Auctionomics Response to Three's Filing Concerning the 2.3GHz and 3.4GHz Auction

Auctionomics has reviewed Ofcom's consultation in connection with the award of the 2.3GHz and 3.4GHz bands, as well as the documents entitled "Three's Response to Ofcom's Consultation on Public Sector Spectrum Release" and the annex prepared by Power Auctions, LLC, entitled "Auction Design Considerations for the Public Sector Spectrum Release." The latter two documents were filed in response to Ofcom's consultation related to the release of 40 MHz of spectrum in the 2.3 GHz band and 150 MHz of spectrum in the 3.4 GHz band.

Power Auctions criticizes both Ofcom's choice of auction format and certain details of its preferred SMRA. We look at each in turn.

Choice of Format: CCA versus SMRA

Ofcom's consultation discusses two general auction formats – CCA and SMRA – that have both been used many times for spectrum sales. It finds that there are advantages and disadvantages to each format, so that the choice of format for any particular application must be conditional on an analysis of the situation.

Power Auctions offers no conditional evaluation, asserting instead that "it is clear that the CCA would result in vastly improved efficiency." It argues that the CCA "has performed exceedingly well in the UK and other jurisdictions" and characterizes Ofcom's adjustments to the SMRA as "half-way measures that are dominated by the full CCA format."

Auctionomics disagrees with Power Auctions' unconditional assertions and supports Ofcom's finding that there are important advantages and disadvantages to both CCA and SMRA formats and that the choice of auction format for any particular application should depend on an analysis of the circumstances. In our opinion, however, Ofcom's analysis omits some of the disadvantages of the CCA. Because bids made in the clock rounds of a CCA are highly unlikely to become winning, those bids can be used strategically to manipulate clock prices and to manage eligibility for the supplementary round. Savvy bidders can often use bids in the supplementary round to drive up competitors' final auction prices while incurring little or no risk for themselves. The dramatic differences in prices paid by winning bidders in several CCAs, including recent ones in Switzerland and Canada, show that this is no mere theoretical possibility.

Ofcom also understates one of the most important advantages of the SMRA, which is that it leads to nearly uniform prices being paid for similar licenses in any category. In a CCA, if licenses are substitutes, then even if participants bid straightforwardly, larger buyers tend to pay lower average prices than smaller ones, which may discourage entry by smaller buyers. It is an advantage of the SMRA that it has quite the opposite tendency. Demand reduction, which in the Power Auctions account is a source of inefficiency, makes it more costly for larger bidders to blockade entry and ensures that small entrants are not forced to pay higher average prices than incumbents for any spectrum they may acquire.

Uniform prices also contribute to making pricing more transparent and understandable for observers and the general public.

Choices of regulators in other countries provide further evidence that that there is no consensus best format for spectrum auctions and that the uses of combinatorial bidding are properly regarded as conditional. Industry Canada, which used the CCA for its 700MHz auction and will use it again in April 2015 for its 2500MHz auction, nevertheless chose sealed-bid rules for its March 2015 AWS-3 auction. The Canadian AWS-3 auction rules incorporated very particular restrictions on combinatorial bidding, again showing the importance of adapting rules to the circumstances. In that auction, bidders were allowed to submit combinatorial bids not for full packages, but only for packages of two licenses in the same geographic area. Bids in different areas were treated separately, as if each region were a separate auction. These rules made good sense for Canada because this level of combinatorial complexity was sufficient to resolve any exposure problem.

Similarly, in the United States, the FCC's Comment Public Notice for the 600 MHz "incentive auction" proposes a clock auction without combinatorial bidding for the allocation phase, which determines the numbers of generic licenses awarded to each bidder. For the same 600MHz auction, however, the FCC proposes to use limited combinatorial bidding in assignment rounds to determine which particular licenses will be awarded to each winning bidder. These choices reinforce the lesson that other spectrum regulators sometimes introduce combinatorial elements and sometimes omit them.

Thus, based on theory and precedent, we find that Ofcom has reached the proper and usual conclusion that combinatorial auction formats can sometimes be desirable, but that non-combinatorial formats like the SMRA may sometimes be preferable for particular spectrum sales. Specifically, the advantages of the CCA are most important when either the auction context presents a severe exposure problem or demand reduction threatens to depress prices and harm efficiency. Auctionomics understands that Ofcom is not permitted to allow its auction design choice to be guided by revenue effects, so our analysis for Ofcom focuses on the efficiency effects, if any, that may arise from demand reduction in a non-combinatorial format like the SMRA.

Exposure Problems in the 2.3GHz and 3.4GHz Bands

For this consultation, Ofcom's analysis could reasonably begin by asking about the benefits of combinatorial bidding in this particular setting. Is there a significant exposure problem that threatens efficiency and could deter bidders? How strong is the incentive for inefficient demand reduction? How likely is that effect to damage efficiency?

An important input to this assessment is found in sections 4.44-4.47 of the consultation. There, Ofcom reports that bidders expect that a minimum lot size is needed for the auction, which we understand to be related to efficient use of the spectrum. The minimum efficient packages include 10MHz or 20MHz, with one bidder reporting 30MHz. Ofcom finds that bidders concur with a proposed lot size of 5MHz, which we understand to mean that lots of this size can be efficiently used provided that the minimum lot size requirements are satisfied.

These reports are relevant for assessing the exposure problem. The likelihood of encountering an exposure problem and the efficiency consequences are both generally understood to decline as the ratio of supply to minimum efficient scale grows.

The 3.4GHz band: no important exposure problem

For the 3.4 GHz band, there is at least 150MHz of spectrum bandwidth available. By the standards of previous spectrum auctions, this implies a very large ratio of supply to minimum scale. A participant that bids for its minimum scale of 20MHz would likely expect its demand to have only a modest effect on price, as larger buyers accommodate its demand to avoid driving up their own prices. In this situation, demand reduction by larger buyers has a positive side: it mitigates the exposure problem and (as noted above) eases entry by smaller buyers.

The 2.3 GHz band: modest exposure problem

With just 40MHz (8 licenses) available in the 2.3GHz band and a 20MHz efficient scale, the band plan itself leaves open a possible exposure problem and we need to evaluate how bidders in the auction could mitigate that problem.

First and most importantly, because the two bands are being sold in a single auction and because the two are substitutes (according to Three, because both are used to add network capacity), a bidder can switch during an SMRA to avoid the most serious exposure problems. For example, a participant who thinks that efficient scale is 30MHz and fears that it will face competition from bidders seeking 20MHz could aim initially to purchase licenses in the higher frequency band, and then continue that strategy unless the price difference becomes too large. Or, a participant could bid for 40MHz of spectrum in this band, encouraging others to bid for the higher frequency band. Or, the bidder who believes that 30MHz is the right minimum scale might still believe that the loss of efficiency from 20MHz is small enough to make such a purchase acceptable.

Viewing this exposure problem from a bidder's perspective, while an SMRA does create an exposure risk for bidders in the 2.3MHz band that is larger than would be present without package bidding. This risk, however, is dwarfed by the risk of price variation of the magnitude experienced in some recent CCAs. Ofcom proposes to mitigate the remaining exposure problem by making variations in the standard SMRA rules. We return to a discussion of those variations below.

The magnitude of the exposure risk faced by bidders depends in part on Ofcom's information policy. To the extent that, during the auction, a bidder can accurately forecast the prices that would result from demanding its minimum scale in the 2.3GHz band, it can avoid getting stuck with an expensive package that it has no wish to buy. One of the most effective ways of forecasting prices is by observing excess demand for licenses during the auction, and we do recommend providing sufficient demand information to bidders during the auction to make that possible.

Demand Reduction in the 2.3GHz and 3.4GHz Bands

The term "demand reduction," applied to auctions, has two related meanings. The first refers narrowly to a bidding strategy in which a potentially large buyer bids for and acquires fewer licenses in order to reduce the prices for the licenses it buys. This version of demand reduction reflects an idea taught in all elementary economics textbooks, in which a buyer with market power can reduce prices by withholding some of its demand. In the textbook treatment, demand reduction can be undesirable for two reasons: it reduces the total volume of transactions and it unfairly reduces the prices enjoyed by sellers.

In spectrum auctions, however, the analysis is different, because when a large buyer reduces its demand, it is rarely the case that any of the offered licenses remain unsold. Rather, when one bidder acquires less spectrum, others – typically smaller buyers – acquire more. Whether this sort of demand

reduction harms efficiency depends on the circumstances. If larger bidders also have an incentive to block competitors from acquiring spectrum, then incentive for demand reduction may have a salutary counteracting effect.

The second meaning of demand reduction refers to a form of implicit collusion, in which large bidders form an idea of what spectrum each should win and avoid bidding aggressively for more than that. If expectations are or become aligned, then the bidders may reach the final allocation at lower prices than would otherwise prevail, depressing government revenues. By design, CCAs avoid this sort of demand reduction in the supplementary round, because bidders who demand more licenses at that round than they are able to win do not incur higher costs on that account, and indeed may drive up the prices paid by their rivals.

Demand reduction of the second sort is most problematic when there is an obvious way for the major bidders to divide the spectrum. For example, if there are three major participants in the proposed auction and only the 30 licenses in the 3.4GHz band were offered, then the three might quickly decide to buy 10 licenses each, resulting in low prices in an SMRA, but also promoting balance among the main competitors in the spectrum resources they acquire.

With three major incumbents and 40MHz of spectrum in the 2.3GHz band, and particularly with a minimum scale of 20MHz, there is no symmetric outcome. Each bidder is likely to try to gain an advantage over its rivals in this band and none may be willing to see a competitor acquire an outsized share of the spectrum at a low price.

In summary, we see some risk that prices may be lower in an SMRA than in a CCA, but no conclusive risk that demand reduction will be damaging to efficiency. It is our understanding that, by statute, Ofcom is not permitted to weigh revenues in deciding on its auction format.

Variants of Ofcom's SMRA

Power Auctions also criticizes the particular rules of Ofcom's SMRA and makes several suggestions.

Replace SMRA with an FCC-style clock auction

Auctionomics and Power Auctions both recommended the particular clock auction that the FCC has adopted for its incentive auction. However, the circumstances of Ofcom's 2.3GHz and 3.4GHz auction are sufficiently different that a separate evaluation of desirability is needed.

- First, the FCC's products differ mainly in the geographic coverage areas, rather than in their frequency band. (The FCC has two license categories in each area, to allow licenses to be distinguished by degree of impairment.) Licenses of equal bandwidth in Ofcom's two different "capacity bands" are closer substitutes than licenses in, say, New York City versus Los Angeles. This difference implies that substitution via switching is more important in Ofcom's auction than in the FCC's incentive auction, which could justify Ofcom's rules that promote the possibility of switching.
- Second, the FCC's products are coverage licenses (in the 600MHz band), which may be useful to bidders even as a single 2x5MHz license. Again, this make switching less important in the FCC auction than in Ofcom's auction, in which switching may be a tactic used to achieve minimum scale.

Although we agree that the FCC's rules could be a viable possibility for Ofcom, we have not conducted a full review of that possibility. To reiterate: the best auction design depends on the circumstances, and circumstances differ in the two auctions being compared here.

Information Policy

Power Auctions also criticizes the failure of Ofcom to give any feedback to bidders about aggregate demand. In theory, if bidders were confident about their values and all licenses were substitutes, such feedback would be unnecessary, because demand that is guided by prices alone could identify an efficient outcome. In such a situation, information feedback would only help bidders to reach an implicit agreement about how to divide the licenses among themselves, thereby depressing prices below competitive levels. Particularly when the number of bidders is small, limiting information can be a device for blocking effective collusion among bidders.

In practice, however, both of the assumptions that underpin this analysis can be challenged. Minimum scale implies that licenses are not substitutes. Thus, a bidder who prefers to acquire four licenses in a band to achieve efficient scale and who is the standing high bidder on two may be faced with a decision about whether to increase its demand to four in that band or to reduce it to zero. Information about excess demand can help it make a better-informed decision, promoting efficient outcomes. In addition, bidders sometimes use information about demand to assess whether they have committed budget sufficient to buy their desired licenses and, if not, whether to withdraw demand to avoid buying a too-small collection of licenses.

For these reasons, we think that Power Auctions criticism that Ofcom's design offers too little information to bidders has merit. Also, because of the risk that there may be just three strong bidders in the auction, we think that limiting the information exchange between them is a useful way to limit implicit collusions. One policy that compromises these two objectives would include a report after each round to all bidders of a range of excess demand in each band, to indicate whether excess demand (standing high bids plus new bids minus supply) in each preceding round was less than 20MHz, less than 40MHz, etc. In this way, a bidder who considers withdrawing 20MHz of demand from a band can forecast reasonably well whether it can expect to succeed. With that information, bidders can use standard procedures to estimate the overall budget revealed by other bidders in the auction, which is useful for estimating whether prices after any auction round are likely to continue to escalate.

Waivers and Withdrawals

Power Auctions judges that Ofcom's use of waivers and withdrawals is "completely outdated and undesirable." We disagree.

Bidders have traditionally used waivers and withdrawals to mitigate the exposure problem and to simplify switching among bands. A bidder that is winning a smaller-than-efficient package in the 2.3GHz band at a high price may exploit those rules to switch its demand to 3.4GHz licenses, or to withdraw its demand and then reinstate it unless another bidder will buy those licenses. These are well-known tactics by which bidders in SMRAs can rationalize their license allocations.

Ranking of Standing High Bids

Ofcom's proposal for ranking standing high bids has the desirable property that just one bidder is left with a partial package at each round. We think that this property is an important one. Subject to that,

we think that randomizing the processing order of bids is the most effective rule for minimizing strategic opportunities.

For Auctionomics, by Paul Milgrom and Jonathan Levin
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