

## **Decrement Formulas for the BGS-FP Auction**

**January 25, 2010**

*As noted in Section XI.C.8 of the Final BGS-FP Auction Rules (dated December 1, 2009), the formulas that will be used in the BGS-FP 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.*

### **IX.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:

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

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 or 30 tranches, whichever is larger, and it 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 load cap on the EDC. This is represented by  $n \cdot LC - TT$ , namely the number of registered bidders ( $n$ ) times the EDC load cap ( $LC$ ) minus the tranche target ( $TT$ ). 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 ( $n \cdot LC - TT$ ), 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 20 tranches or more, then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.005 , \min \{ (0.066 \gamma - 0.006) , 0.05 \} ]$$

For example if  $\gamma = 0.5000$ , then  $\Delta = 0.0270$ , which means that prices are reduced by 2.70% for the next round. Prices will be rounded off to the nearest thousandth of a cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the price decrease would be rounded off to the nearest thousandth of a cent). When the oversupply ratio is at or below 0.1667 (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 0.8485 or greater, which means that the excess supply on the EDC reaches 84.85% of its maximum, the decrement is set at 5%. When the oversupply ratio is between 0.1667 and 0.8485, so that the excess supply on the EDC is between 16.67% and 84.85% 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 10 and 19 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.005 , \min \{ (0.136 \gamma - 0.013) , 0.05 \} ]$$

For example if  $\gamma = 0.3000$ , then  $\Delta = 0.0278$ , which means that prices are reduced by 2.78% for the next round. Prices will be rounded off to the nearest thousandth of a cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the price decrease would be rounded off to the nearest thousandth of a cent). When the oversupply ratio is at or below 0.1324 (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 0.4632 or greater, which means that the excess supply on the EDC reaches 46.32% of its maximum, the decrement is set at 5%. When the oversupply ratio is between 0.1324 and 0.4632, so that the excess supply on the EDC is between 13.24% and 46.32% 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 5 and 9 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.005 , \min \{ (0.16 \gamma - 0.006) , 0.05 \} ]$$

For example if  $\gamma = 0.2500$ , then  $\Delta = 0.0340$ , which means that prices are reduced by 3.40% for the next round. Prices will be rounded off to the nearest thousandth of a cent.

Using this rule, the smallest decrement would be 0.50% (and the amount of the price decrease would be rounded off to the nearest thousandth of a cent). When the oversupply ratio is at or below 0.0688 (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 0.3500 or greater, which means that the excess supply on the EDC reaches 35% of its maximum, the decrement is set at 5%. When the oversupply ratio is between 0.0688 and 0.3500, so that the excess supply on the EDC is between 6.88% and 35% of its maximum, the decrement is between 0.50% and 5% according to the rule given above.

If an EDC's tranche target is 4 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 price decrease would be rounded off to the nearest thousandth of a 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 3%.

The following series of three steps will be used:

$$\Delta = \begin{cases} 0.01 & \text{if } \gamma \leq 0.15 \\ 0.03 & \text{if } 0.15 < \gamma \leq 0.3 \\ 0.05 & \text{if } \gamma > 0.3 \end{cases}$$

When the oversupply ratio is at or below a minimum value of 0.1500, the decrement is set at 1%. When the oversupply ratio is above a maximum value of 0.3000, which means that the excess supply on the EDC exceeds 30% of its maximum, the decrement is set at 5%. When the

oversupply ratio is at or below 0.3000, but above 0.1500, so that the excess supply on the EDC is at or below 30% but above 15% of its maximum, the decrement is constant at 3%.

### ***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 30 or fewer tranches, 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 20 tranches or more, then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.0025 , \min \{ ( 0.033 \gamma - 0.002 ) , 0.025 \} ]$$

For example if  $\gamma = 0.5000$ , then  $\Delta = 0.0145$ , which means that prices are reduced by 1.45% for the next round. Prices will be rounded off to the nearest thousandth of a 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 thousandth of a cent). When the oversupply ratio is at or below 0.1364 (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 0.8182 or greater, which means that the excess supply on the EDC reaches 81.82% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.1364 and 0.8182, so that the excess supply on the EDC is between 13.64% and 81.82% 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 10 and 19 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.0025 , \min \{ ( 0.068 \gamma - 0.0065 ) , 0.025 \} ]$$

For example if  $\gamma = 0.3000$ , then  $\Delta = 0.0139$ , which means that prices are reduced by 1.39% for the next round. Prices will be rounded off to the nearest thousandth of a 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 thousandth of a cent). When the oversupply ratio is at or below 0.1324 (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 0.4632 or greater, which means that the excess supply on the EDC reaches 46.32% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.1324 and 0.4632, so that the excess supply on the EDC is between 13.24% and 46.32% 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 5 and 9 tranches (inclusive), then the decrement for that EDC is set as follows:

$$\Delta = \text{Max} [ 0.0025 , \min \{ (0.08 \gamma - 0.003) , 0.025 \} ]$$

For example if  $\gamma = 0.3000$ , then  $\Delta = 0.0210$ , which means that prices are reduced by 2.10% for the next round. Prices will be rounded off to the nearest thousandth of a 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 thousandth of a cent). When the oversupply ratio is at or below 0.0688 (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 0.3500 or greater, which means that the excess supply on the EDC reaches 35% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is between 0.0688 and 0.3500, so that the excess supply on the EDC is between 6.88% and 35% 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 4 tranches or fewer, the decrement for that EDC is set as a series of steps.

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 thousandth of a 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 in between the pre-determined minimum and maximum values, the decrement will be set at 1.50%.

The following series of three steps will be used:

$$\Delta = \begin{cases} 0.0025 & \text{if } \gamma \leq 0.15 \\ 0.015 & \text{if } 0.15 < \gamma \leq 0.3 \\ 0.025 & \text{if } \gamma > 0.3 \end{cases}$$

When the oversupply ratio is at or below a minimum value of 0.1500, the decrement is set at 0.25%. When the oversupply ratio is above a maximum value of 0.3000, which means that the excess supply on the EDC exceeds 30% of its maximum, the decrement is set at 2.50%. When the oversupply ratio is at or below 0.3000 but above 0.1500, so that the excess supply on the EDC is at or below 30% but above 15% of its maximum, the decrement is constant at 1.50%.

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 (0.25%) 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 (0.25%) 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, if the oversupply ratio is at or below 0.1500 for rounds 20, 21, 22 and 23, the decrement is set at the minimum (0.25%) in rounds 20, 21 and 22, but the decrement is increased to 0.875% (the average of the minimum decrement 0.25% and the next highest decrement, 1.50%) in round 23.