Bureau Of Ocean Energy Management

AUCTION PROCEDURES FOR OFFSHORE WIND LEASE SALES

V1.0

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Revision History

Revision	Date	Comments	Editor
1	12/6/2023	Initial Version	Power Auctions/BOEM

1. Introduction

This document describes the auction procedures for the offshore wind lease sales that the Bureau of Ocean Energy Management (BOEM) is planning to conduct in 2024.

Each auction will use the ascending clock auction format. An auction will be conducted in a series of timed bidding rounds and will proceed through a sequence of ascending prices for the lease areas.

The ascending clock auction format will be used with single-factor or multiple-factor bidding. For an auction with multiple-factor bidding, each bid of a bidder that qualifies for a bidding credit will be a combination of a monetary bid and a non-monetary factor.

The ascending clock auction format will be used with or without the 'one per customer' rule. In an auction with a 'one per customer' rule, each bidder's initial eligibility equals one, and a bidder can win at most one lease area in the auction. In an auction without a 'one per customer' rule, a bidder's initial eligibility may exceed one, and a bidder may win more than one lease area in the auction.

The ascending clock auction format will be used for sales with one or multiple regions. For sales with multiple regions, if the 'one per customer' rule does not apply, there may be applicable region limits limiting the number of lease areas a bidder can win in a region. For example, if there are two regions and a bidder has a limit of one in each region, the bidder can win at most one lease area in each region.

1.1 Updates to Auction Rules

Five key changes have been made to the ascending clock auction format used in previous wind auctions.

The first change is that the upcoming auctions will use a 'second price' rule. A given lease area will be won by the bidder that submitted the highest bid amount for the lease area, but the winning bidder will pay only the highest price at which there was competition (the 'second price'), after subtracting any bidding credit. The 'second price' rule has been chosen because it encourages bidders to bid according to their true values for the offered lease areas. Less strategizing is needed, as the last bidder for a lease area does not need to place an exit bid to avoid paying the full bid increment. This should make bidding easier and make the final prices more closely aligned with bidders' values.

The second change is that the determination of provisional winners will no longer use the two-stage process. The auction rules are implemented in a way that, when the auction concludes, the bidder who remains on a lease area after the final round becomes its provisional winner. There will be no additional processing to determine if any other lease areas can be awarded to other bidders.

The third change is that a bidder will be allowed to submit a bid to reduce demand for a lease area and, simultaneously, submit a bid for another lease area, without having to reduce its eligibility. This allows a bidder to possibly switch to another lease area if the price exceeds the specified bid price for the first lease area.

The fourth change is that a bidder's bidding credit will now be expressed directly as a percentage of its bid.

Finally, bids for two or more lease areas will not be treated as package bids; instead, each bid for a lease area will be treated on a stand-alone basis. This change is relevant only for auctions without a 'one per customer' rule.

2. Overview

A bidder's bid deposit determines the bidder's initial eligibility for the auction. For an auction with a 'one per customer rule,' each bidder that submits a bid deposit will have an initial eligibility of one. For an auction without a 'one per customer rule,' a bidder's initial eligibility may be more than one if the bidder submits a sufficiently large bid deposit. A bidder's initial eligibility is the bidder's eligibility for Round 1.

Before each round, the auction system announces the prices for each lease area for the round. During a round, each bidder submits bids for lease areas, subject to its eligibility and to any region limits, as described in Section 3. Throughout the auction, a bidder can bid in a round as long as its eligibility has not dropped to zero.

After each round, the auction system processes the bids, as described in Section 4. Bid processing determines each bidder's processed demand for each lease area and the resulting prices (posted prices) for all the lease areas. A bidder's processed demand for a lease area indicates whether the bidder is 'on' that lease area at the round's posted price. If the bidder is 'on' the lease area, the bidder's processed demand for the lease area is one; otherwise, it is zero.

When processing the bids, the auction system will ensure that at least one bidder remains 'on' each lease area for which there has been a bid in the auction. This guarantees that a lease area will have a winner at the end of the auction if it has received any bid in the auction.

After the bids for the round have been processed, the auction system will calculate the number of bidders with processed demand of one (i.e., the aggregate demand) for each lease area, and will determine whether there is excess demand (i.e., aggregate demand > 1) for any lease area.

If there is excess demand for at least one lease area, the auction will continue with a new clock round in which the start-of-round price for each lease area equals the posted price of the previous round. A bidder's eligibility for the next round equals the number of lease areas for which the bidder's processed demand is one. Before the next round begins, each bidder is informed of its own eligibility for the next round and of the aggregate demand for all lease areas, as described in Section 5.

If, after the bids for the round have been processed, there is no lease area with excess demand, the auction will end. When the auction ends, at most one bidder is 'on' a lease area. A bidder will become a provisional winner for all lease areas for which its processed demand is one after the final round. The price to be paid for a lease area equals the posted price after the final round less any bidding credit discount, as described in Section 6.

3. Bidding

In each round of the auction, a bidder indicates the lease area it wants at the round's prices. When submitting a bid, the bidder specifies a lease area along with a quantity (0 or 1) and a price.

3.1 Eligibility and Region Limits

The number of lease areas for which a bidder has submitted bids with bid quantity = 1 must be less than or equal to the bidder's eligibility for the round.

Additionally, for an auction with multiple regions that has region limits, the number of lease areas in a given region for which a bidder has submitted bids with bid quantity = 1 must be less than or equal to the bidder's limit for that region. A bidder's region limits remain the same throughout the auction.

3.2 Bidding in Round 1

In Round 1, there is a single price associated with each lease area, which is referred to as the clock price of Round 1 or the opening price. Each bidder indicates which lease areas it wants at the opening prices by indicating a quantity of 1 for those lease areas, subject to its initial eligibility.

3.3 Bidding after Round 1

Starting in Round 2, each lease area is associated with a range of prices for the round. The start-of-round price is the lowest price in the range and is equal to the posted price of the previous round. The clock price is the highest price in the range and is set by BOEM before the round.

A bidder's processed demand for a given lease area after the previous round is either 1 or 0.

The bids that a bidder can submit starting in Round 2, depending on its processed demand, are as follows:

Bid to remain on a lease area at the clock price (maintain demand). A bidder can submit such a bid if its processed demand for the lease area after the previous round equals 1. A bid to maintain its demand at the round's clock price indicates that the bidder is willing to buy the lease area at all prices in this round up to and including this round's clock price. Intra-round bids to maintain demand are not permitted (i.e., to maintain demand on a lease area, you must be willing to pay up to the clock price).

Bid to get out of a lease area (reduce demand). A bidder can submit such a bid if its processed demand for the lease area after the previous round equals 1. A bid requesting to reduce demand for a lease area (from 1 to 0) at price p in a round indicates that the bidder wants to get out of that lease area at that price. In particular, in this round:

(1) The bidder is willing to buy the lease area at all prices greater than or equal to the start-of-round price and less than the bid price p;

(2) At price p, the bidder is indifferent between buying and not buying the lease area; and

(3) The bidder is not willing to buy the lease area at a price above p.

Bid for a new lease area (increase demand). A bidder can submit such a bid if its processed demand for the lease area is 0, subject to the eligibility and region limits described in Section 3.1. A bid requesting to increase demand for a lease area (from 0 to 1) at price p indicates that the bidder is willing to buy the lease area at all prices associated with this round (i.e., prices that are greater than or equal to the start-of-round price and less than or equal to the clock price). In other words, such a bid means that the bidder is trying to get into that lease area.

If the bidder's eligibility is 1, a bid to increase demand must be submitted at the clock price (i.e., price p must be the clock price). If the bidder's eligibility is greater than 1, the bidder is allowed to submit a bid to increase demand at any price associated with the round. If a bidder with eligibility greater than 1 submits multiple bids to increase demand in the same round, the bid prices affect the order in which those bids are processed (see Appendix 2 for an example). However, irrespective of the bid price, by submitting a bid to increase demand, the bidder indicates that it is willing to pay the highest price associated with the lease area in the round (i.e., the clock price).

The three types of bids that a bidder can submit in a round after Round 1 are summarized in Table 1 below.

Table 1. Possible Bids after Round 1

Bid Description	Previous Round Processed Demand	Bid Quantity	Bid Price
Bid to maintain demand	1	1	Clock price
Bid to reduce demand	1	0	Any price in the round
Bid to increase demand	0	1	If eligibility = 1: Clock price If eligibility > 1: Any price in the round[1]

As described in Section 4.1, if a bidder's processed demand for a lease area after the previous round is 1 and the bidder does not submit a bid for a lease area in the current round, the system will treat that as a bid to reduce demand for the lease area at the start-of-round price.

The example below describes the process for a bidder to switch from one lease area to another lease area.

Example: Bids to switch demand from lease area A to lease area B. The bidder's processed demand after the previous round equals 1 for lease area A and 0 for lease area B. The bidder is only willing to pay up to $1,040,000 for lease area A. The bidder wants to switch to lease area B if the price of lease area A exceeds $1,040,000. For lease area A, the start-of-round price is $1,000,000 and the clock price is $1,100,000. For lease area B, the start-of-round price is $1,200,000 and the clock price is $1,320,000. As shown in Table 2, the bidder submits a bid to reduce its demand in lease area A to 0 at price $1,040,000 and a bid to increase its demand in lease area B to 1 at price $1,320,000 (the clock price).

Table 2. Example of Bids to Switch Demand from Lease Area A to Lease Area B

Lease Area	Previous Round Processed Demand	Start-of-Round Price	Clock Price	Submitted Bids
A	1	$1,000,000	$1,100,000	0 at $1,040,000
B	0	$1,200,000	$1,320,000	1 at $1,320,000

After bid processing, if the posted price of lease area A is less than $1,040,000, then the bidder's processed demand will continue to be 1 for lease area A and 0 for lease area B; in other words, the bidder will still be 'on' lease area A. However, if the posted price of lease area A exceeds $1,040,000, then the bidder's processed demand will be 0 for lease area A and 1 for lease area B; in this case, the bidder will be 'on' lease area B.

Throughout the auction, a bidder can move back and forth amongst lease areas as long as it has sufficient eligibility and does not violate any region limits. For instance, in the context of the example above, reducing demand in Lease Area A and increasing demand in Lease Area B does not prevent the bidder from moving back to Lease Area A in a later round.

[1] The price for a bid to increase demand may affect the outcome of bid processing only when the bidder submits multiple bids to increase demand in the round. See Appendix 2 for further discussion.

4. Bid Processing

The purpose of bid processing is to determine, at the conclusion of a round of bidding, the processed demands for all bidders, and the posted prices for all the lease areas.

Once the bids of Round 1 are processed, a bidder's processed demand will be 1 for each of the lease areas for which the bidder bid in the round, and the posted price of a lease area will equal the opening price for that lease area. The remainder of this section describes bid processing for a round after Round 1.

4.1 Missing Bids

If a bidder fails to submit a bid in the current round for a lease area for which the bidder's processed demand after the previous round was 1, the system will place a missing bid for that bidder. The missing bid will be treated as if the bidder wants to reduce its demand for that lease area at the start-of-round price. For example, if the start-of-round price for a particular lease area is $6,000 and a bidder with processed demand of 1 for that lease area did not submit a bid in this round for that lease area, the missing bid will be processed just as if the bidder submitted a bid for a quantity of 0 at $6,000. Note that this does not necessarily mean that the bidder's processed demand will be 0 after the round.

4.2 Price Points

For a given bid, the *price point* indicates the percentage of the distance between the start-of-round price and the clock price. Specifically, the price point of a bid is calculated as the following ratio:

$$\text{price point} = \frac{\text{bid price} - \text{start-of-round price}}{\text{clock price} - \text{start-of-round price}}$$

The result of the calculation is rounded to 10 decimal places.

For example, the 0% price point refers to the start-of-round price, the 100% price point refers to the clock price, and the 50% price point refers to the mid-point of the start-of-round price and the clock price. Table 3 below provides some additional examples.

Table 3. Price Point Examples

Start-of-Round Price	Clock Price	Bid Price	Price Point
$1,000,000	$1,100,000	$1,000,000	0%
$1,000,000	$1,100,000	$1,023,000	23%
$1,200,000	$1,320,000	$1,260,000	50%
$1,200,000	$1,320,000	$1,290,000	75%
$1,200,000	$1,320,000	$1,320,000	100%

4.3 Processed Demands

The demands of a bidder following the round's bid processing are referred to as its processed demands.

Bids to *maintain demand* are processed first during bid processing; they are always applied. That is, if a bidder's processed demand for a lease area after the previous round is 1 and in the current round the

bidder submitted a bid for that lease area with quantity of 1 at the clock price, the bidder's processed demand for that lease area after the current round will continue to be 1.

Next, bids to *change demand* are processed in increasing order of price point (from 0% to 100%), across all lease areas. For example, a bid at the 10% price point will be processed before a bid at the 20% price point. If two or more bids have the same price point, the auction system will use bid-specific pseudorandom numbers to break the tie. Bids at the same price point will be processed in increasing order of pseudorandom number (from lowest to highest).[2]

A bid to reduce demand (from 1 to 0) for a lease area is applied if it would not cause the aggregate demand for the lease area to drop to 0. In other words, a bidder's bid to reduce demand is not applied if this is the only bidder with processed demand of 1 for the lease area.

When checking whether a bid to increase demand can be applied, the auction system considers the bidder's processed activity which is defined as the number of lease areas for which the bidder's processed demand is 1. For an auction with multiple regions, a bidder's processed activity in a region is the number of lease areas in that region for which the bidder's processed demand is 1.

A bid to increase demand (from 0 to 1) for a lease area is applied if:

(1) It would not cause the bidder's processed activity to exceed its eligibility; and

(2) In the case of an auction with multiple regions that has region limits, it would not cause the bidder's processed activity in a region to exceed the bidder's region limit for that region.

The bid processing algorithm maintains a queue of all bids to change demand from the round that have not been applied. Whenever a bid is applied, it is removed from the queue, and the queue is re-tested to determine whether this enables any other bids to be applied. If a bid cannot be applied, it is kept in the queue so that it may be re-tested later, and the next bid in the queue is processed. Bid processing concludes when either there are no bids left in the queue (i.e., all bids have been applied) or no bids still in the queue can be applied. At that point, all bids remaining in the queue are discarded.

Note that if a bid to change demand is not applied during bid processing, the bid does not carry forward to the next round. The bidder must reevaluate its demand in the next round based on the previous round's results and submit its bids.

The remainder of this section provides examples of bids to change demand that are not applied. A more detailed example of bid processing is provided in Section 7.

Example: Bid to reduce demand not applied. Consider a lease area with aggregate demand = 1 after the previous round. The bidder with processed demand = 1 submitted a bid to reduce its demand (from 1 to 0) for that lease area in the current round. No other bidder submitted a bid for that lease area in the current round. Then, the bid to reduce demand will not be applied because applying the bid would cause the aggregate demand for the lease area to drop to 0.

Example: Bid to increase demand not applied due to insufficient eligibility. Consider a bidder with eligibility = 1 for the current round. The bidder submitted a bid to reduce demand in lease area A and a

[2] For example, suppose that two bidders with processed demand = 1 after the previous round for a lease area submit bids to reduce demand at the same price. Since both bids are at the same price (and thus the same price point), the bid with the lower pseudorandom number will be processed first. Pseudorandom numbers are used during bid processing *only* when two or more bids are at the exact same price point. If one bidder's bid price for a lease area is $1 less than the other bidder's bid price for the same lease area, the bid with the lower price will be processed first (and pseudorandom numbers will not be used).

bid to increase demand in lease area B (e.g., the bids shown in Table 2). Suppose that the bid to reduce demand cannot be applied because it would cause the aggregate demand for lease area A to drop to 0 (as in the example above), and thus the bidder's processed demand for lease area A remains equal to 1. Then, applying the bid to increase demand would cause the bidder's processed demand to be 1 also for lease area B, which means that the bidder's processed activity would be 2. Since the bidder's eligibility is 1, the bid to increase demand in lease area B will not be applied in this scenario. Thus, after bid processing, the bidder's processed demand remains 1 for lease area A and 0 for lease area B.

Example: Bid to increase demand not applied due to region limit. Consider an auction with 2 regions, and a bidder with a limit of 1 for each region. The bidder's processed demand after the previous round equals 1 for lease area A (in region 1), 1 for lease area B (in region 2), and 0 for lease area C (in region 2). The bidder's eligibility for the current round is 2. For each of the lease areas, the start-of-round price is $1,000,000 and the clock price is $1,100,000. As shown in Table 4, the bidder submits bids to reduce demand in lease areas A and B, and a bid to increase its demand in lease area C.

Table 4. Example of Bid to Increase Demand that is Not Applied due to Region Limit

Lease Area	Region	Previous Round Processed Demand	Submitted Bids	Applied?
A	1	1	0 at $1,040,000	Yes
B	2	1	0 at $1,060,000	No, due to insufficient aggregate demand
C	2	0	1 at $1,100,000	No, due to region limit

Suppose that the bid to reduce demand in lease area A is applied, but the bid to reduce demand in lease area B cannot be applied because it would cause the aggregate demand for lease area B to drop to 0. This means that the bidder's processed demand for lease area A is now 0, but the bidder's processed demand for lease area B remains equal to 1. The bid to increase demand in lease area C cannot be applied because it would cause the bidder's processed activity in region 2 to exceed the bidder's region limit of 1. Thus, after bid processing, the bidder's processed demand is 0 for lease area A, 1 for lease area B, and 0 for lease area C.

4.4 Posted Prices

Once processed demands have been determined, the posted price for a lease area is set based on the aggregate demand for that lease area. The aggregate demand of a lease area is the number of bidders with processed demand = 1 for that lease area.

The posted price of each lease area is determined as follows:

- If aggregate demand exceeds 1, the posted price equals the clock price for the round.
- If aggregate demand equals 1 and at least one bid to reduce demand for the lease area was applied, the posted price equals the highest bid price among all bids to reduce demand for the lease area that were applied (i.e., the 'second price' of that round).
- In all other cases, the posted price equals the start-of-round price (*i.e.*, the posted price of the previous round).

5. Information Provided to Bidders Between Rounds

If, after the bids of a round have been processed, the aggregate demand for any lease area exceeds 1, then the auction proceeds with a new round.

A bidder's eligibility for the next round equals the bidder's processed activity after the current round. If a bidder's processed demand is 0 for all lease areas, then the bidder's eligibility for the next round is 0, which means that the bidder can no longer bid in the auction.

Before the next round begins, BOEM will set a clock price for each lease area. The clock price will exceed the start-of-round price (which is the posted price for the previous round).

Before the next round begins, the auction system will inform each bidder of the aggregate demand for each lease area after the previous round as well as the start-of-round price and the clock price for each lease area for the next round.

Each bidder will also be informed of its eligibility for the next round and its processed demand for each lease area from the previous round. Bidders will not be informed about the eligibility or processed demand of other bidders.

6. Conclusion of the Auction

If, after the bids of a round have been processed, aggregate demand does not exceed 1 for any lease area, the auction will end. Each bidder with processed demand = 1 for a lease area after the final round will become a provisional winner for that lease area.

A provisional winner that has not qualified for a bidding credit will pay the posted price after the final round for each lease area it has won.

A provisional winner that has qualified for a bidding credit will pay the posted price after the final round for each lease area it has won *less* its bidding credit. The bidding credit of a provisional winner is calculated by multiplying the bidder's bidding credit percentage by the sum of the posted prices after the final round across all lease areas the bidder has won. If the auction has multiple regions, a bidder may have a different bidding credit percentage for each region.

7. Illustrative Example

This section provides an example of an auction with four bidders and three lease areas (A, B, and C). Each bidder's initial eligibility is 1. For each of these lease areas the opening price is $10,000.

Round 1 – Bidding on a lease area

In Round 1, bidders 1 and 2 bid on lease area A, and bidders 3 and 4 bid on lease area B, as shown in Table 5.

Table 5. Round 1 Bids for Illustrative Example

		R1 Submitted Bids			
Lease Area	**R1 Clock Price**	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**
A	$10,000	1 at $10,000	1 at $10,000	-	-
B	$10,000	-	-	1 at $10,000	1 at $10,000
C	$10,000	-	-	-	-

After Round 1, the posted price of each lease area is $10,000, and each bidder's processed demand is 1 for the lease area it bid on in Round 1, as shown in Table 6. The aggregate demand for lease area A is 2 (due to bidders 1 and 2), the aggregate demand for lease area B is 2 (due to bidders 3 and 4), and the aggregate demand for lease area C is 0.

Table 6. Round 1 Results for Illustrative Example

	R1 Processed Demand				R2 Results	
Lease Area	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**	**Aggregate Demand**	**Posted Price**
A	1	1	0	0	2	$10,000
B	0	0	1	1	2	$10,000
C	0	0	0	0	0	$10,000

Round 2 – Continue bidding on the same lease area (maintain demand)

For Round 2, the clock price of each lease area is set at $11,000, and each bidder maintains its Round 1 demand at the new clock price, as shown in Table 7.

Table 7. Round 2 Bids for Illustrative Example

	R2 Prices		R2 Submitted Bids			
Lease Area	**Start-of-Round Price**	**Clock Price**	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**
A	$10,000	$11,000	1 at $11,000	1 at $11,000	-	-
B	$10,000	$11,000	-	-	1 at $11,000	1 at $11,000
C	$10,000	$11,000	-	-	-	-

Since all Round 2 bids are bids to maintain demand, each bidder's processed demand remains the same. Thus, the aggregate demand for lease area A continues to be 2, the aggregate demand for lease area B continues to be 2, and the aggregate demand for lease area C continues to be 0.

The Round 2 posted prices are set as follows:

- Lease area A: Since the aggregate demand exceeds 1, the posted price equals the clock price (i.e., $11,000).
- Lease area B: Since the aggregate demand exceeds 1, the posted price equals the clock price (i.e., $11,000).
- Lease area C: Since the aggregate demand is 0, the posted price equals the start-of-round price (i.e., $10,000).

The results of bid processing for Round 2 are summarized in Table 8.

Table 8. Round 2 Results for Illustrative Example

	R2 Processed Demand				R2 Results	
Lease Area	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**	**Aggregate Demand**	**Posted Price**
A	1	1	0	0	2	$11,000
B	0	0	1	1	2	$11,000
C	0	0	0	0	0	$10,000

Round 3 – Switch lease areas (reduce demand in one lease area and increase demand in another)

For Round 3, the clock price is set at $1,000 higher than the start-of-round price for each lease area. In Round 3 bidders submit the following bids:

- Bidders 1 and 2 maintain their demand for lease area A at the new clock price.
- Bidder 3 submits a bid to reduce its demand for lease area B at $11,200 (i.e., at the 20% price point), and a bid for lease area C at the clock price ($11,000). With these bids, bidder 3 indicates that it wishes to switch to lease area C if the price of lease area B exceeds $11,200. If the price of lease area B is below $11,200, bidder 3 wants to buy lease area B. However, if the price of lease area B exceeds $11,200, bidder 3 wants to buy lease area C.
- Bidder 4 submits a bid to reduce its demand for lease area B at $11,100 (i.e., at the 10% price point), and a bid for lease area C at the clock price ($11,000). With these bids, bidder 4 indicates that it wishes to switch to lease area C if the price of lease area B exceeds $11,100.

The bids submitted for Round 3 are summarized in Table 9.

Table 9. Round 3 Bids for Illustrative Example

	R3 Prices		R3 Submitted Bids			
Lease Area	**Start-of-Round Price**	**Clock Price**	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**
A	$11,000	$12,000	1 at $12,000	1 at $12,000	-	-
B	$11,000	$12,000	-	-	0 at $11,200	0 at $11,100
C	$10,000	$11,000	-	-	1 at $11,000	1 at $11,000

The bids of Round 3 are processed as follows:

- The bids of bidders 1 and 2 to maintain demand are applied. As a result, for each of these bidders, the processed demand for lease area A continues to be 1.
- The bids of bidders 3 and 4 are bids to change demand and thus are processed in increasing order of price point (from 0% to 100%):
    - The bid of bidder 4 to reduce demand for lease area B at $11,100 is at the 10% price point and is processed first. Applying the bid does not cause the aggregate demand for lease area B to drop to 0, because the processed demand of bidder 3 for lease area B is still 1. Thus, the bid is applied.
    - The bid of bidder 3 to reduce demand for lease area B at $11,200 is at the 20% price point and is processed next. The bid cannot be applied because it would cause the aggregate demand for lease area B to drop to 0. Thus, the processed demand of bidder 3 for lease area B continues to equal 1.

- The bid of bidder 3 to increase demand for lease area C cannot be applied because it would cause bidder 3 to exceed its eligibility. Note that bidder 3's processed demand for lease area B is still 1, because its bid to reduce demand for lease area B was not applied.
- The bid of bidder 4 to increase demand for lease area C is applied because it does not cause bidder 4 to exceed its eligibility. Thus, bidder 4's processed demand for lease area C is now 1.

Now, the aggregate demand is 2 for lease area A (due to bidders 1 and 2), 1 for lease area B (due to bidder 3), and 1 for lease area C (due to bidder 4).

The Round 3 posted prices are set as follows:

- Lease area A: Since the aggregate demand exceeds 1, the posted price equals the clock price (i.e., $12,000).
- Lease area B: Since the aggregate demand equals 1 and a single bid to reduce demand was applied, the posted price equals the bid price of that bid. Specifically, the posted price equals $11,100, which is the price at which bidder 4 stopped bidding for the lease area. Note that $11,100 is the highest price that a bidder other than bidder 3 has been willing to pay for lease area B so far in the auction.
- Lease area C: Since aggregate demand equals 1 but no bid to reduce demand was applied, the posted price equals the start-of-round price (i.e., $10,000).

The results of bid processing for Round 3 are summarized in Table 10.

Table 10. Round 3 Results for Illustrative Example

	R3 Processed Demand				R3 Results	
Lease Area	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**	**Aggregate Demand**	**Posted Price**
A	1	1	0	0	2	$12,000
B	0	0	1	0	1	$11,100
C	0	0	0	1	1	$10,000

Round 4 – Auction concludes – aggregate demand does not exceed 1 for any lease area

For Round 4, the clock price is set at $1,000 higher than the start-of-round price for each lease area. In Round 4 bidders submit the following bids:

- Bidder 1 maintains its demand for lease area A at the new clock price.
- Bidder 2 submits a bid to reduce its demand for lease area A at $12,500 (i.e., the 50% price point). Bidder 2 does not submit any other bid in the round. This means that if the price of lease area A exceeds $12,500, the bidder's eligibility will drop to 0 and the bidder will no longer be able to bid in the auction.
- Bidder 3 submits a bid to reduce its demand for lease area B at $11,200 (i.e., the 10% price point), and a bid to increase its demand for lease area C at the clock price ($11,000).
- Bidder 4 maintains its demand for lease area C at the clock price.

The bids submitted for Round 4 are summarized in Table 11.

Table 11. Round 4 Bids for Illustrative Example

	R4 Prices		R4 Submitted Bids			
Lease Area	**Start-of-Round Price**	**Clock Price**	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**
A	$12,000	$13,000	1 at $13,000	0 at $12,500	-	-
B	$11,100	$12,100	-	-	0 at $11,200	-
C	$10,000	$11,000	-	-	1 at $11,000	1 at $11,000

The bids of Round 4 are processed as follows:

- The bids of bidders 1 and 4 to maintain demand are applied.
- The bids of bidders 2 and 3 are bids to change demand and thus are processed in increasing order of price point:
    - The bid of bidder 3 to reduce demand for lease area B at $11,200 is at the 10% price point and is processed first. The bid cannot be applied, because it would cause the aggregate demand for lease area B to drop to 0. Thus, the processed demand of bidder 3 for lease area B continues to be 1.
    - The bid of bidder 2 to reduce demand for lease area A at $12,500 is at the 50% price point and is processed next. The bid is applied because it does not cause the aggregate demand for lease area A to drop to 0 (bidder 1's processed demand for lease area A is still 1).
    - The bid of bidder 3 to increase demand for lease area C is not applied because it would cause bidder 3 to exceed its eligibility.

The aggregate demand for each lease area is now 1.

The Round 4 posted prices are set as follows:

- Lease area A: The posted price equals $12,500, which is the price at which bidder 2 stopped bidding for the lease area.
- Lease area B: Since the aggregate demand is 1 and no bid to reduce demand for lease area B was applied in the round, the posted price equals the start-of-round price (i.e., $11,100).
- Lease area C: Since the aggregate demand is 1 and no bid to reduce demand for lease area C was applied in the round, the posted price equals the start-of-round price (i.e., $10,000).

The results of bid processing for Round 4 are summarized in Table 12.

Table 12. Round 4 Results for Illustrative Example

	R4 Processed Demand				R4 Results	
Lease Area	**Bidder 1**	**Bidder 2**	**Bidder 3**	**Bidder 4**	**Aggregate Demand**	**Posted Price**
A	1	0	0	0	1	$12,500
B	0	0	1	0	1	$11,100
C	0	0	0	1	1	$10,000

The auction concludes after Round 4 because the aggregate demand does not exceed 1 for any lease area. The final results are as follows:

- Bidder 1 is the provisional winner of lease area A, and the posted price after the final round for lease area A is $12,500.
- Bidder 2 is the provisional winner of lease area B, and the posted price after the final round for lease area B is $11,100.
- Bidder 3 is the provisional winner of lease area C, and the posted price after the final round for lease area C is $10,000.

If one of these bidders has qualified for a bidding credit, the auction system will calculate the bidder's monetary portion by subtracting the bidder's bidding credit from the posted price after the final round.

For example, if bidder 1 has a bidding credit percentage of 22%, then its bidding credit is $2,750 (which is calculated as 22% of $12,500) and the bidder's monetary portion is $12,500 - $2,750 = $9,750.

Appendix 1: Glossary

Term	Definition
Bidding Credit Percentage	The percentage that is used to calculate the bidder's bidding credit for an auction with multiple-factor bidding. Some bidders may have a bidding credit percentage of 0%. For an auction with multiple regions, a bidder may have a different bidding credit percentage for each region.
Bid	To submit a bid, the bidder specifies a lease area along with a quantity and a price: • **Bid Quantity**: The quantity (0 or 1) of a given bid. For bids to maintain demand and bids to increase demand, the bid quantity is 1. For bids to reduce demand, the bid quantity is 0. • **Bid Price**: The price of a given bid. For bids to maintain demand, the bid price equals the clock price. For bids to reduce demand, the bid price may be any price between the start-of-round price and the clock price (inclusive). If the bidder's eligibility is 1, the bid price of a bid to increase demand equals the clock price. If the bidder's eligibility is greater than 1, the bid price of a bid to increase demand may be any price between the start-of-round price and the clock price (inclusive). For an auction with multiple-factor bidding, each bid of a bidder that qualifies for a bidding credit will be a multiple-factor combination of a monetary bid and a non-monetary factor.
Bidding Credit	The bidder's bidding credit percentage multiplied by the sum of posted prices after the final round of all lease areas won by the bidder. For an auction with multiple regions, a bidder's bidding credit is calculated separately for each region by multiplying the bidder's bidding credit percentage for the region by the sum of posted prices after the final round of all lease areas won by the bidder in that region.
Demand	• **Processed Demand:** The demand (either 0 or 1) of a bidder for a lease area following the processing of the bids for the round. • **Aggregate Demand:** The number of bidders with processed demand of 1 for a given lease area following the processing of the bids for the round.
Eligibility	The maximum number of bids with bid quantity = 1 that the bidder can submit in a given round. The eligibility for Round 1 is known as the **Initial Eligibility.** With a 'one-per-customer' rule, the initial eligibility of a bidder who has submitted a bidding deposit is one. A bidder's eligibility for a round after Round 1 equals the bidder's processed activity following the processing of the bids for the previous round.
Missing Bid	A bid placed by the system during a recess for a lease area when the bidder's processed demand for the lease area in the previous round was

Term	Definition
	1 but the bidder did not place a bid for that lease area during the current round. A missing bid contains quantity of 0 at the start-of-round price.
Price	• **Opening Price**: The minimum bid price for a lease area. This is the clock price in Round 1. Opening prices are determined by BOEM prior to the auction. • **Start-of-Round Price:** The lowest price that can be bid in a round for a given lease area. • **Clock Price:** The highest price that can be bid in a round for a given lease area. • **Posted Price:** The price determined for each lease area after processing all bids for a round. The posted price for a lease area in each round is the start-of-round price for that lease area in the next round.
Price Point	The percentage of the distance between the start-of-round price and the clock price for a given bid. The price point of a bid is calculated as the following ratio: $$\frac{\text{bid price} - \text{start-of-round price}}{\text{clock price} - \text{start-of-round price}}$$
Processed Activity	The number of lease areas for which the bidder's processed demand is 1.
Recess	The period following an open round during which bids are processed.
Region Limit	The maximum number of bids with bid quantity = 1 that the bidder can submit for lease areas in a given region in a given round. Region limits may be applicable only if the auction has multiple regions and does not employ a 'one per customer' rule. A bidder's region limits remain the same throughout the auction.

Appendix 2: Prioritizing Bids to Increase Demand

As described in Section 4.3, bids to change demand are processed in increasing order of price point. This allows a bidder with eligibility > 1 to prioritize its bids to increase demand, if it submits multiple bids to increase demand in the same round. Since bids are processed in increasing order of price point, the bid with the lowest price point will be processed first. Thus, among all lease areas with increase bids, the bidder should bid at a lower price point for the lease area it wants to prioritize. This appendix provides an example.

Consider an auction with 5 lease areas (A, B, C, D, and E) and 2 bidders. In the current round, bidder 1 has eligibility to bid on 3 lease areas and bidder 2 has eligibility to bid on 2 lease areas. Table 13 shows the start-of-round prices and clock prices for all lease areas, as well as each bidder's processed demand from the previous round and its submitted bids in this round.

Table 13. Submitted Bids in Example with Eligibility > 1

Lease Area	Previous Round Processed Demand		Round Prices		Submitted Bids	
	Bidder 1	Bidder 2	Start-of-Round Price	Clock Price	Bidder 1	Bidder 2
A	1	0	$15,000	$20,000	0 at $16,000 *[Reduce demand]*	-
B	0	0	$16,000	$21,000	1 at $20,000 *[Increase demand]*	-
C	0	0	$13,000	$17,000	1 at $16,000 *[Increase demand]*	-
D	1	1	$12,000	$16,000	0 at $13,000 *[Reduce demand]*	1 at $16,000 *[Maintain demand]*
E	1	1	$13,000	$18,000	1 at $18,000 *[Maintain demand]*	1 at $18,000 *[Maintain demand]*

Based on the table above, bidder 1's processed demand is 1 for lease areas A, D, and E after the previous round. In this round, the bidder has submitted bids to reduce its demand for lease area 1 and 4, and to increase its demand for lease areas B and C. Bidder 1 has bid to maintain its demand at the clock price for lease area E.

With these bids, bidder 1 is attempting to switch its demand from lease areas A and D to lease areas B and C, while maintaining its demand for lease area E. Additionally, these bids indicate that bidder 1 wishes to prioritize its bid to increase demand for lease area C (price point=75%) over its bid to increase demand for lease area B (price point=80%), because the bid for lease area C has a smaller price point. In other words, these bids indicate that, if only one of the bids to reduce demand is applied (i.e., either only for lease area A or only for lease area B), bidder 1 will switch its demand from that lease area to lease area C.

Bidder 2's processed demand is 1 for lease areas D and E after the previous round and, in this round, the bidder has maintained its demand for both lease areas at the round's clock price.

The bids are processed as follows:

- The bids to maintain demand are applied. As a result, bidder 1's processed demand for lease area E, bidder 2's processed demand for lease area D and bidder 2's processed demand for lease area E continue to be 1.
- The bids of bidder 1 to change demand are processed in increasing order of price point:
  - The bid to reduce demand for lease area A is at the 20% price point and is processed first. This bid cannot be applied because it would cause the aggregate demand for lease area A to drop to 0. Thus, bidder 1's processed demand for lease area A continues to be 1.
  - The bid to reduce demand for lease area D is at the 25% price point and is processed next. Applying this bid does not cause the aggregate demand to drop to 0 because bidder 2's processed demand for lease area D is 1. Thus, the bid is applied and bidder 1's processed demand for lease area D becomes 0.
  - The bid to increase demand for lease area C is at the 75% price point and is processed next. The bid is applied because it does not cause bidder 1 to exceed its eligibility. Thus, bidder 1's processed demand for lease area C becomes 1. Note that bidder 1's processed demand is 1 also for lease areas A and E.
  - The bid to increase demand for lease area B is at the 80% price point and is processed next. This bid cannot be applied because it would cause bidder 1 to exceed its eligibility, since the bidder's eligibility for the round is 3 and the bidder's processed demand is already 1 for lease areas A, C, and E.

The bid processing results are summarized in Table 14.

Table 14. Round Results in Example with Eligibility > 1

	Processed Demand		Aggregate Results	
Lease Area	**Bidder 1**	**Bidder 2**	**Aggregate Demand**	**Posted Price**
A	1	0	1	$15,000
B	0	0	0	$16,000
C	1	0	1	$13,000
D	0	1	1	$13,000
E	1	1	2	$18,000

Note that in this example, price point ordering for the bids to increase demand matters. Since the bid to increase demand for lease area B was submitted at the 75% price point and the bid to increase demand for lease area C was submitted at 80%, the bid for lease area C was considered earlier and was applied whereas the bid for lease area B was considered later and could not be applied.