

current implementation of package bidding uses a simultaneous multiple-round design. In addition to submitting bids on packages, bidders may also submit bids on individual licenses.

A. License Complementarities

5. Under certain circumstances, package bidding may be desirable for bidders that wish to aggregate licenses. Bidders have aggregated licenses under our SMR auction design. However, package bidding may be appropriate when bidders have strong and divergent complementarities among licenses, and when package bidding rules do not introduce other undue difficulties. Complementarities exist when the value of the whole is greater than the sum of the parts. In the context of spectrum auctions, complementarities could result in a bidder being willing to pay more for two licenses together than the sum of the amounts it would be willing to pay for either license individually. That is, a bidder willing to pay \$1 million for a license covering Washington, DC, or \$1 million for a license covering Baltimore, Maryland, would be willing to pay more than \$2 million for both licenses together.

6. Divergent complementarities exist when the patterns of complementarities are different for different bidders. For example, if one bidder has complementarities for a geographic aggregation and another bidder has complementarities for a bandwidth aggregation, then either of these bidders achieving its desired aggregation would prevent the other bidder from doing so. That is, if there are two licenses available in each of two markets, a bidder successfully aggregating both licenses in one market (bandwidth aggregation) precludes another bidder from aggregating one license in each market (geographic aggregation).

B. Exposure Problem

7. The *exposure problem* is a financial risk that occurs when a bidder, in hopes of also winning complementary items, bids more for a single object than the object alone is worth to that bidder. Package bidding allows bidders to mitigate the exposure problem by placing all-or-nothing bids on packages of licenses.

8. The following builds upon the previous example of a bidder willing to pay \$1 million for a license covering Washington, DC, or \$1 million for a license covering Baltimore, Maryland, but willing to pay more than \$2 million for both licenses together. For purposes of this explanation, assume that the bidder is willing to pay \$3 million for both licenses together.

9. In an SMR auction in which bids are submitted on individual licenses, the bidder would clearly be willing to bid \$1 million for each of the Washington and Baltimore licenses, for a total of \$2 million. If the auction price of one of those licenses exceeds \$1 million, the bidder faces a dilemma. The bidder can stop bidding for a license when the license price exceeds what the bidder is willing to pay for that license alone, or the bidder can keep bidding in hopes of winning both licenses. This exposes the bidder to a financial risk. On the one hand, if the bidder wins both licenses by bidding \$1 million for Washington and \$1.5 million for Baltimore, it will pay a total of \$2.5 million for both licenses, which is less than the \$3 million it is willing to pay for both licenses together. Thus, the bidder would be satisfied with its decision to bid \$1.5 million for the Baltimore license even though that license alone is only worth \$1 million to the bidder. On the other hand, if the bidder bids \$1.5 million for the Baltimore license (again, in hopes of winning both licenses) but wins only that license and not the Washington license as well, the bidder would have to pay more for the Baltimore license than the license is worth to the bidder.

10. In a package bidding auction, the bidder in the example could submit package bids to avoid such a risk. The bidder could create a package of the Washington and Baltimore licenses and submit a bid for the package. The bidder would either win the package—*i.e.*, both licenses—at the amount it bid for the package, or it would not win the package. By placing a bid on a package, the bidder would not have to worry about the possibility of only winning part of the package. That is, the bidder could bid up to \$3 million for the package and thereby express what it is willing to pay not only for the licenses but also for the complementarity of the licenses.

C. Threshold Problem

11. Allowing package bidding potentially introduces a *threshold problem*—the difficulty that multiple bidders for the single licenses (or smaller packages) that constitute a larger package may have in outbidding a single bidder on the larger package, even though the multiple bidders may value the sum of the parts more than the single bidder values the whole. This may occur because bidders for parts of a larger package each have an incentive to hold back in the hope that a bidder for another part will increase its bid sufficiently for the bids on the pieces collectively to beat the bid on the larger

package. The package bidding procedures that the Bureau proposes are designed to facilitate the emergence of bids that will overcome this problem. Specifically, the Bureau proposes to allow bids on licenses and packages that individually are not high enough to enter immediately into the provisionally winning set. This allowance is meant to facilitate price discovery and diminish the threshold problem. Effectively, bidders can take “baby steps” toward getting into the provisionally winning set. Additionally, under these proposed package bidding procedures, the auction will close after two consecutive rounds with no new bids. Thus, after a round with no new bids, bidders will be notified that if no new bids are placed in the subsequent round, the auction will close.

D. Other Package Bidding Highlights

12. Implementing package bidding requires changes in some of the procedures used in the Bureau’s SMR auctions. Some of the main differences are introduced in this section in order to highlight the differences between the Bureau’s proposed package bidding procedures for Auction No. 51 and the Bureau’s SMR auction procedures. Later in this public notice, in the “Auction Structure” and “Bidding Procedures” sections, the Bureau seeks comment on the package bidding procedures for Auction No. 51.

i. Provisionally Winning Bids

13. In an SMR auction it is a simple matter to determine high bids. At the end of a bidding round, the high bids are determined based on the highest gross bid amount received for each license. A high bid from a previous round is sometimes referred to as a “standing high bid.” A “standing high bid” remains the high bid until there is a higher bid on the same license at the close of a subsequent round.

14. In a package bidding auction, provisionally winning bids are similar to standing high bids. Provisionally winning bids are the set of bids that maximizes revenue at the end of a particular round. The set of provisionally winning bids cannot include overlapping bids; each license may be assigned only once. In the event of tied bids or tied sets of bids, ties are broken randomly. The set of provisionally winning bids may, of course, include package bids as well as individual license bids.

15. Unlike in an SMR auction, a provisionally winning bid does not necessarily remain a provisional winner until there is a higher bid on the same license or package at the close of a