve prices is that they may be helpful for the purpose of achieving efficient use of the spectrum by managing the risk of strategic behaviour that might occur during or prior to the auction aimed at reducing competition for spectrum (such as bidders reducing their demand to decrease significantly the price they pay). By having material reserve prices, this would likely reduce the maximum potential pay-off that any bidder could receive from bidding strategically. This would be likely to reduce the incentives on any bidder to seek to execute such a strategy. Higher reserve prices may also help with the auction

process in that they would reduce the time necessary to reach price levels close to the eventual value of the spectrum.

A2.33 A disadvantage of higher reserve prices is that if set too high, they may deter bidders from participating in the auction, and some spectrum might be left unsold.

A2.34 We have decided to follow option (b) above and set higher reserve prices than the low but non-trivial reserve prices that we have set in previous auction. Our reasons for this are set out in detail in the statement of 12 November 2012 accompanying the final auction regulations and this RIA. We consider that the reserve prices we have set appropriately balance the advantages and disadvantages set out above.

Costs to Ofcom and the public sector

A2.35 There are one-off administrative costs associated with making Statutory Instruments. We consider these implementation costs to be low. The costs of our decision to award the licences relate mainly to the costs of carrying out the award process and clearance of the spectrum. The administrative costs of the award will be small in relation to the benefit generated to the economy and the award process is very unlikely to have a negative financial impact. The cost of clearing the 800 MHz and 2.6 GHz bands, and adjacent spectrum, will be significant. However in comparison with the total reserve prices for the spectrum being auctioned, and in comparison with the likely consumer benefits of 4G services, we consider the costs of spectrum clearance are relatively small.

Cost to business, including small business and the voluntary sector

A2.36 The business sector most likely to be affected by the auction of this spectrum is the mobile communications service provision sector. The types of service most likely to be provided using this spectrum are high speed mobile broadband services. Ofcom considers that the net effect of the award on this business sector (both small and large business) will be positive given the increased availability of spectrum necessary to support their retail and wholesale service provision.

A2.37 Other business sectors are likely to benefit from a more efficient supply of communications services as a result of this decision.

A2.38 Some business sectors which use spectrum which may be impacted by the future use of the spectrum bands which are being auctioned as they will need to change the way that they use spectrum. Detailed arrangements, as referred to in the Information Memorandum, have been put in place to address these issues.

A2.39 We do not consider that our decision to make these regulations will have any material cost implications for the voluntary sector.

Conclusion

A2.40 Having considered the advantages and disadvantages of the various options set out above, and in light of all the representations made to us in response to our various consultations, Ofcom has concluded that:

- The spectrum should be awarded using an auction mechanism;

- Ofcom should reserve some spectrum for a fourth national wholesaler;
- Ofcom should impose a sub-1GHz and an overall spectrum cap in the auction;
- The most appropriate auction format to use in this case is a combinatorial clock auction format; and
- We will apply higher reserve prices than we have in previous auctions, in light of the specific factors relating to this auction.