Comments on Proposed Auction 901 Procedures

Comment on DA 12-121

MOBILITY FUND PHASE I AUCTION SCHEDULED FOR SEPTEMBER 27, 2012

COMMENT SOUGHT ON COMPETITIVE BIDDING PROCEDURES FOR AUCTION 901 AND CERTAIN PROGRAM REQUIREMENTS

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by

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Combinatorial Bidding Issues

If the Commission decides to allow combinatorial bidding in its auction design for Auction 901, it should ensure that auction procedures, from bid submission to winner determination, are implementable and are guaranteed to be executable in a reasonable time.

1. If bidders are allowed to create their own aggregations of the eligible census blocks (as proposed in Paragraphs 31-37), the Commission should also protect the auction procedure from bidders who might try to submit an unreasonable number of bids. Introducing a large number of bids might not be costly to a bidder (e.g., bidders can even ensure that at most one such bid is potentially winning by adding an irrelevant census block so that all bids intersect.) This can be achieved in numerous ways that all need further thought. Below are some possibilities:
   a. Make submission of a large number of bids costly. (For example, any bid over some pre-specified number of bids will require larger deposit or will have to be accompanied by a submission fee that could be refundable if that bid becomes a winning bid.)

b. Limit the number of combinatorial bids that can be submitted by a single bidder. (Alternative measures on the collection of bids from a bidder can be introduced.)
c. Introduce a two-round bidding and make 1st round winning bids binding, and allow for 2nd round bids only to improve on the same combinations that were bid on by that bidder in the 1st round (provided it is above a reserve price or within some value implied from winning combination in the first round, so that too many non-competitive bids are discouraged). A two-round procedure could also impose penalties on bidders submitting unreasonable large number of non-competitive bids.
d. Have bidders prioritize their combinatorial bids and have winner determination take this into account. (This would require substantial changes in winner determination.)

2. Regarding winner determination discussed in Paragraph 34, keep the requirement for no overlap of winning bids. While small overlap could increase the coverage within the predefined budget, and while it is possibly beneficial when it comes to costs of building necessary infrastructure, bidders' valuations would likely depend on whether they would be offering service alone or in competition with another provider. Therefore, if overlaps are allowed, bidders might adjust their bids accordingly or would have to provide burdensome information on their bids under all possible overlap scenarios. Thus, the best option within the proposed design would be to impose no overlap among winning bids.

3. The $300 million budget constraint should be a soft one. Allowing little flexibility with the budget constraint can help with solvability of the winner determination problem, especially if a large number of submitted bids is a possibility. Even in the simplistic case in which only non-package bids are allowed, the winner determination with a budget constraint corresponds to a hard computational problem which actually has computationally manageable solutions if the budget constraint can be relaxed a little bit. (The knapsack problem studied in combinatorial optimization is NP-hard but has fully polynomial time approximation scheme.)

4. The winner determination could be made feasible by limiting the structure of admittable package bids. For example, whatever underlying measure is used to determine the value of coverage (traffic density might be combined by road miles, if such data is available), the Commission could start with a spanning tree over the road network, possibly breaking any cycles at the lowest possible category roads, and allow package bids that form connected components on that spanning tree. The winner determination problem would become computationally feasible. (Furthermore this approach could probably be adjusted to allow for fractional allocations within bidding units, if necessary.)

5. The Predefined Aggregations approach (described in Paragraphs 38-45) can avoid many potential problems with implementation. Allowing packaging for up to three contiguous tracts (Paragraph 42) should not pose any computational problems. However, if package bidding is

allowed, the structure of package bids might be aligned with potential synergies. One example was described in 4. above.

6. There is insufficient detail provided on proposal from Paragraph 46, but it appears that winner determination could create possibly insurmountable computational difficulties in the worst case scenario.

Auction goals

The Commission should give primary consideration to its overall goals, going beyond current $300 million budget. Since $300 million is not likely to ensure coverage of all areas where desired service is not available, determining auction winners has to take into account the cost of providing service (at a later time) to areas that will be left without coverage after this auction. For example, the structure of blocks for which coverage will be supported through this auction also defines the structure of blocks that will be left without coverage. This left-out blocks could become disconnected and leave little room for synergies in subsequent attempts to ensure coverage, hence raising future costs to the Commission. In short, the optimal allocation in this auction cannot be looked at in isolation of estimated costs of eventually providing coverage to all areas. A way to remedy this issue could be a procedure that would first solve the winner determination problem without any budget constraint. Then, it would choose the optimal subset (according to some underlying measure) of "winning" bids within $300 budget. (The latter is just a knapsack problem on a potentially small number of bids.) This approach would require for reserve prices to be determined on all blocks (which, for example, could be set at some value closely related to the cost of building required infrastructure).

In summary, the Commission should primarily focus on its own long-term goals of providing coverage, and less so on tactical desires of bidders in this auction.

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