

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )  
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Service Rules for Advanced Wireless Services ) WT Docket No. 04-356  
in 1915-1920 MHz, 1995-2000 MHz, 2020-2025 )  
MHz and 2175-2180 MHz Bands )  
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Observations on Bidding Rules

Charles L. Jackson

May 24, 2005

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Observations on Bidding Rules

I, Charles L. Jackson, address one topic—the desirability of offering an option for bidders to bid on nationwide licensees.

I am an engineer with substantial experience in spectrum management and spectrum policy.<sup>1 2</sup> These comments represent my views and do not necessarily represent those of any of the clients of my consulting firm, JTC, LLC.

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<sup>1</sup> My professional biography is available at [www.jacksons.net](http://www.jacksons.net)

<sup>2</sup> Some might regard it as presumptuous for an engineer to be advising on auction theory—normally the province of economists and operations research theorists. However, I note that I was the first to devise combinatorial auctions and to show many of their characteristics, such as the optimality properties of the generalized Vickery prices, that the generalized Vickery prices create a Nash equilibrium, the threshold problem and some of the perverse incentives that it creates, that the winner-determination problem is NP hard, and that combinatorial auctions are well suited to auctions of radio spectrum. See the historical review in de Vries and Vohra, cited below., or chapter 5 of C. L. Jackson, "Technology for Spectrum Markets," EECS PhD thesis, MIT, November 16, 1976.

## **Summary**

The Commission should adopt auction rules for the H-block and the J-block that permit parties to bid for nationwide licenses. The ability to bid for nationwide licenses creates an important option for new entrants or firms that wish to deploy new technologies. The Commission can permit nationwide bids without excluding bids on licenses defined over smaller geographic regions by either (1) using the combinatorial auction capabilities of the auction software already in hand at the Commission or (2) using a simplified combinatorial auction that permits bids on larger geographic regions after a simultaneous multiple-round auction for smaller regions has stopped. Permitting bidding on nationwide licenses will, at negligible cost and delay, permit market forces to choose the appropriate level of license aggregation quickly.

## **Why Nationwide Bids Should Be an Option**

Arguments for providing an option for a nationwide bid fall into two categories: (1) general reasons and (2) reasons specific to this auction. The general case is well known. Nationwide licenses offer many advantages—for example, uniform coverage, the option to offer service to national organizations, the ability to adopt new technologies, and simplified frequency coordination—over licenses of smaller geographic extent. A key part of the early business strategy of both Nextel and McCaw Cellular Communications was assembling a portfolio of inefficiently small licenses to create a wireless enterprise with nationwide coverage. These firms found it efficient to create what were, in effect, nationwide licenses from a patchwork of smaller licenses.

But there are also reasons specific to this auction, the first auction of a new continuous block of spectrum suitable for personal wireless service in several years, that make the case for a nationwide option even more compelling than in the general case. First, a nationwide option improves the opportunities for new entrants. Second, a nationwide option facilitates the deployment of new technologies.

## **New Entrants**

These new spectrum blocks create an opportunity for new entry in the wireless industry—an opportunity that has not been seen in the decade since the original PCS auctions. Consider the plight of a potential new entrant bidding in an auction for licenses

in the H-block. If the new entrant plans to offer a traditional service—for example, a traditional PCS service using GSM—then the inability to win a few markets in the auction would not necessarily be a fatal handicap. The new entrant might be able to arrange for a roaming agreement with T-Mobile or Cingular, both of whom operate GSM networks. On the other hand, such roaming agreements may be hard to arrange and the uncertainty about such arrangements increases the risk of the new venture. But what if the new entrant desires to use a technology that is not compatible with that of the current CMRS providers? Assume that the block was auctioned using the FCC's proven simultaneous multiple-round auction (SMR auction). Suppose that the new entrant participated in the SMR auction and did well—having the high bid in most regions but losing the regions containing New York City, Los Angeles, and Chicago. A new service that cannot be sold in those three cities faces a substantial handicap. If the service requires, or would benefit greatly from, providing roaming coverage, those coverage holes may well doom the service in the other regions. The risk of such coverage holes would be a substantial deterrent to any new entrant.

One might object that the odds of there being such a hypothetical new entrant are remote—the wireless business is no longer a newborn but rather a healthy adolescent; the current major CMRS providers have a substantial first-mover advantage (or first-through-sixth-mover advantage) over a new entrant. However, a little reflection will indicate that many firms are well placed to be new entrants.

Consider Intel. Intel sells the bulk of the processor chips used in personal computers. Widespread, affordable data communications are a natural complement to personal computers. Intel could easily afford to buy 10 MHz of nationwide spectrum and deploy a data network.<sup>3</sup> If such a data network were to spur the sale of additional Intel processors and other chips, it could substantially benefit Intel.

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<sup>3</sup> At the end of Q3 2004, Intel had \$24 billion in current assets.

Consider Microsoft. Microsoft's position is similar to that of Intel—a data network complementing personal computers and PDAs would increase the value of Microsoft's operating system and applications software.

Consider AT&T. AT&T currently lacks its own local distribution capability in much of the nation. An exclusive 10-MHz spectrum block would provide it with a powerful tool for both local access and mobile services.

Consider General Motors (GM). GM's OnStar subsidiary reached the 3-million-subscriber level in December 2004. Having its own nationwide spectrum would make OnStar less dependent on the technology plans of its CRMS provider suppliers and would insulate OnStar from possible future price changes caused by changes in wireless demand. GM has an enterprise value of roughly \$250 billion—it could probably afford to purchase a 10-MHz nationwide license.

Further reflection would probably allow one to identify other firms that have both an incentive to become a wireless service provider and the resources to do so. But the risk of winning a set of licenses covering only 60% of the population of the United States may deter even firms with such substantial resources.

### **New Technology**

A similar issue arises with new technologies. A service provider that wishes to deploy a new technology whose business plan requires either the ability to offer nationwide service or nationwide roaming will benefit substantially from access to a nationwide block of spectrum. If the new technology were substantially similar to an existing technology—in the way that cdma2000 is similar to the earlier cdmaOne—the service provider might be able to provide nationwide coverage and roaming through the use of dual-mode consumer units. However, if the new technology were radically different from existing technologies or served a new application, then dual-mode consumer units might not be an efficient solution. A nationwide spectrum block would permit the service provider to roll out service without the need for dual-mode consumer units.

### **Ways to Allow Bids for Nationwide Licenses**

Several parties suggested that the H-block be licensed on the basis of 493 BTA-based geographic areas. One reason for this suggestion was that such licenses would have common geographic borders with the existing PCS licenses—thereby simplifying frequency coordination among carriers.

However, combinatorial auctions permit the Commission offer both BTA-based licenses and a nationwide license. Combinatorial auctions<sup>4</sup> allow bidders to bid on packages of licenses rather than just on single licenses. The FCC’s new Integrated Spectrum Auction System software (ISAS) supports combinatorial auctions. The auctions of the H-block and the J-block provide an important opportunity to use this capability. I recommend that the Commission use ISAS to permit combinatorial bidding in these auctions.

Alternatively, the FCC could use a more structured process to permit bidding on larger geographic licensing regions without going to full combinatorial auctions. I put forward on such alternative, which I call *layered auctions*, as a counterargument to those who would reject the use of combinatorial auctions because of their complexity. The process I describe below is, at most, only minimally more complex than the simultaneous multiple-round auctions that the FCC has conducted in the past and could be managed using the same software as the Commission has used in the past.

#### *Layered Auction Mechanism for the H-block*

Round 1: Auction off H-block licenses based on BTAs, using the traditional SMR auction that the Commission has successfully conducted many times.

Round 2: Conduct a second auction of H-block licenses but based on MTAs, using the traditional SMR auction. The bid for any MTA license must exceed the sum of the winning bids for the constituent BTAs of that MTA in Round 1.

Round 3: Auction off a nationwide H-block license. The bids for the nationwide license must exceed the relevant bids for the licenses in the constituent BTAs and MTAs from rounds 1 and 2.

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<sup>4</sup> For a survey of combinatorial auction theory see Sven de Vries, Rakesh Vohra “Combinatorial Auctions: A Survey,” *INFORMS J. of Computing* , vol. 15(3), pp. 284-309, 2003.

Although such a layered auction does not permit examination of as wide a range of alternatives as does a full combinatorial auction, it does consider many of the important alternatives. It also permits small organizations to bid for licenses for smaller geographic regions. If the combined value that these smaller organizations would pay in a traditional BTA-based SMR auction exceeds the values that would be generated in an MTA-based SMR auction or in a nationwide auction, then these organizations will win those rights. If there are substantial efficiencies to such smaller rights packages, competition will drive up the winning bids in the BTA-auction and the BTA-based winning bids will dominate the MTA-based and nationwide bids. Conversely, if an entity is willing to pay more for a nationwide license than the sum of the BTA- and MTA-based bids, it is highly likely that the nationwide license is more valuable than more geographically restricted licenses. A nationwide bid can only win over the set of BTA-based licenses if it generates greater revenue.

### **Concluding Thoughts**

Several factors, most important the need to create the opportunity for efficient new entry into the wireless industry, argue for permitting nationwide bids in the upcoming H-block and J-block auctions. Either combinatorial auctions using the Commission's ISAS software or the layered auctions that I have described permit such bidding while also permitting bidding on licenses defined over smaller geographic areas. There appears to be nothing to lose and much to gain from using one of these options.

  
Charles I. Jackson  
May 24, 2005