

Declaration of Peter Cramton

I, Peter Cramton, hereby declare the following:

0 Qualifications

1. I am Professor of Economics at the University of Maryland and Chairman of Market Design Inc. (MDI). Over the last 20 years, I have published research on auction theory and practice in the leading peer-reviewed economics journals. During the last 12 years, I have applied this research in the design and implementation of auction markets worldwide, especially in North America and Europe. I have led the design and implementation of dozens of high-stake auctions. I have advised telecommunications firms on bidding strategy in more than 25 spectrum auctions (all using the simultaneous ascending format). Since 1998, I have advised ISO New England on electricity market design and I currently am a lead designer of the proposed forward capacity auction for New England. I received my B.S. in Engineering from Cornell University and my Ph.D. in Business from Stanford University. My vita, which includes a list of my publications and other experience, is attached.

1 Introduction

2. Based on my expertise, T-Mobile USA has asked me to comment on the Public Notice DA 06-238, "Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006." I have no financial interest in the auction or in T-Mobile. In developing my comments, I assume throughout that the primary objective of the FCC is to conduct an efficient auction, one that puts the licenses in the hands of the companies best able to use them.

3. Overall, the FCC has done an excellent job of preparing for the auction and establishing sound auction rules, consistent with best practice. As discussed below, I concur with the FCC's proposed approach in all areas but their decision to conceal information concerning bidder identities and bidding information. I believe that full transparency consistent with the FCC's past practices is the best policy for the June 29 Advanced Wireless Services auction.

4. Most importantly, I would like to emphasize the importance of the timing the auction. The AWS spectrum is valuable spectrum for the deployment of advanced wireless services such as Third Generation wireless ("3G") services. This spectrum has been earmarked for a decade for this purpose. This spectrum is needed in the marketplace now more than ever, due to recent industry consolidation and the continued rapid demand for mobile wireless offerings by consumers. The mobile wireless industry just experienced record-breaking fourth quarter growth as consumers increasingly subscribe to wireless services. Minutes of use are up, and consumer demand for new video and data applications is here. Meanwhile U.S. penetration rates are well below those of Europe, suggesting there is room for continued growth and healthy competition. All that is needed is for the FCC to deploy additional spectrum, so that all carriers (not just the top three) have the ability to deploy 3G services and compete for consumer demands. The sooner the spectrum is auctioned, the sooner the operators can firm up their buildout plans, the sooner the buildout can occur, and the sooner consumers can enjoy the benefits of robust competition for advanced wireless services. The FCC should do everything it can to make sure that the June 29 auction start date does not slip.

2 A single simultaneous ascending auction should be held *without* package bidding

5. I concur with the FCC that it makes sense to use the simultaneous ascending format without package bidding in the June 29 auction. The alternative of splitting the licenses into two groups and using a package auction with one group and a non-package auction with the other makes little sense, and would lead to inefficient results (e.g., such as bidders ending up with either more or less than they want). Such an approach defeats the benefits of the FCC’s “band plan,” because dividing the licenses into two groups that are auctioned separately under different rules greatly complicates the ability of bidders to select from among substitutable licenses to achieve aggregation, which is the hallmark of the successful simultaneous ascending auction. While the FCC should continue to develop and test package bidding methods, it would be a mistake to complicate the AWS auction in this manner with an untested hybrid process that seriously constrains the aggregation of substitutable licenses. This is the most significant auction the FCC has conducted in a decade, because of the amount of spectrum and geographic scope of what is being offered. I would strongly urge the FCC to keep the licenses together in a single SMR auction—a format that has worked well and will allow for the most efficient and effective outcome.

3 The AWS auction should be fully transparent

3.1 *Background on bid signaling*

6. The key innovation of the FCC spectrum auctions is having an open auction for many licenses simultaneously. In other auctions commonly used, the auctions are open but for a single unit at a time, like an English auction at Sotheby’s or Christie’s, or are for many units simultaneously but are sealed-bid, like Treasury auctions. The FCC has good reason for conducting auctions that are both open and simultaneous.

7. The main reason is that in this way, bidders can build efficient aggregations of licenses. This efficiency is much more difficult to achieve in sequential auctions, where markets are sold in sequence, since then a bidder who wants a certain collection of markets does not know what the prices will be in future auctions when calculating whether to win the present auction. Alternatively, when all licenses are sold simultaneously, a bidder can observe the tentative prices on all of the licenses, and so knows which aggregations are the best value.¹ In addition, if some licenses in the sequential auction become too expensive, a bidder may have to abandon key complementary licenses, and will not get the opportunity to build a substitute aggregation if some of the needed licenses are already sold. Sealed-bid simultaneous auctions also hinder bidders in building efficient aggregations. A bidder may not get critical markets it needs or may get more than it requires. The outcome is simply a crapshoot. Bidders cannot condition their bids on critical assignment and pricing information.

8. A second advantage of the simultaneous, open auction format the FCC adopted is that it provides information on the value of licenses to bidders. Digital wireless services are a relatively

¹ One question is whether the tentative price information is of sufficient quality. Cramton (1997), in a study of the early FCC spectrum auctions, demonstrates that both price and assignment information improves throughout the auction. The tentative information is of sufficiently high quality early enough that bidders have the flexibility to make adjustments in response to the information.

new technology. Bidders are uncertain about build-out costs, penetration rates, prices, and market shares. The information revealed in an open auction can help bidders learn about these values. Since the auctions are simultaneous, this information is useful on all licenses, not just those that will be sold later.

9. A third benefit of the FCC's simultaneous ascending auction is full transparency. Bidders and other interested parties can verify that the rules are followed. If problems exist, they are found and resolved before significant damage is done. Moreover, since secrecy is not an issue, costly protocols to preserve secret data are unnecessary.

3.2 A fully transparent auction has many advantages

10. A critical design decision is whether to report bidder identities.² An alternative to full transparency is an anonymous auction, where only the bids are reported, and not who made them. The main issue is whether the risks of collusive bidding are sufficiently strong to warrant a switch away from the FCC's long-standing policy of full transparency. Below we list and discuss the benefits and costs of reporting bidder identities.

3.2.1 Benefits of Reporting Bidder Identities

11. Reporting the bidder identities makes the auction fully transparent. The FCC simply posts all information on the Internet. Bidders can more easily verify bids, and feel confident that the auction rules are being followed.

12. Reporting bidder identities can induce higher auction revenues and improved efficiency if a bidder's valuation for one license in a market depends on who will be the winner of the other licenses in the market or neighboring markets. For AWS, bidders care what type of service competitors provide. There are two main competing technology paths: CDMA 2000 and UMTS. Bidder A might want to be the only UMTS provider in Pittsburgh, and so will bid higher on Pittsburgh if it knows that the other likely winners in Pittsburgh do not intend to use UMTS technology. This technology motivation for knowing bidder identities may be especially strong for small bidders seeking to partner with larger operators using a particular technology. Indeed, the feasibility of some small bidder's business plans may hinge on how successful certain operators are in the auction. For example, getting equipment may depend critically on the success of a large carrier—using the same technology as the small bidder—creating a market for the equipment.

13. Bidders can better evaluate interference issues knowing who is bidding on which bands. Again this is especially relevant given that different operators intend to use different wireless

² Specifically, the FCC has proposed not to reveal until the close of the auction (1) bidders' license selections on their short-form applications and the amount of their upfront payments, (2) the amounts of non-winning provisional bids and the bidder identities, and (3) the identities of bidders making provisionally winning bids. Thus, the only information that would be available during the auction would be the list of applicants and the gross amount of the provisionally winning bids. See *Auction of Advanced Wireless Services Licenses Scheduled for June 29, 2006, Comment Sought on Reserve Prices or Minimum Opening Bids and Other Procedures*, Notice of Proposed Rulemaking, AU Docket No. 06-30, DA 06-238 (rel. Jan. 31, 2006) at 7. It is important that the FCC adopt full transparency for the AWS auction, including disclosure of the information described in clause (1) above at the outset of the action and clauses (2) and (3) above round-by-round.

technologies. In general, interference is more of a concern when operators in adjacent bands are using different technologies. With full transparency, the bidders can better assess interference issues and purchase license aggregations that minimize interference. This improves efficiency and revenues in the auction.

14. Bidders do not waste resources trying to figure out who is who.

15. Full transparency tends to level the playing field. In an anonymous auction, large bidders are better able to invest significant resources in understanding who is bidding round-by-round and to react better to the more uncertain competitive landscape. It may not be economical for small bidders to make such investments. Thus, small bidders may be disadvantaged in an anonymous auction. More broadly, in an anonymous auction, there is a risk that some bidders can “figure it out” while other bidders cannot—which leads to uneven information among the bidders that is dangerous and disruptive to an efficient auction outcome.

16. Full transparency improves the efficiency of capital markets. Auctions like the AWS are of critical importance to many of the companies bidding. Auction outcomes can and do impact stock prices. Stockholders of a public company participating in the auction benefit from knowing what their company is doing in the auction so that they can make appropriate buy/sell decisions.

17. Finally, as has long been recognized by the FCC, conducting an anonymous auction requires great care to keep auction information confidential over an extended period. A leak, whether inadvertent or intentional, could result in irreparable harm to the integrity of the FCC’s successful auction program. Although commercial auctions are often conducted in a veil of secrecy, the commercial auctions are typically done in a single day.³ The AWS auction will likely last six weeks or more, requiring that information be kept secret for multiple months.

3.2.2 Costs of Reporting Bidder Identities

18. Reporting identities allows for retaliation. Even the threat of retaliation may dampen bidding. A bidder that has a favorable price on a key market may be reluctant to bid on other markets for fear that the bumped bidder will respond by raising its price in the key market. This is especially important in auctions with little competition, and was a major issue in the DEF auction. That auction had few bidders per license and an eligibility ratio of 1.68, much lower than the other broadband PCS auctions.

19. Another cost of revealing bidder identities is that revelation can discourage competitive bidding because some bidders avoid bidding against certain others. One reason for avoiding a

³ Large electricity auctions for energy forwards or energy options are now commonly done using a simultaneous ascending auction with the clock format and anonymous bidding (see Ausubel and Cramton 2004). Industry best practice is to conduct these auctions in a single day, which is possible since the auctions are solving a problem much less complex than in a large spectrum auction. Although one electricity auction took more than one week to run (the first Basic Generating Service auction in New Jersey in 2002), all subsequent auctions have completed in less than one week. I have conducted more than two-dozen of these high-stake electricity auctions; all have been completed in a single day. The U.S. Treasury auctions are static uniform price auctions. The time between the submission of bids and the posting of auction results is measured in minutes, not hours or days. Indeed, market participants often argue that the speed of the auction from bid deadline to posting of results should be sped up from minutes to *seconds*. Part of the concern of participants is the potential leak of market-relevant information.

bidder is because the bidder has a reputation for blanket retaliation or other types of aggressive bidding.

20. Reporting identities could help the bidders coordinate on a cooperative split of the licenses, that is, it could aid in targeted demand reduction. If two bidders A and B are competing in markets X and Y, both may realize it is unwise to try to win both markets. Bidder A may back off Y with the hopes that bidder B backs off X. They can telegraph their intentions with strategic withdrawals.

21. Bidders spend resources trying to encode or decode bid signals. These are the transactions costs of bid signaling. Every time a bidder is bumped it must determine whether it was retaliated against for its bidding elsewhere. In addition, savvy bidders may search where to punish to deter competition.

3.2.3 Balancing the costs and benefits

22. First, the FCC has already taken steps to limit the last two costs above. Limiting withdrawals to two rounds eliminates the use of withdrawals to signal a collusive split. Requiring bids to be a whole number of bid increments eliminates code bidding. Thus, the sole remaining concern in a fully transparent design comes from the possibility of retaliation.

23. Although the FCC's fully transparent auction design is potentially vulnerable to retaliatory behavior, in my careful study of these auctions over the last twelve years (see the references below), I have found—even in auctions with weak competition, such as the DEF auction—only a small fraction of the bidders used retaliatory strategies. These bidders were only sometimes successful at keeping prices low. Indeed, direct estimates of revenue losses from these practices are inconclusive (Cramton and Schwartz 2002).

24. The FCC should think carefully about the tradeoff between more informed price discovery and the risk of retaliatory bidding. However, given the protections the FCC has already implemented—the elimination of bid signaling and the limits on the use of withdrawals—I believe the FCC should favor full transparency in the AWS auction, which promises to be a competitive auction. In the biggest auction in a decade, attempting to conceal this information is risky and could lead to problems. In my view, the FCC should experiment with concealing bidder information in a smaller, less high-profile auction, where there is significant risk that there will not be strong competition (such as some of the smaller broadcast auctions).

3.3 *Much has changed, since the DEF auction, to reduce the risk of collusive bidding*

25. Over the last decade, I have been a strong voice on the importance of information policy in auction design (see the references below). I have conducted many detailed examinations of major FCC auctions and other simultaneous ascending auctions, specifically evaluating the potential for low-price equilibria. Although it is undeniable that bidders sometimes engage in bid signaling during a fully transparent SMR auction, what is less clear is whether such signaling is effective at reducing prices or otherwise distorting the bidding outcome. Among the dozens of auctions conducted by the FCC, the lead example of bid signaling is the DEF auction, which I study with Jesse Schwartz (Cramton and Schwartz 2000, 2002; see also Bajari and Fox 2005). Even in that auction, which was by far the least competitive of all the broadband PCS auctions, the evidence is only suggestive that bid signaling was effective at reducing auction prices.

Moreover, there is no evidence that the auction outcome was inefficient as a result of bid signaling.

26. Since the DEF auction was conducted in 1996, much has changed to reduce the risk of collusive bidding. Specifically, in the DEF auction, 1) there were no reserve prices—the minimum bid was \$0, 2) bidders could make an unlimited number of withdrawals, 3) bidders could use the trailing digits of their bids to encode messages to other bidders about appropriate splits, and 4) the FCC had not yet established effective methods for pacing the auction, causing the auction to last nearly five months and 276 rounds. In sharp contrast, in the AWS auction, 1) there are significant reserve prices, 2) a bidder can only make withdrawals in two rounds, 3) bids are in a whole number of bid increments, and 4) the FCC has refined and effective tools to manage the pace of the auction, assuring closure in a matter of weeks, rather than months. Armed with these protections, the FCC should be less concerned with the risk of collusive bidding in the AWS auction.

4 The other auction parameters in the public notice are consistent with best practice

27. The FCC's other proposed auction parameters set forth in the public notice are all sensible and consistent with best industry practice. Indeed, the FCC should be commended for its efforts to fine-tune important features such as the bid increment methodology.

- An upfront payment and minimum opening bid of \$0.05/MHz-pop are appropriate. This minimum opening bid represents a significant fraction of full value. It guarantees that revenues will be sufficient to cover clearing costs, yet is sufficiently low that the licenses are likely to be sold. The sizeable minimum opening bid also has the advantage that the auction will conclude more rapidly. Likewise, the upfront payment is significant, but not so high so as to discourage participation.
- A two stage activity rule with activity requirements of 80% and 95%, with three waivers is appropriate. These activity parameters have proven effective in prior auctions in facilitating price discovery and accelerating the pace of the auction.
- The proposed handling of bid increments is consistent with best practice. The proposed parameters result in large increments, but this is necessary in a simultaneous ascending auction with so many licenses. The FCC has fine-tuned its approach over dozens of auctions.
- Two bid withdrawals should be sufficient. Without such a restriction, bid withdrawals can be used for inappropriate bid signaling. This restriction has worked well in prior auctions. Limiting each bidder to two withdrawals still gives the bidder an opportunity to back out of a failed aggregation, but largely prevents the use of withdrawals for bid signaling.
- An interim withdrawal penalty of ten percent (10%) is appropriate. A significant withdrawal penalty is needed to discourage speculative bidding. Ten percent seems about right.

- An additional default payment percentage of ten percent is appropriate. Default after the auction imposes even greater costs on the market participants. The proposed ten percent (10%) penalty is commensurate with the harm caused by the default.

5 Conclusion

28. The FCC has done an excellent job in preparing for the AWS auction. I believe the proposed auction format and parameters are generally sound. My one point of disagreement is that I do not believe the FCC should conceal bidder identities in the AWS auction. There are important efficiency reasons why full transparency is better than secrecy in this particular auction. Rather than experiment with concealing information in the AWS auction, the FCC should instead postpone such a change to a later auction, after the FCC has fully developed and tested the new methods. I would recommend experimenting with this new approach in a smaller, less high profile auction—and an auction that is potentially less competitive than this one.

29. Finally, let me conclude by emphasizing the importance of a timely auction. Given the multiple-year delays of the 700 MHz spectrum, it is critical that the AWS spectrum be assigned to operators as soon as possible. Then buildout plans can be firmed up and executed, and consumers can begin to enjoy the bandwidth and competition that this spectrum will create. Delay would result in a huge loss of consumer welfare, especially in the dynamic world of mobile wireless. The FCC should do everything in its power to conduct this auction on the announced June 29 start date.

I declare under penalty of perjury that the foregoing is true and correct.



Peter Cramton

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