

**Decrement Formulas for the BGS-CIEP Auction**

**January 25, 2010**

*As noted in Section X.C.8 of the Final BGS-CIEP Auction Rules (dated December 1, 2009), the formulas that will be used in the BGS-CIEP Auction are released to all bidders no later than three days after bidder registration. These decrement formulas, which depend on the EDC load caps and the number of registered bidders, are provided below.*

**X.G.2.        Decrements**

The calculation of the size of the decrement,  $\Delta$ , is based on the oversupply ratio,  $\gamma$ , which is the ratio of the excess supply on an EDC to an estimate of the maximum excess supply:

$$\gamma = \frac{B - TT}{\min(\overline{RES}, n \cdot \min\{SWLC, TT\} - TT)}$$

The numerator is the excess supply on an EDC, which is the number of tranches bid at the going price ( $B$ ) minus the tranche target ( $TT$ ). The denominator is an estimate of maximum possible excess supply for that EDC. The excess supply on an EDC must be less than or equal to the total excess supply in the Auction.  $\overline{RES}$  is the upper bound of the range of total excess supply reported to bidders and serves as a measure of total excess supply in the Auction. The excess supply on an EDC must also be less than or equal to the excess supply that would result from all bidders bidding the maximum possible number of tranches on the EDC. The maximum possible number of tranches that can be bid on an EDC is either the statewide load cap ( $SWLC$ ) or the tranche target ( $TT$ ), whichever is lower. Thus, the excess supply that would result from all bidders bidding the maximum possible number of tranches on the EDC would be  $n \cdot \min\{SWLC, TT\} - TT$  tranches, namely the number of registered bidders ( $n$ ) times the statewide load cap ( $SWLC$ ) or the tranche target ( $TT$ ), minus the tranche target (to get a measure of excess supply). The estimate of maximum possible excess supply for the EDC used for the

decrement rule is  $\overline{RES}$ , or the measure based on the number of registered bidders and the load cap ( $n \cdot \min\{SWLC, TT\} - TT$ ), whichever is smaller.

### ***Regime 1***

At the start of the Auction, in Regime 1, the following decrement formulas will be used.

If an EDC's tranche target is 15 tranches or more, then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.005 , \min \{ (0.068 \gamma - 0.0085) , 0.05 \} ]$$

For example if  $\gamma = 0.4705$ , then  $\Delta = 0.0235$ , which means that prices are reduced by 2.35% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the decrease in price would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.1985 (but above 0), the decrement is set at 0.50%. The decrement is never more than 5% (subject to rounding off). When the oversupply ratio is 0.8603 or greater, which means that the excess supply on the EDC reaches 86.03% of its maximum, the decrement is set at 5%. When the oversupply ratio is between 0.1985 and 0.8603, so that the excess supply on the EDC is between 19.85% and 86.03% of its maximum, the decrement is between 0.50% and 5% according to the rule given above.

If an EDC's tranche target is between 7 and 14 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.005 , \min \{ (0.155 \gamma - 0.0157) , 0.05 \} ]$$

For example if  $\gamma = 0.2000$ , then  $\Delta = 0.0153$ , which means that prices are reduced by 1.53% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the decrease in price would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.1335 (but above 0), the decrement is set at 0.50%. The decrement is never more than 5% (subject to rounding off). When the oversupply ratio is 0.4239 or greater, which means that the excess supply on the EDC reaches 42.39% of its maximum, the decrement is set at 5%. When

the oversupply ratio is between 0.1335 and 0.4239, so that the excess supply on the EDC is between 13.35% and 42.39% of its maximum, the decrement is between 0.50% and 5% according to the rule given above.

If an EDC's tranche target is between 3 tranches and 6 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [0.005, \min \{(0.281 \gamma - 0.0175), 0.05\} ]$$

For example if  $\gamma = 0.2000$ , then  $\Delta = 0.0387$ , which means that prices are reduced by 3.87% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the decrease in price would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.0801, the decrement is set at 0.50%. The decrement is never more than 5% (subject to rounding off). When the oversupply ratio is 0.2402 or greater, which means that the excess supply on the EDC reaches 24.02% of its maximum, the decrement is set at 5%. When the oversupply ratio is between 0.0801 and 0.2402, so that the excess supply on the EDC is between 8.01% and 24.02% of its maximum, the decrement is between 0.50% and 5% according to the rule given above.

If an EDC's tranche target is 2 tranches or fewer, the decrement for that EDC is set as a series of steps.

Using this rule, the smallest decrement would be 1% (and the amount of the decrease in price would be rounded off to the nearest cent). The smallest decrement would be in effect when the oversupply ratio is at or below a pre-determined minimum value. The decrement is never more than 5% (subject to rounding off). The largest decrement would be in effect when the oversupply ratio is above a pre-determined maximum value. When the oversupply ratio is in between the pre-determined minimum and maximum values, the decrement will be set at 4%.

The following series of three of steps will be used:

$$\Delta = \begin{cases} 0.01 & \text{if } \gamma \leq 0.375 \\ 0.04 & \text{if } 0.375 < \gamma \leq 0.8 \\ 0.05 & \text{if } \gamma > 0.8 \end{cases}$$

When the oversupply ratio is at or below a minimum value of 0.3750, the decrement is set at 1%. When the oversupply ratio is above a maximum value of 0.8000, which means that the excess supply on the EDC exceeds 80% of its maximum, the decrement is set at 5%. When the oversupply ratio is at or below 0.8000 but above 0.3750, so that the excess supply on the EDC is at or below 80.00% but above 37.50% of its maximum, the decrement is constant at 4% according to the rule given above.

### ***Change in Regime***

Decrements continue to be between 0.50% and 5% of the previous going price as calculated by the decrement formulas of Regime 1 until the going prices for round 4 are calculated. After that time, in the first round in which the total excess supply in the Auction is reported to bidders to be 15 or fewer tranches, then the decrement formulas of Regime 2 will be used for the prices that will be the going prices in the next round and for the remainder of the Auction.

### ***Regime 2***

Later in the Auction, in Regime 2, the following decrement formulas will be used.

If an EDC's tranche target is 15 tranches or more, then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [0.0025 , \min \{ (0.034 \gamma - 0.00725) , 0.025 \} ]$$

For example if  $\gamma = 0.8$ , then  $\Delta = 0.01995$ , which means that prices are reduced by 1.995% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.25% (and the amount of the decrease in price would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.2868 (but above 0), the decrement is set at 0.25%. The decrement is never more than 2.50% (subject to rounding off). When the oversupply ratio is 0.9485 or greater, which means that the excess supply on the EDC reaches 94.85% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.2868 and 0.9485, so that the excess supply on the EDC

is between 28.68% and 94.85% of its maximum, the decrement is between 0.25% and 2.50% according to the rule given above.

If an EDC's tranche target is between 7 and 14 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.0025 , \min \{ (0.0775 \gamma - 0.01385) , 0.025 \} ]$$

For example if  $\gamma = 0.4$ , then  $\Delta = 0.01715$ , which means that prices are reduced by 1.715% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.25% (and the amount of the decrease in price would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.2110 (but above 0), the decrement is set at 0.25%. The decrement is never more than 2.50% (subject to rounding off). When the oversupply ratio is 0.5013 or greater, which means that the excess supply on the EDC reaches 50.13% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.2110 and 0.5013, so that the excess supply on the EDC is between 21.10% and 50.13% of its maximum, the decrement is between 0.25% and 2.50% according to the rule given above.

If an EDC's tranche target is between 3 tranches and 6 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.0025 , \min \{ (0.1125 \gamma - 0.0175) , 0.025 \} ]$$

For example if  $\gamma = 0.2$ , then  $\Delta = 0.005$ , which means that prices are reduced by 0.50% for the next round. Prices will be rounded off to the nearest cent.

Using this rule, the smallest decrement would be 0.25% (and the amount of the price decrease would be rounded off to the nearest cent). When the oversupply ratio is at or below 0.1778 (but above 0), the decrement is set at 0.25%. The decrement is never more than 2.50% (subject to rounding off). When the oversupply ratio is 0.3778 or greater, which means that the excess supply on the EDC reaches 37.78% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.1778 and 0.3778, so that the excess supply on the EDC is between 17.78% and 37.78% of its maximum, the decrement is between 0.25% and 2.50% according to the rule given above.

If an EDC’s tranche target is 2 tranches or fewer, the decrement for that EDC is set as a series of steps. The decrement is also subject to an automatic bump-up, as further described below.

Using this rule, the smallest decrement would be 0.5% (and the amount of the decrease in price would be rounded off to the nearest cent). The smallest decrement would be in effect when the oversupply ratio is at or below a pre-determined minimum value. The decrement is never more than 2.50% (subject to rounding off). The largest decrement would be in effect when the oversupply ratio is above a pre-determined maximum value. When the oversupply ratio is above the pre-determined minimum values and at or below the pre-determined maximum value, the decrement will be set at 2%.

The following series of three of steps will be used:

$$\Delta = \begin{cases} 0.005 & \text{if } \gamma \leq 0.275 \\ 0.02 & \text{if } 0.275 < \gamma \leq 0.625 \\ 0.025 & \text{if } \gamma > 0.625 \end{cases}$$

When the oversupply ratio is at or below a minimum value of 0.2750, the decrement is set at 0.5%. When the oversupply ratio is above a maximum value of 0.6250, which means that the excess supply on the EDC exceeds 62.50% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.2750 and 0.6250, so that the excess supply on the EDC is between 27.50% and 62.50% of its maximum, the decrement is constant at 2%.

The decrement for an EDC with a tranche target of 4 or fewer is subject to an automatic increase when the decrement remains at the Regime 2 minimum (0.5%) for three rounds in a row. The maximum number of rounds in a row for which the decrement is increased is three rounds. If the decrement is increased, it is set to the average of the minimum decrement and the next highest decrement.

Specifically, the decrement is **bumped up**, i.e., increased from the minimum (0.5%) to an average of the two smallest decrements, whenever the decrement would otherwise have been set at the minimum in that round, and:

- In the three previous rounds, the decrement was set at the minimum; or

- Of the three previous rounds, the decrement was set at the minimum for the first two of these previous rounds and the decrement was bumped up in the third; or
- Of the three previous rounds, the decrement was set at the minimum for the first of these three previous rounds and was bumped up in the second and third of these previous rounds.

For example, suppose that the tranche target is 1 and that the number of registered bidders is 9. If the oversupply ratio is at or below 0.275 for rounds 20, 21, 22 and 23, the decrement is set at the minimum (0.5%) in rounds 20, 21 and 22, but the decrement is increased to 1.25% (the average of the minimum decrement 0.5% and the next highest decrement, 2%) in round 23.