FACT SHEET

EXPONENTIAL SMOOTHING BID INCREMENT METHODOLOGY

I. Description of Methodology

The Commission is enhancing its Automated Auction System to include an additional methodology for calculating minimum bid increments. The new methodology, referred to as exponential smoothing, will base the bid increment for each license on a weighted average of the activity on that license in the most recently completed round and the activity on that license in all previous rounds.

After a license receives a new high bid, a bid increment is applied to the new high bid to set a minimum acceptable bid for the next bidding period. Generally, minimum acceptable bids for licenses are calculated as the amount of the new high bid on a license plus the greater of either a percentage increment (a percentage of the new high bid) or an absolute increment (a fixed dollar amount per bidding unit for each license, *e.g.,* $.02 per bidding unit).

Under exponential smoothing, the absolute bid increment methodology will not change from previous auctions. It will still be calculated as a fixed dollar amount per bidding unit for each license (*e.g.,* $.02 per bidding unit). The exponential smoothing formula, however, will replace the fixed or tiered percentages the Commission has used before in setting percentage increments.

Using exponential smoothing, the calculation of the percentage bid increment for each license will be based on an activity index, which is calculated as the weighted average of the current activity and the activity index from the previous round. The activity index at the start of the auction (round 0) will be set at 0. The current activity index is equal to a weighting factor times the number of new bids received on the license in the current bidding period plus one minus the weighting factor times the activity index from the previous round. The activity index is then used to calculate a percentage increment by multiplying a minimum percentage increment by one plus the activity index with that result being subject to a maximum percentage increment. The Commission anticipates initially setting the weighting factor at 0.5, the minimum percentage increment at 0.05, and the maximum percentage increment at 0.2. The mathematical formulas can be found in the Equations section, following.

The Automated Auction System retains the capability to calculate the percentage increment as a fixed value for all licenses (*e.g.,* 10%). The Commission will announce, prior to the start of each auction, the specific bid increment methodology to be used in that auction. Factors to be considered in the determination of the appropriate minimum bid increment methodology to be used in an auction include, but are not limited to, the number of licenses being auctioned, the anticipated activity on individual licenses, and the degree of substitutability of licenses.

II. Equations

$A_i = (C * B_i) + ((1-C) * A_{i-1})$
$I_i = $ smaller of $((1 + A_i) * N)$ and M

where,
A_i = activity index for the current round (round i)
C = activity weight factor
B_i = number of bids in the current round (round i)
A_{i-1} = activity index from previous round (round i-1), A_0 is 0
I_i = percentage bid increment for the current round (round i)
N = minimum percentage increment
M = maximum percentage increment

Under the exponential smoothing methodology, once a bid has been received on a license, the minimum acceptable bid for that license in the following round will be the new high bid plus the greater of either the dollar amount associated with the percentage increment (variable I_i from above times the high bid) or the absolute increment (a fixed dollar amount per bidding unit for each license, *e.g.,* $.02 per bidding unit).

III. Example

License 1 (10,000,000 bidding units)
C=0.5, N = 0.05, M = 0.15, Absolute bid increment = $0.02 per bidding unit

Round 1 (2 new bids, high bid = $1,000,000)

1. Calculation of percentage increment using exponential smoothing:
      $A_1 = (0.5 * 2) + (0.5 * 0) = 1$
      $I_1 = (1 + 1) * 0.05 = 0.1$

2. Dollar increment using the percentage increment (I_1 from above)
      $0.1 * \$1,000,000 = $ **$100,000**

3. Dollar increment using the absolute increment
      $0.02 * 10,000,000$ bidding units $= $ **$200,000**

4. Minimum bid increment: greater of percentage and absolute $= $ **$200,000**

Round 2 (3 new bids, high bid = 2,000,000)

1. Calculation of percentage increment using exponential smoothing:
      $A_2 = (0.5 * 3) + (0.5 * 1) = 2$
      $I_2 = (1 + 2) * 0.05 = 0.15$

2. Dollar increment using the percentage increment (I_2 from above)
    0.15 * $2,000,000 = **$300,000**

3. Dollar increment using the absolute increment
    $0.02 x 10,000,000 bidding units = **$200,000**

4. Minimum bid increment: greater of percentage and absolute = **$300,000**

Round 3 (1 new bid, high bid = 2,300,000)

1. Calculation of percentage increment using exponential smoothing:
    $A_3 = (0.5 * 1) + (0.5 * 2) = 1.5$
    $I_3 = (1 + 1.5) * 0.05 = 0.125$

2. Dollar increment using the percentage increment (I_3 from above)
    0.125 * $2,300,000 = **$287,500**

3. Dollar increment using the absolute increment
    $0.02 x 10,000,000 bidding units = **$200,000**

4. Minimum bid increment: greater of percentage and absolute = **$287,500**

If you have questions, contact: Brett Tarnutzer, Auctions Division, (202) 418-0660.