Auction Examples

Nova Scotia Cap-and-Trade Program
Auction of Greenhouse Gas Allowances

Updated on April 3, 2023

Contents

1. Background

This document provides information on auction bidding procedures and an outline of the settlement price determination process; how to determine the amount of a bid guarantee[1]; and bid evaluation procedures for purchase limits, holding limits, and bid guarantees.

This document should be read in conjunction with the **Detailed Auction Requirements and Instructions** document. Terms defined in the Detailed Auction Requirements and Instructions document also apply to this document. This document is guidance only and does not supersede the *Environment* Act or the Cap-*and-Trade Program Regulations*. In circumstances of uncertainty, the *Environment Act* and the *Cap-and-Trade Program Regulation* are the controlling documents.

When bidding in an auction during the open bidding window, the bid currency, bid price, number of bid lots, and instrument vintage are entered for each bid. When placing bids for the auction, the vintage that must be selected is "Current." The auction may include allowances of vintages from the current and previous calendar years. In the event that the auction offers allowances of vintages prior to the current year, bids cannot be placed for a particular vintage but are instead submitted as "Current" vintage.

Please note that account representatives will see future vintage allowances ("2022") in the Auction Platform as part of an Advance Auction. However, Nova Scotia is not offering an Advance Auction. This is a constraint of the Auction Platform where one future vintage allowance is required to be entered in the Advance Auction. Any bids placed on this allowance will be rejected as Nova Scotia is not offering an Advance Auction.

For the auction, an Auction Reserve Price will be determined in accordance with the *Cap-and-Trade Program Regulations.* For the purposes of this document and all examples, the Auction Reserve Price is $20.00 Canadian Dollars (CAD). The Auction Administrator will not accept any bids for which the bid price is less than the Auction Reserve Price.

The Settlement Price in an auction is determined after the bidding window is closed based on the following steps:

1. Each entity's submitted bids are evaluated to ensure that submitted bids or value of submitted bids do not exceed the purchase limits, holding limits, or the entity's bid guarantee.
2. Each entity's qualified bids are determined as the bid quantity that remains after the submitted bids have been evaluated and reduced to meet all limits.
3. Qualified bids are ranked in order of bid price, from highest to lowest.
4. Allowances are awarded to entities, beginning with the highest qualified bid price and moving to successively lower qualified bid prices, until the entire supply of allowances is exhausted or all qualified bids have been filled.

The discussion in the remainder of the document follows the steps listed above, in order, to discuss the various elements of the settlement price determination process.

---

[1] The term "bid guarantee" will be used throughout this document to refer to "financial guarantee" as defined in the *Cap-and-Trade Program Regulations*.

2. Determining An Entity's Bid Guarantee

Table 1 presents hypothetical bid submissions for an auction in which seven entities are participating. Each entity's set of bids is referred to as a bid schedule in the remainder of this document. Each row in Table 1 provides the bid value at each bid price. The Auction Administrator will accept bids for lots of allowances; each bid lot represents 1,000 allowances.

The value of an entity's bid is calculated by multiplying the price per allowance by the total number of allowances bid on at that price in addition to any allowances that the entity has bid on at a higher price.

Entity Name	Bid Price (CAD)	Bid Lots	Bid Number of Allowances	Entity Cumulative Bid Allowances	Entity Cumulative Bid Value (CAD)
A	$34.37	40	40,000	40,000	$1,374,800
A	$27.95	55	55,000	95,000	$2,655,250
A	$23.38	70	70,000	165,000	$3,857,700
A	$20.78	85	85,000	250,000	$5,195,000
B	$25.62	80	80,000	80,000	$2,049,600
B	$20.36	170	170,000	250,000	$5,090,000
C	$65.22	25	25,000	25,000	$1,630,500
C	$59.02	100	100,000	125,000	$7,377,500
C	$42.96	40	40,000	165,000	$7,088,400
D	$32.63	50	50,000	50,000	$1,631,500
D	$27.86	120	120,000	170,000	$4,736,200
E	$29.88	35	35,000	35,000	$1,045,800
E	$26.58	50	50,000	85,000	$2,259,300
E	$23.38	70	70,000	155,000	$3,623,900
E	$20.34	110	110,000	265,000	$5,390,100
F	$20.34	200	200,000	200,000	$4,068,000
G	$29.88	50	50,000	50,000	$1,494,000
G	$27.86	120	120,000	170,000	$4,736,200

Table 1:Bid Submissions for all Auction Examples

Table 1 Terminology:

- Bid Number of Allowances = Bid Lots * 1,000
- Entity Cumulative Bid Allowances = Sum of current Bid Number of Allowances and Bid Number of Allowances at each higher Bid Price
- Entity Cumulative Bid Value = Entity Cumulative Allowances * Bid Price
- Entity Maximum Bid Value (CAD) = Entity Cumulative Bid Value at Bid Price where Entity Cumulative Bid Value is greatest

The Maximum Bid Value for each entity is highlighted grey in the Entity Cumulative Bid Value (CAD) column in Table 1.

The cumulative allowances shown in Table 1 are not entered or shown in the bid schedule, but are shown here for illustrative purposes. The "Entity Cumulative Bid Allowances" column indicates the total allowances for which the entity has submitted bids to purchase at that bid price and all higher bid prices.

The *Cap-and-Trade Program Regulations* requires bid guarantees to be greater than or equal to the maximum value of the bids submitted (i.e., maximum bid value). Thus, each entity's bid guarantee should be equal to or greater than the maximum bid value for the planned bid schedule in Table 1. Entities bidding in an auction will be limited to incurring a total cost less than or equal to the dollar amount of the bid guarantee submitted and should evaluate their bids against the bid guarantee they provided in the manner illustrated in the examples below.

The following are examples of how an entity might calculate the minimum bid guarantee required to avoid having their bids rejected:

Example 1: Calculating a Bid Guarantee When Submitting Multiple Bids

As shown in Table 1, Entity A has submitted four different bids at four different bid prices

- Bid price of $34.37: Entity A bid for 40,000 allowances at a value of $1,374,800.
- Bid price of $27.95: Entity A bid for 95,000 allowances at a value of $2,655,250. (95,000 allowances = 40,000 + 55,000)
- Bid price of $23.38: Entity A bid for 165,000 allowances at a value of $3,857,700. (165,000 allowances = 40,000 + 55,000 + 70,000)
- Bid price of $20.78: Entity A bid for 250,000 allowances at a cost of $5,195,000. (250,000 allowances = 40,000 + 55,000 + 70,000 + 85,000)

Entity A's bid schedule shows that it is willing to purchase a total of 250,000 allowances at a price of $20.78 at a maximum bid value of $5,195,000. **Entity A should submit a bid guarantee of at least $5,195,000 if it wants to buy all the allowances in its bid schedule as highlighted in Table 1.**

Using the same evaluation process for the bid schedules submitted by Entities B to G, the maximum bid value of each entity's bid schedule is determined and shown in Table 1, highlighted in grey.

The minimum bid guarantee Entities A to G should submit to avoid having their bid(s) rejected in lots of 1,000 allowances by the Auction Administrator would be as follows:

- Entity A – $5,195,000
- Entity B – $5,090,000
- Entity C – $7,377,500
- Entity D – $4,736,200
- Entity E – $5,390,100
- Entity F – $4,068,000
- Entity G – $4,736,200

3. Entity Bid Evaluation Procedures for Purchase Limits and Holding Limits

Example 2 and Example 3 illustrate how entities should evaluate their Current Auction bid schedules for purchase limits and holding limits.

3.1. Purchase Limits

Every entity within the Nova Scotia Cap-and-Trade Program has a purchase limit. This purchase limit is not shared amongst related entities, so is not divided across Corporate Association Groups (CAG). Purchase limits differ depending on the type of entity.

Example 2: Determining an Entity's Auction Purchase Limit

For auctions held in 2023, a qualified bidder is permitted to purchase emission allowances at auction in the amount equivalent to their outstanding allowance obligations for the 2019-2022 compliance period.

The purchase limit for each entity will be rounded up to the nearest 1,000.

Entity Type	Allowance Outstanding Obligation	Purchase Limit
Entity 1	84,632	85,000
Entity 2	150	1,000

Table 2: Purchase Limit Calculations

3.2. Holding Limits

The holding limit is the maximum number of emission allowances that may be held by an entity or jointly held by a group of related entities in a CAG. Every entity and CAG has a set holding limit of 500,000.

Allowances purchased in the auction are subject to the holding limit. The holding limit applies to allowances from the current calendar year, previous calendar years, and the Minister's reserve account.

There is a separate holding limit for each calendar year of allowances with a vintage year beyond the current calendar year. Nova Scotia will not be holding an Advance Auction, so this holding limit will not effectively apply under the Nova Scotia Cap-and-Trade Program.

An emitter may exempt a limited number of allowances from the holding limit by transferring them to its compliance account. This "limited exemption" is described in Section 20(2) of the *Cap-and-Trade Program Regulations*. The limited exemption is based on an entity's emissions and is designed to allow entities the ability to accumulate the allowances they need for compliance.

Entities can calculate the maximum number of allowances they can hold by following Example 3.

Example 3: Determining the Maximum Number of Allowances an Entity Can Hold and Purchase to Comply with the Holding Limit

The maximum number of allowances an entity can hold at one time equals the holding limit plus the limited exemption. For allowances to be counted towards an entity's limited exemption, they must be held in the entity's compliance account.

When submitting bids in an auction, an entity may not exceed the applicable holding limit plus the limited exemption. For example, an entity's limited exemption is equal to 65,000 allowances and it holds 150,000 allowances in its compliance account and an additional 50,000 allowances of vintage 2019 or prior year vintage allowances in its general holding account. The maximum number of current vintage allowances the entity may acquire before exceeding its holding limit plus the limited exemption is:

500,000 + 65,000 – 150,000 – 50,000 = 365,000 allowances.

Based on the example above, an entity could purchase 365,000 allowances without exceeding the holding limit plus limited exemption.

Per the *Cap-and-Trade Program Regulations*, Nova Scotia Environment will not deposit emission allowances directly into an entity's compliance account. Therefore, any entity purchasing allowances that would bring its total beyond its holding limit will have to transfer any allowances in excess of the holding limit into its compliance account to take full advantage of the limited exemption.

It is each entity's responsibility to complete any necessary transfer of allowances within five (5) days of the date the holding limit is exceeded to conform to the holding limit. If emission allowances exceeding the holding limit remain in the general holding account five (5) days after the auction emission allowance distribution, the excess emission allowances may be removed and put back in the Auction Account of the Minister to be sold in a subsequent auction.

4. Auction Administrator Application of the Bid Evaluation Criteria

Submitted bids that contain bid quantities in excess of the purchase limit or the holding limit, or have a maximum value in excess of the bid guarantee at the settlement price, will be rejected, in bundles of 1,000 allowances, until all bid limitations are met. Only that portion of the bid quantity that exceeds one or more limit(s) will be rejected, not the entire bid quantity. Bid quantities that have been rejected will not be considered in determining the settlement price. "Qualified bids" are the bids that remain after the submitted bids have been evaluated and reduced to meet all limits.

Determination of qualified bids occurs after the bidding window has been closed and before the settlement price is determined. The result is a set of qualified bids from which the settlement price is determined for the auction.

Table 3 shows bid evaluation data for a sample auction where 1,000,000 allowances are available. These data will be used in the examples below to demonstrate how the Auction Administrator will evaluate each entity's submitted bids for the Current Auction. In some cases, a bid may exceed more than one evaluation criterion (i.e., purchase limit, holding limit, or bid guarantee value). When a bid exceeds more than one criterion, the bid will be reduced in lots of 1,000 allowances to meet the most constraining bid limitation.

Entity Name	Purchase Limit (Number of Allowances)	Holding Limit (Number of Allowances)	Bid Guarantee (CAD)
A	250,000	500,000	$5,696,128
B	200,000	500,000	$5,039,344
C	175,000	500,000	$9,226,080
D	100,000	500,000	$4,837,312

E	300,000	500,000	$5,847,616
F	250,000	500,000	$3,711,456
G	200,000	500,000	$4,737,312

Table 3: Bid Evaluation Data

Purchase limits in the examples throughout this document are based on the percentages assigned to each entity type as described previously.

In the sample bid evaluation data in Table 3, the bid guarantees represent the bid guarantees submitted. In some cases, the bid guarantee is different from the maximum total value of an entity's bid schedule shown in Table 1. This has been done to demonstrate how the bid guarantee criterion impacts bids if the bid guarantee is less than the bid value at a specific bid price.

4.1. Purchase Limit Evaluation

<u>Example 4: Purchase Limit Evaluation by Comparison of Sample Bid Schedules in Table 1 against the Sample Bid Evaluation Data Criteria in Table 3.</u>

Table 4 compares entity purchase limits from Table 3 with each entity's cumulative bid allowances from Table 1.

Entity Name	Maximum Cumulative Bid Allowances	Purchase Limit	Purchase Limit Evaluation
A	250,000	250,000	Ok
B	250,000	200,000	Limit Exceeded
C	125,000	175,000	Ok
D	170,000	40,000	Limit Exceeded
E	265,000	300,000	Ok
F	200,000	250,000	Ok
G	170,000	200,000	Ok

Table 4: Example 4 Purchase Limit Evaluation

Entities B and D submitted bids that exceed their purchase limits.

Entity B: Entity B's bids are not within its purchase limit as the cumulative total of its bids, 250,000 allowances, exceeds the purchase limit of 200,000 allowances. As a result, Entity B's submitted bids that contain bid quantities in excess of the purchase limit will be rejected in lots of 1,000 allowances until the purchase limit is met. Thus, only the portion of the bid that exceeds the limit will be rejected, not the entire bid. Entity B's first bid is 80,000 allowances. It can purchase an additional 120,000 allowances (200,000 - 80,000). Thus, Entity B's second bid would be limited to 120,000 allowances.

Entity D: Entity D's bids are not within its purchase limit as the cumulative total of its bids, 170,000 allowances, exceeds the purchase limit of 40,000 allowances. Submitted bids that contain bid quantities in excess of the purchase limit will be rejected in lots of 1,000 allowances until the purchase limit is met. Thus, only the portion of the bid that exceeds the limit will be rejected, not the entire bid. Entity D's first bid is for 50,000 allowances. Thus, Entity D's first bid would be limited to 40,000 allowances and the second bid would be rejected.

4.2. Holding Limit Evaluation

In Example 5, the available space within an entity's holding limit is defined as the maximum number of allowances that can be purchased by an entity at the auction while in compliance with the holding limit. This is described in the Detailed Auction Requirements and Instructions document as the holding limit cap that is transmitted to the Auction Administrator prior to the auction. Denoted as 'Holding Limit' in Table 3, the holding limit cap indicates how many allowances an entity may acquire at auction before exceeding its holding limit.

<u>Example 5: Holding Limit Evaluation by Comparison of Bids in Table 1 against the Sample Bid Evaluation Data in Table 3.</u>

In this example, all the bids submitted by entities are within their current vintage holding limit. Each entity's maximum cumulative bid allowances is less than 500,000.

4.3. Bid Guarantee Evaluation

Prior to auction settlement, the Auction Administrator will evaluate the submitted bid guarantee for each entity for the auction.

The settlement price algorithm is structured to recognize that a bid that is limited by the bid guarantee at a submitted bid price may not be limited as much or limited at all at lower potential settlement prices. If a bid quantity is limited by the bid guarantee at the submitted bid price, but could be fulfilled if the settlement price is lower than the submitted bid price, the entity will be awarded allowances up to the bid quantity and the limits of the bid guarantee.

Table 4 compares entity bid guarantees from Table 3 with each entity's maximum bid value based on the Entity Cumulative Bid Value from Table 1.

Entity Name	Maximum Bid Value (CAD)	Bid Guarantee (CAD)	Bid Guarantee Evaluation
A	$5,195,000	$5,696,128	Ok
B	$5,090,000	$5,039,344	Limit Exceeded
C	$7,377,500	$9,226,080	Ok
D	$4,736,200	$4,837,312	Ok
E	$5,390,100	$5,847,616	Ok
F	$4,068,000	$3,711,456	Limit Exceeded
G	$4,736,200	$4,737,312	Ok

Table 5: Example 5 Bid Guarantee Evaluation

<u>Example 6: Bid Guarantee Evaluation</u>

Entities B and F submitted bids for which their bid guarantee is insufficient.

Entity B: Entity B's bid guarantee of $5,039,344 is not sufficient to cover its maximum bid value of $5,090,000. The Auction Administrator would reduce Entity B's second bid to 167,000 allowances. At the bid price of $20.36, a total of 247,000 allowances can be purchased with the submitted bid guarantee $5,039,344 / $20.36 = 247,511, rounded down to 247,000). The total number of allowances that can be purchased through the second bid is 168,000 (247,000 - 80,000). Thus, Entity B's second bid would be limited to 167 bid lots based on the bid guarantee limitation. See Table 1 for Entity B's bidding details.

Entity F: Entity F's bid guarantee of $3,711,456 is not sufficient to cover its maximum bid value of $4,068,000. At the bid price of $20.34, the Auction Administrator would reduce Entity F's single bid to 182,000 allowances ($43,711,456 / $20.34 = 182,470, rounded down to 182,000). Thus, Entity F's single bid would be limited to 182 bid lots based on the bid guarantee limitation. See Table 1 for Entity F's bidding details.

Entity B's second bid is limited by the purchase limit and its bid guarantee. When a bid is limited by more than one criterion, the bid will be reduced in lots of 1,000 allowances to the most limiting constraint. A reduction of the second bid to 167,000 allowances would meet the bid guarantee limit but not the purchase limit. Therefore, the second bid would be reduced to 120,000 allowances to meet both limitations. The bid must pass all evaluations to be qualified and in this example, the most limiting criterion is the purchase limit. Therefore, Entity B's qualified second bid is 120 bid lots.

Entity D: Entity D's bid guarantee of $4,837,312 is sufficient to cover its maximum bid value of $4,736,200. However, as discussed in Example 4, the bids submitted exceed the purchase limit and thus the first bid is reduced to 40,000, and the second bid is rejected.

Table 6 shows the qualified bids after the Auction Administrator has completed the bid evaluation process, with the reduced bid quantities shaded in grey. These are the bids that would be used in calculating the settlement price. Please note that the cumulative allowances and bid values are also adjusted to reflect reduced bid quantities where applicable.

Entity Name	Bid Price (CAD)	Submitted Bid Lots	Qualified Bid Allowances (Qualified Bid Lots * 1000 Allowances)	Entity Cumulative Qualified Bid Allowances	Entity Cumulative Qualified Bid Value (CAD)
A	$34.37	40	40,000	40,000	$1,374,800
A	$27.95	55	55,000	95,000	$2,655,250
A	$23.38	70	70,000	165,000	$3,857,700
A	$20.78	85	85,000	250,000	$5,195,000
B	$25.62	80	80,000	80,000	$2,049,600
B	$20.36	170	120,000	200,000	$4,072,000
C	$65.22	25	25,000	25,000	$1,630,500
C	$59.02	100	100,000	125,000	$7,377,500
C	$42.96	40	40,000	165,000	$7,088,400
D	$32.63	50	40,000	40,000	$1,305,200
D	$27.86	120	0	40,000	$1,114,400
E	$29.88	35	35,000	35,000	$1,045,800
E	$26.58	50	50,000	85,000	$2,259,300
E	$23.38	70	70,000	155,000	$3,623,900
E	$20.34	110	110,000	265,000	$5,390,100
F	$20.34	200	182,000	182,000	$3,701,880
G	$29.88	50	50,000	50,000	$1,494,000
G	$27.86	120	120,000	170,000	$4,736,200

Table 6: Example 6 Bids Accepted by Auction Administrator

5. Settlement and Price Determination Procedures

The process to determine the settlement price requires that the Auction Administrator rank qualified bids from all entities from highest to lowest prices submitted for the bids. Emission allowances will be awarded to entities, beginning with the highest qualified bid price and moving to successively lower qualified bid prices, until the entire supply of allowances is exhausted or all qualified bids have been filled. Each bid will be assessed against purchase and holding limits and the value of the bid guarantee as described in the previous section. The bid price at which all available allowances are sold or all qualified bids are filled becomes the settlement price; this is the price per allowance that all entities will be charged for the allowances won in the auction. Bids submitted at prices below the settlement price will not be awarded any allowances.

The settlement price algorithm is structured to recognize that a bid that is limited by the bid guarantee at a submitted bid price may not be limited as much or limited at all at other potential settlement prices. If a bid quantity is limited by the bid guarantee at the submitted bid price, but could be fulfilled if the settlement price is lower than the submitted bid price, the entity will be awarded allowances up to the bid quantity and the limits of the bid guarantee. However, the settlement price algorithm will not award the entity more allowances than they bid for.

In determining the settlement price, the Auction Administrator may find that the quantity of allowances bid for at a specific price exceeds the remaining allowances available for sale. When this occurs, a tiebreaker procedure is used to determine the number of allowances awarded to each entity.

This section provides two examples of the calculation of the settlement price. Example 7 shows the sale of all available allowances with the last winning bid completely exhausting the available allowances. Example 8 illustrates the tiebreaker procedure.

Example 7: Settlement Price When the Last Winning Bid Exhausts the Available Allowances

Qualified bids from Entities A to G in the bid evaluation process provided in Table 6 are used in this settlement price example. For this example, the quantity of allowances available for sale is 980,000.

All qualified bids submitted by all entities are ranked from the highest qualified bid price to the lowest qualified bid price. In Table 7, the fifth column (Auction Cumulative Qualified Bid Allowances) shows the cumulative number of allowances for all entities at each declining bid price increment. The sixth column (Allowance Supply Remaining) shows allowances remaining to be sold, which is the difference between the allowance supply of 980,000 and the Auction Cumulative Qualified Bid Allowances in the fifth column.

Entity Name	Bid Price (CAD)	Submitted Bid Lots	Qualified Bid Allowances (Qualified Bid Lots * 1000 Allowances)	Auction Cumulative Qualified Bid Allowances	Allowance Supply Remaining
C	$65.22	25	25,000	25,000	955,000
C	$59.02	100	100,000	125,000	855,000
C	$42.96	40	40,000	165,000	815,000
A	$34.37	40	40,000	205,000	775,000
D	$32.63	50	40,000	245,000	735,000
E	$29.88	35	35,000	280,000	700,000
G	$29.88	50	50,000	330,000	650,000
A	$27.95	55	55,000	385,000	595,000
D	$27.86	120	0	385,000	595,000
G	$27.86	120	120,000	505,000	475,000
E	$26.58	50	50,000	555,000	425,000
B	$25.62	80	80,000	635,000	345,000
A	$23.38	70	70,000	705,000	275,000
E	$23.38	70	70,000	775,000	205,000
A	$20.78	85	85,000	860,000	120,000
B	$20.36	170	120,000	980,000	0
E	$20.34	110	110,000	1,090,000	0
F	$20.34	200	182,000	1,272,000	0

Table 7: Example 7 Settlement Price Determination

At the highest bid price of $65.22, only 25,000 allowances have been sold and 955,000 allowances remain to be sold. At the next lower bid price, $59.02, a total of 125,000 allowances have been sold and 855,000 allowances remain. Continuing down the sixth column, at the bid price of $20.36, the entire available supply of allowances is sold and qualified bids at prices below $20.36 cannot be filled. Hence, the settlement price is $20.36 (shaded in grey in Table 6) and 980,000 allowances are sold.

Allowances won by each entity and their respective total bid cost are shown in Table 8. Entity A would win 250,000 allowances from its four bids, and its total bid cost is $5,090,000 (250,000 * $20.36).

Entity Name	Allowances Won	Total Cost (CAD)
A	250,000	$5,090,000
B	200,000	$4,072,000
C	165,000	$3,359,400
D	40,000	$814,400
E	155,000	$3,155,800
F	0	$0
G	170,000	$3,461,200
Total	980,000	$19,952,800

Table 8: Example 7 Allowances Won and Total Costs

Example 8: Tiebreaker Example

Section 78 of the *Cap-and-Trade Program Regulations* specifies that the tiebreaker procedure is used when the sum of multiple entities' bid quantities at the settlement price exceeds the remaining allowances available for sale. During the tiebreaker procedure, each entity that has submitted qualified bids at the settlement price will be awarded allowances based on its share of qualified bids at the settlement price. An entity with a bid guarantee limited qualified bid will be included in the tiebreaker if it can purchase additional allowances at the settlement price.

Each entity is awarded allowances based on its share of qualified bids at the settlement price times the number of allowances remaining to be sold, rounded down to the nearest whole allowance. If there are allowances remaining as a result of rounding down, those allowances are awarded to entities by assigning a random number to each entity. The remaining allowances are awarded to entities starting with the lowest assigned random number and proceeding to the next higher random number until all remaining allowances are awarded. Under the tiebreaker procedure, allowances sold to entities in the tiebreaker will not necessarily be in lots of 1,000 allowances.

Example 8 includes the same bid submissions as used in Examples 7 and 8. The quantity of allowances available for sale for this example is 1,100,000.

Table 9 shows the determination of the settlement price for the allowance supply of 1,100,000 allowances. Again, bids from all entities are ranked from highest bid price to lowest bid price. At $20.36, there are 120,000 allowances remaining to be sold, but at the next bid price of $20.34, Entities E and F have combined qualified bids for 292,000 allowances. For this auction, the settlement price is $20.34 where all 1,100,000 allowances are sold. The Auction Administrator must implement the tiebreaker procedure to determine allowances won by Entities E and F at the settlement price.

Entity Name	Bid Price (CAD)	Submitted Bid Lots	Qualified Bid Allowances (Qualified Bid Lots * 1000 Allowances)	Auction Cumulative Qualified Bid Allowances	Allowance Supply Remaining
C	$65.22	25	25,000	25,000	1,075,000
C	$59.02	100	100,000	125,000	975,000
C	$42.96	40	40,000	165,000	935,000
A	$34.37	40	40,000	205,000	895,000
D	$32.63	50	40,000	245,000	855,000
E	$29.88	35	35,000	280,000	820,000
G	$29.88	50	50,000	330,000	770,000
A	$27.95	55	55,000	385,000	715,000
D	$27.86	120	0	385,000	715,000
G	$27.86	120	120,000	505,000	595,000
E	$26.58	50	50,000	555,000	545,000
B	$25.62	80	80,000	635,000	465,000
A	$23.38	70	70,000	705,000	395,000
E	$23.38	70	70,000	775,000	325,000
A	$20.78	85	85,000	860,000	240,000
B	$20.36	170	120,000	980,000	120,000
E	$20.34	110	110,000	1,090,000	0
F	$20.34	200	182,000	1,272,000	0

Table 9: Settlement Price Determination with a Tiebreaker

Entities E and F have qualified bid allowances totaling 292,000 at the bid price of $20.34. Entity shares of the 292,000 allowances bid are determined and entities are sold allowances, from the 120,000 remaining, according to their shares, with allowance amounts rounded down. Total allowances sold based on shares may be less than 120,000 due to rounding. The remaining allowances are sold based on random number assignments to entities, lowest random number first.

- Entity E's share is 0.37671233 (110,000 / 292,000 = 0.37671233).
- Entity F's share is 0.62328767 (182,000 / 292,000 = 0.62328767).

- Entity E would be awarded 45,205 allowances (0.37671233 * 120,000).
- Entity F would be awarded 74,794 allowances (0.62328767 * 120,000).

The total number of allowances awarded through this process is 119,999; one allowance remains to be awarded to the entities with the single lowest random numbers. If Entity E is assigned a random number of 5 and Entity F is assigned a random number of 200, one allowance is awarded to Entity E.

While Entity E could have purchased up to 265,000 allowances at the settlement price of $20.34, due to the tiebreaker process Entity E is awarded a total of 158,768 allowances (35,000 + 50,000 + 70,000 + 45,205 + 1). Allowances won in the tiebreaker are added to allowances won at higher bid prices.,

Entity F's only placed one bid, which was at the tiebreaker price. Due to the tiebreaker, Entity F is awarded 74,794 allowances.

Allowances won by each entity and their respective total bid cost are shown in Table 10.

Entity Name	Allowances Won	Total Cost (CAD)
A	250,000	$5,090,000
B	200,000	$4,072,000
C	165,000	$3,359,400
D	40,000	$814,400
E	200,206	$4,076,194
F	74,794	$1,522,806
G	170,000	$3,461,200
Total	1,100,000	$22,396,000

Table 10: Example 8 Allowances Won and Total Cost