DEPARTMENT OF THE INTERIOR
Bureau of Ocean Energy Management (BOEM)

Summary of Renewable Energy Auction Formats under Consideration by BOEM

Economics Division, Office of Strategic Resources
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Purpose of the Paper

The purpose of this paper is to facilitate public comment on auction format options, as presented in the Auction Format Information Request (AFIR) published by BOEM in the Federal Register on December 2, 2011. Therein, it is mentioned that BOEM is considering selected auction formats for application to the first cohort of anticipated lease sales for the proposed Wind Energy Areas (WEAs) offshore the states of Maryland, Virginia, New Jersey, Rhode Island, and Massachusetts. The wide variation possible in the private valuation of preferred lease tract configurations desired by bidders requires auction formats that go beyond BOEM's experience with the simpler sealed-bid approach used to lease areas for oil and gas development.

Uncertainties created by this wide variation in valuation can be more effectively addressed through the use of an ascending bidding mechanism that allows bidders to discover prices and substitute lease blocks during the auction. Such formats include simultaneous ascending and package auctions that have evolved based on the experience of the Federal Communication Commission (FCC), electric power authority auctions, and auctions employed by other entities that faced similar situations. This family of auctions employs the cash bonus as the bid variable because other bid variables introduce unnecessary complications into the sale process.

BOEM contracted with Power Auctions/MDI for advice on the application of the family of simultaneous auction formats in the context of offshore wind. Based on their findings and BOEM's own internal research efforts, BOEM staff identified a group of simultaneous auction formats that it considers suitable for the initial group of WEA offerings. This paper identifies and describes these auction formats and how each format would be implemented. In addition, it discusses BOEM's concept for implementing a Multiple-Factor Auction (MFA) format should we decide its application for a particular WEA is appropriate.

The auction formats and their specifications are designed to address important program performance goals. Foremost among the goals is BOEM's desire to convey leases to entities most likely to successfully develop the wind resources of the lease area and to comply with the statutory requirement to obtain a fair return on the leased acreages. An optimal lessee allocation and a fair return are most likely to be achieved if leases are awarded in a competitive sale to companies that can generate the greatest value from the leased areas in a timely manner. The auction performance measures that BOEM is concerned with include:

- Economic Efficiency: The lease auction process should try to ensure that commercial renewable energy leases on the OCS are awarded to those who value the areas the most because these entities would most likely be most efficient at using the wind resource;
- Fair Return: BOEM is statutorily required to obtain a "fair return" for leases and grants on the OCS;
- Program Efficiency: The lease auction process must be manageable for BOEM to administer;
- Lease Boundary Flexibility: Within constraints fixed by BOEM, the auction should allow bidders to identify the optimal lease areas;
- Competition: The lease auction process must be fair, and encourage participation from all interested bidders while minimizing the opportunity for collusion among bidders;

- Transparency: The lease auction process must be an open one in which bids are comparable and the reason why the winners won is clear;
- Neutrality: The lease auction process must ensure that all bidders are treated equally;
- Simplicity: The lease auction process must be easily understood and implemented, for both the bidders and BOEM; and
- Consistency: The lease auction process should be applicable to the issuance of leases in a variety of contexts.

See: http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Renewable-Energy-Auction-Formats.aspx for a copy of the summary report from Power Auctions/MDI.

Preference for Bidding on the Cash Bonus

Although the regulations allow BOEM the option to conduct an auction with either a cash bonus or operating fee rate as the bid variable, experience in a number of settings makes a strong case for using the cash bonus as the bid variable, particularly in the early auctions. Conducting the auction with the bonus bid allows for easy comparison of competing offers, tends to award leases to bidders with good financial backing, and avoids distorting bidding behavior as may occur when the value is contingent upon the performance or configuration of a project that the bidder may have in mind. These desirable features provide evidence and assurance of bidders' viability and intentions.

In contrast, objective evaluation of competing operating fee rates as the bid variable for areas of overlapping interest would be difficult as the value of the fee rates offered would be dependent on each bidder's financial and technical capabilities and their construction and operations plan, which may be submitted and considered long after the lease is awarded. Thus, simply choosing the bidder offering the highest operating fee rate would not necessarily result in obtaining the most revenue for the bureau. For example, a poorly funded start-up company could propose a significant fee rate since no cash would be required up front. If such a company did win, ultimate development of a project could be problematic without relief from the high fee rate upon which the lease award was based. Also, resale of the lease in the secondary market might not be possible owing to the size of the applicable operating fee rate which could result in the bidder forfeiting the area and thereby delaying development of the wind resource until a new lease sale could be held. For these reasons, BOEM plans to use the cash bonus as the bid variable in the early lease sale auctions.

Auction Setting Design Challenges

BOEM identified important characteristics of the auction setting that must be addressed in determining an appropriate auction format for offshore wind energy leasing. First, the lease blocks within a WEA will vary by wind quality, water depth, distance to shore, proximity to power markets, ease of interconnection to the power grid, sub-sea conditions, stipulations on use, and so on, which bidders will account for in determining desirable lease tracts as well as bid amounts.

Second, bidders will likely have divergent strategies for ultimate project development both within and across WEAs that will influence both the number and size of their desired lease tracts and their locations based on proximity to target customers or markets for the electric power. As

part of their strategic planning, bidders will likely have contemplated several potential, alternative project configurations within the potential lease areas in a WEA and may utilize whatever flexibility and price discovery that emerges during the auction process to identify the most profitable options, including the configuration of buffer areas which must also be acquired during an auction. Bidders also may have undertaken scientific investigations such as installing a met tower on a limited lease to characterize the resource, or may have participated in a State- or utility- sponsored competitive procurement process for the potential sale of power that may be generated from a lease area in the future with an adjacent state or utility.

Third, the value of the WEA will may be influenced by the presence of financial support from adjacent state and local governments, in addition to any financial support from the federal government that may be available to bidders. Valuation of the WEA will also be affected by other key uncertainties surrounding the installation cost for offshore wind facilities, as well as restrictions on the use of a leased area based on the outcome of BOEM's review of a lessee's construction and operation plan (COP) well after the lease sale.

In light of these characteristics, bidders will face a high level of uncertainty about the financial value of the OCS for offshore wind development when entering an auction. If a simple sealed bid process were used, bidders would need to submit a single bid amount for a tract reflecting their own economic evaluation and their speculation about their competitors' bid amounts. As a result, the winning bidders would be exposed to the possibility of paying too much in their attempt to ensure a successful outcome (winner's curse) along with the possibility of not obtaining the full set of desired blocks.[1] Losing bidders may feel that the auction was not entirely fair and transparent if they would have offered more knowing what the winning bidder was offering. These important uncertainties can be mitigated through the application of an ascending auction process that allows for adequate price discovery during the auction. An ascending bidding process gives bidders the opportunity to outbid their competitors through a series of auction rounds.

The reluctance of potential bidders to reveal their preferred bundles of blocks prior to the auction makes it difficult for BOEM to configure a WEA into desirable units to help ensure potential bidders receive an economically efficient configuration of blocks while simplifying the auction process by limiting the number of items for sale. This important issue is addressed by utilizing an auction format that allows bidders to submit bids reflecting their desired lease tracts, or "packages" of lease blocks. The family of "simultaneous ascending" and "ascending package" auctions, which are described in greater detail below, enable bidders to adjust their bids and packages throughout the auction to reflect the price and demand information they receive between rounds. BOEM may opt to offer a WEA as a single unit if it contains a small number of blocks that the bureau judges is capable of only supporting one viable project. This represents the simplest version of the simultaneous ascending and package auctions.

[1] In order to avoid the winner's curse bidders may engage in "bid shading" which occurs when a bidder does not bid up to their true valuation of the lot to avoid the possibility of paying significantly more than what other bidders in the auction may have offered for the lot. In addition to simply overpaying, the bidding agent will have to answer to investors for taking actions that may appear poorly conceived in hindsight.

Overview of Auction Formats

BOEM identified several standard auction formats as suitable for addressing these auction challenges. The simple ascending clock auction allows for competitive leasing of a single-lot lease sale area on the OCS. For multiple-lot lease sale areas, three types of auctions were similarly identified, including: (1) a simultaneous ascending clock auction (SACA); (2) a package clock auction; and (3) an ascending package auction. Two methods for closing the SACA are also presented. The simple ascending, simultaneous ascending, and package clock formats build upon one another and all of the formats belong to the family of simultaneous ascending auctions.

Each of these options fares well against the auction format evaluation criteria listed above. Bidders are afforded the flexibility to bid on desirable packages of blocks throughout the auction. In addition, these formats impose limits on opportunities for collusive or other adverse bidding behavior by inherently masking the identity and specific bid values of the individual bidders and discouraging bid sniping by encouraging activity in each round at each bidder's eligible number of lots. [2] A representative definition of the key auction format attributes is put forth for each of the standard auction format options so workable examples can be presented to demonstrate how each format could work in practice to facilitate informed public comment. A discussion of their potential applicability to the proposed WEAs follows. The paper concludes with discussion of how a multiple-factor approach could be layered onto the standard auction formats.

Single Lot: Simple Ascending Clock Auction Format

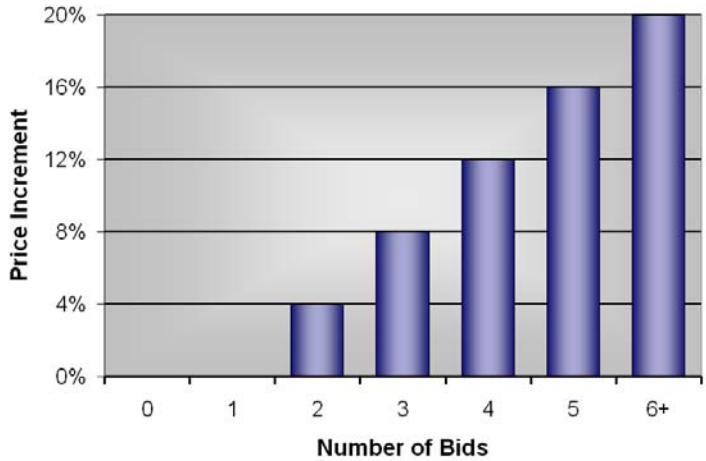
This auction format option would be applicable in situations where BOEM offers a set of OCS lease blocks as a single item, or "lot." This auction format is conducted as a series of rounds, where the price ticks up like a "clock" in each subsequent round by an increment determined by BOEM (in this manner it is "ascending"). At the opening of each round BOEM announces the current round's price and the number of bidders for the single lot. Bidders then indicate if they are "in" or "out" at the announced price for the round. Once a bidder is out of the auction, they cannot subsequently re-enter the auction in a later round (note that this is a basic "activity rule" governing how bidders are required to bid in each round of the auction). The auction closes when no more than one bidder signals an interest in the lot at the announced price for the round.

If only one bidder signaled an interest in the lot at the final round's announced price the lot is awarded to that bidder at that price. However, a tie can occur if all of the bidders entering a round drop out of the auction in the round, i.e., no bidder is "in" at the round's announced price. The auctioneer addresses this situation by requiring bidders who do not meet the current round's price to submit a confidential "exit bid" at a price between the previous and current round's prices. These bids are referred to as exit bids since the bidder is not allowed to re-enter the auction in a subsequent round once such a bid is submitted. In the event of a tie, the bidder with the highest exit bid price is awarded the lot at that price. A random selection procedure could then be applied if the auction remains tied after considering the exit bids.

[2] Bid sniping is the practice whereby a bidder waits until the close of the auction to enter a surprise high bid.

The opening price is set to the BOEM minimum bid price for the lot.[3] The size of the price increase between rounds depends on the number of bidders still bidding at the end of the current round and the prevailing price and may be estimated on the basis of a set or amount or percentage increase. Bidders are likely to be willing to pay significantly more for a lot the larger the number of bidders that remain interested in the lot. For example, if there were 6 or more bidders still bidding on a lot, the price in the next round may be set 20% higher. As demand starts to fall during the auction as the price increases, the rate of increase applied may be reduced to facilitate more accurate price discovery and avoid a situation where all bidders drop out from one round to the next. Illustrative default increment percentages for a clock auction were set forth in Ausubel and Cramton (2011c, p. 39) as shown in Exhibit 1 and could serve as guidelines for BOEM to use during the auction.

Exhibit 1 Percentage Bid Increment Example



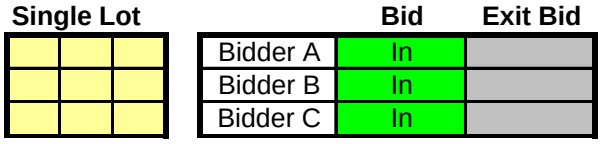
Source: Ausubel and Cramton (2011c, p. 39)

For example, if only 2 bidders are still bidding, the price in the next round would only increase by 4%. If 3 bidders are still in the auction, the price in the next round would increase by 8%, and so on.

Example

The following example illustrates a hypothetical auction for a single lot applying the simple ascending clock auction format with and without the need to consider exit bids. Each description of what happens in each round is followed by a graphic illustrating the described actions. A single lot, comprised of nine OCS blocks, is offered by BOEM at an opening price of $100 at the start of round 1. Bidders A, B, and C all indicate an interest, or bid in, at that price resulting in demand of 3 for the lot.

Round 1
Announced Price: $100
Demand: 3



[3] Refer to the next section on Multiple-Lot: Simultaneous Ascending Clock Auctions for a discussion of potential minimum bid and bid deposit requirements.

BOEM increases the second round's price to $108 following the default increment of 8% for this level of demand shown above, and bidders B and C bid in at this new announced price resulting in a demand of 2 for the lot. Bidder A exits the auction and submits an exit bid of $105. However, because at least one other bidder was still in at $108, the exit bid is set aside and bidder A may no longer participate in the auction.

Round 2
Announced Price: $108
Demand: 2

Single Lot		

	Bid	Exit Bid
Bidder A	Out	$105
Bidder B	In	
Bidder C	In	

Since demand is now down to two bidders, the price is only increased by 4% to $112 at the start of round 3. Bidder B exits the auction and submits an exit bid of $110. However, since bidder C is still in at the announced price of $112, bidder B's exit bid is set aside and the lot is awarded to bidder C, accordingly.

Round 3
Announced Price: $112
Demand: 1

Single Lot		

	Bid	Exit Bid
Bidder A		
Bidder B	Out	$110
Bidder C	In	

Winner: Bidder C at $112 for the Lot

Had bidder C also exited the auction in round 3 and submitted an exit bid of $111, the lot would have been awarded to bidder C since its exit bid is $1 more than the exit bid entered by bidder B.

Round 3
Announced Price: $112
Demand: 0

Bidder A		
Bidder B	Out	$110
Bidder C	Out	$111

Winner: Bidder C at $111 for the Lot

Assessment

This format allows for a simple bidding procedure where bidders indicate interest with a simple yes/no response at the prices announced by BOEM in each round or through exit bids. Bids received are easy to track and validate, and the process for determining the next round's prices is relatively straightforward. BOEM maintains control over the pace of the auction based on its choice of the size of the price increases that bidders will face between rounds. BOEM's control over the price along with the activity rules during the auction, prevent adverse bidding practices such as bid sniping and bid shading and attempts to use odd bid amounts to signal other bidders. In addition, from the bidders' perspective, price discovery during the auction helps them to avoid unpleasant surprises from over- or under-bidding as occurs under a sealed-bid format for a single lot.

Multiple Lots: Simultaneous Ascending Clock Auction (SACA) Format [Standard]

This auction format would be applicable in situations where BOEM subdivides a larger lease area into a set of individual lots, e.g., geographic OCS lease blocks. The bidding on all of the

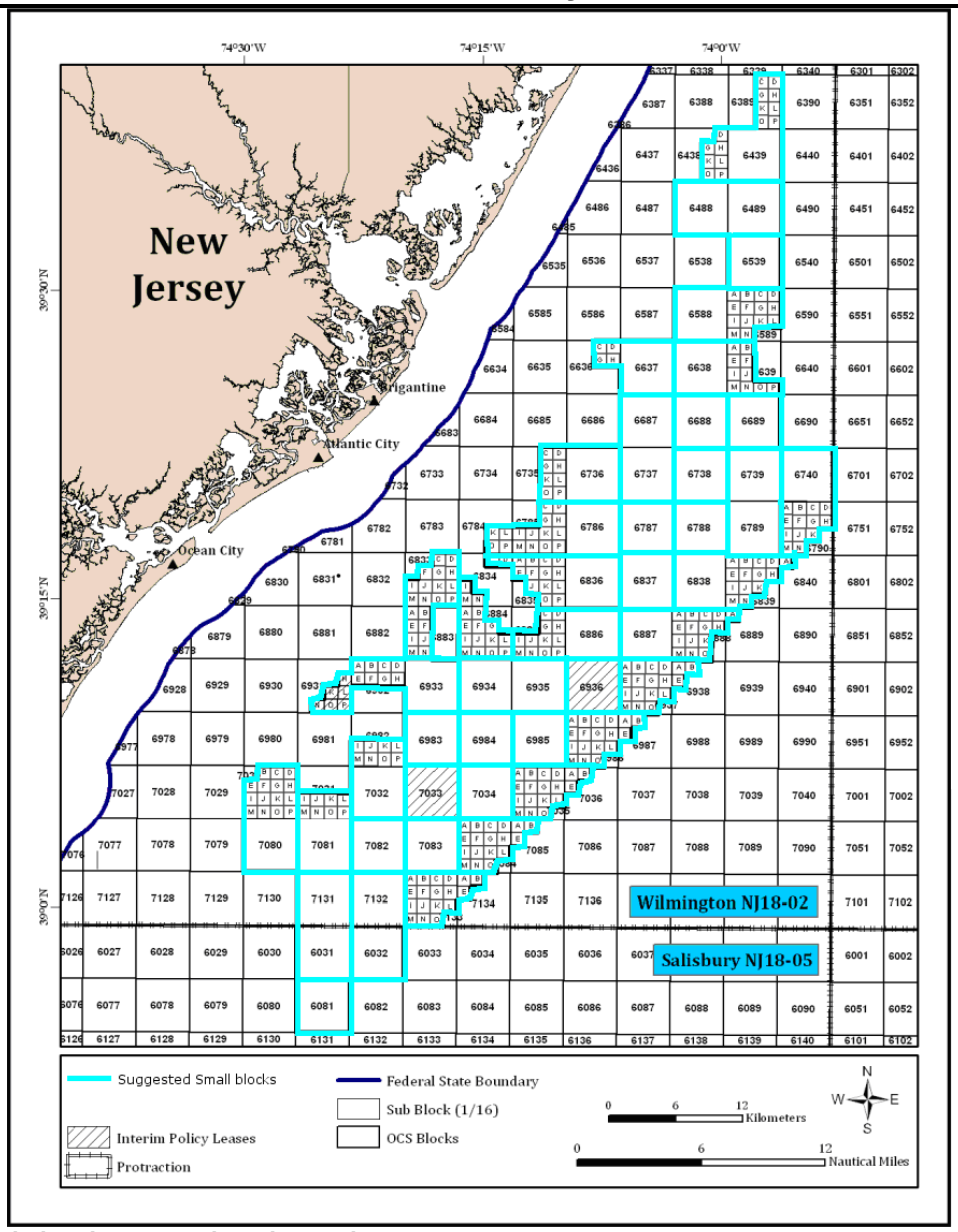
individual lots offered in the lease sale occurs at the same time over a series of rounds (hence the term "simultaneous"). As in the single-lot format, BOEM ticks up the price for each lot separately at the outset of each round based on the amount of overlapping interest from bidders in the previous round. In any given round bidders simply indicate a "yes" for each lot in the set of contiguous lots they wish to acquire at the round's stated auction price for each lot. Another round occurs if the number of bidders interested in any lot is more than one, i.e., more than one bidder indicated "yes" for at least one lot. Otherwise, the auction ends and each remaining bidder wins the lots they bid on in that round at the prevailing auction price for each lot, i.e., the bidding is open on every lot as long as overlapping persists for any lot.

Defining the Lots within the Lease Sale Area

The lots in the auction would be determined by BOEM prior to an auction in a manner that allows bidders to bid on the set of lots that are most aligned with their business objectives. A simple approach would be to define lots as corresponding to standard OCS block boundaries (approximately 9 square miles). An issue with this approach is that for certain OCS lease blocks BOEM may only offer a portion of the block in the lease sale. These "partial" OCS blocks could be offered as a single lot. Alternatively, lots could be defined to a finer level of granularity, such as the "aliquot" (1/16th sections of an OCS block), to allow bidders a greater degree of precision in delineating lease areas during the auction. In this case, the aliquots within a partial OCS block would be offered as separate lots. Bidders would also have more flexibility when competing with another bidder over a specific OCS block since each bidder could retreat to a portion of the OCS block most valuable to them.

However, defining lots at the aliquot level dramatically increases the number of items for bidding that bidders must monitor and respond to during the auction. Consider the example of the New Jersey wind energy area. If the area was subdivided by aliquot there would be 996 lots for bidders to bid on in the auction, compared to only 77 lots if standard OCS boundaries are used. If OCS blocks are the basis for lots, it may be advantageous for BOEM to consider combining the partial lots, or oddly-situated whole OCS blocks, with an adjacent whole OCS block to encourage bidders to lease them. Ausubel and Cramton (2011c, p.49) applied this logic to the New Jersey WEA to define 44 lots which lowers the number of lots bidders need to monitor and respond to by almost half as shown in Exhibit 2. To facilitate a general understanding of the auction formats, we will assume that one lot equals one whole OCS block for illustrative purposes in the discussions and examples that follow.

Exhibit 2 Possible Lot Definition for New Jersey WEA



Source: Ausubel and Cramton (2011b, p. 49)

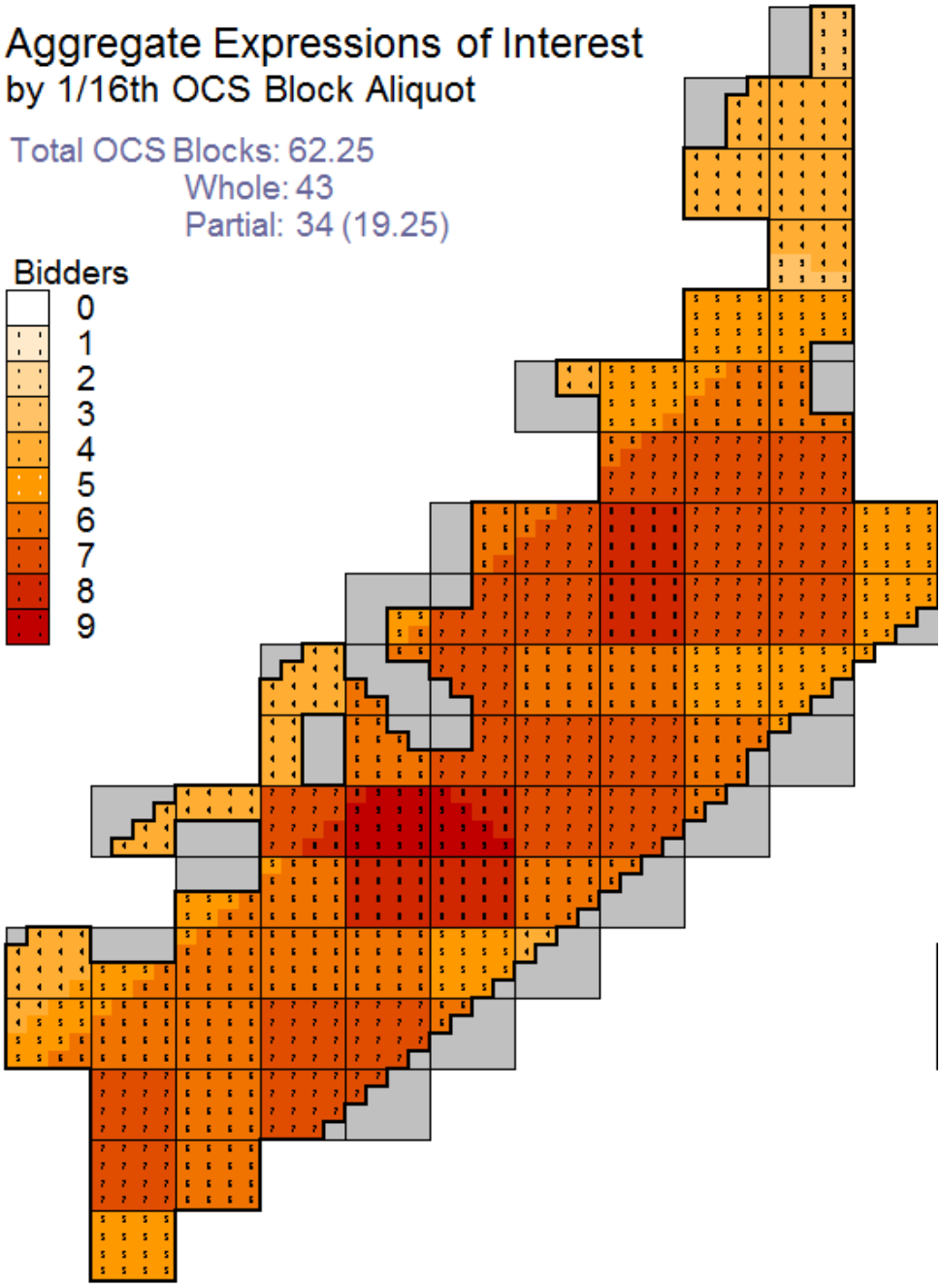
Information Policy

At the opening of each round BOEM publishes the current round's auction price for each lot and a count of the number of bidders interested in each lot during the previous round. This information is provided to all of the bidders.[4] BOEM also determines each bidder's eligibility in the round based on the sufficiency of the bid deposit amount and the bidder's activity in the previous round. Each bidder's eligibility is only known by the bidder and BOEM and is not shared with the other bidders during the auction.

[4] The feedback offered to bidders at the outset and between rounds of the auction is referred to as the "information policy" for the auction.

Exhibit 3 provides an example of how BOEM could consider conveying the number of bidders interested in each lot at the outset of a round. In this hypothetical example, the expressions of interest received in response to the New Jersey call issued by BOEM are treated as though they were the opening round of bids in an auction where the lots were defined at the aliquot level. A similar matrix of prices would also be made available to bidders to assist them in making informed decisions about their bidding in the subsequent round.

Exhibit 3 Overlapping Interest in New Jersey WEA Based on BOEM Call



Source: BOEM

Determination of Prices

The opening round price for each lot would be announced prior to the auction and may be determined based on a reservation price per acre as well as the lot's size.[5] The minimum bid per lot would be set so as to recognize the opportunity value of the lot and to discourage frivolous bidders from participating in the auction. To participate in the auction, potential bidders would be asked to post a deposit based on this opening round price. For example, if each lot represents a geographic OCS block and the opening round price for each lot is based on a value of $12.00 per acre, bidders would need to post $69,120 per lot based on approximately 5,760 acres per block, assuming 640 acres per square mile and 9 square miles per block.[6]

The price for a specific lot remains unchanged if no more than one bidder expressed an interest in the lot during the previous round. Otherwise, BOEM will increase the price for lots with more than one interested bidder in the previous round in a manner similar to the rules described above for the single-area ascending clock format. In this manner, bidders are able to move their lot selections to their next best lease option based on the change in individual lot prices between rounds without having to incur any penalties as could occur if BOEM used a non-clock format.[7] Bidding is also, therefore, anonymous. Bidders only know how many, but not which, bidders are interested in each lot, and have no way to signal the other bidders, since prices are controlled by BOEM.

Activity Rules

As in the single-area ascending clock format, bidders must remain "active" in each round of the auction or exit the auction. However, points are now assigned to each lot prior to the auction and each bidder's activity in each round of the auction is measured as the sum of the points assigned to each lot included in their bid. Activity points can be related to the relative size or dollar valuations of the lots, but once the auction starts, the points are tracked separately from prices.[8] Bidders are only allowed to bid up to their eligibility at the start of each round. A bidder's eligibility is permanently reduced in all subsequent rounds in the event they bid on a number of lots whose activity point total is less than their eligibility in the current round of the auction. For example, if a bidder was eligible to bid on lots with an activity value of up to 8 points in a round but only bid on lots with an activity value of 6 points, that bidder will only be eligible to bid on lots with an activity value of 6 points in all subsequent rounds. If a bidder does not bid for any lots in a round the bidder is out of the auction.

Bidders are allowed to submit an exit bid in the round where they would otherwise intend to exit the auction. Exit bids are treated as a "package" in that the bidder is allowed to specify a single

[5] The minimum bid requirements would likely be published in the Proposed and Final Sale Notices (PSN and FSN, respectively) prior to the auction.

[6] $12 per acre is 48% of the current value of $25 per acre minimum bid amount required in shallow water oil and gas competitive bidding.

[7] Non-clock simultaneous ascending auctions result in the declaration of provisional winners at the end of each round, i.e., if no other bidder comes along and bids more for a lot for the remainder of the auction, the provisional winner would be required to purchase the item at the price they bid for it. Alternatively, the bidder could pay a significant penalty to withdraw their standing high bid for a lot to bid elsewhere.

[8] Activity point assignments could be designed to take into account differences in the expected relative size of each lot or the valuation among the lots being offered; however, the basis for BOEM to make such determinations based on variables besides relative lot sizes is lacking in the early auctions given the lack of any prior sales of this nature.

price for a set of lots that complies with the bidder's eligibility requirement for the round. The price bid for the package must fall between the value of the lots at the previous and current rounds' announced prices. The exit bid would only be considered if: a) no bids at the current round's price were submitted on any of the lots in the package; and b) there is no overlapping demand for any lot in the lease sale area, causing the auction to close. If both of these conditions are met, the bidder placing the exit bid would win the lots in the package it bid. Otherwise, if one or both criteria for a successful exit bid are violated, the exit bid is ignored and the bidder is out of the auction. If more than one exit bid is submitted that satisfy the above criteria and those exit bids contain overlapping lots, the package offering the greatest revenue to the government would be awarded.

BOEM may also set forth limits on the minimum or maximum numbers of blocks that may be included in a package to accommodate programmatic objectives, such as ensuring more than one developer is able to obtain a lease or to guard against adverse bidding behavior. Also, bidders seeking more than one contiguous lease area must register for the auction as two separate bidding entities.

Bid Deposits and Opening Round Eligibility

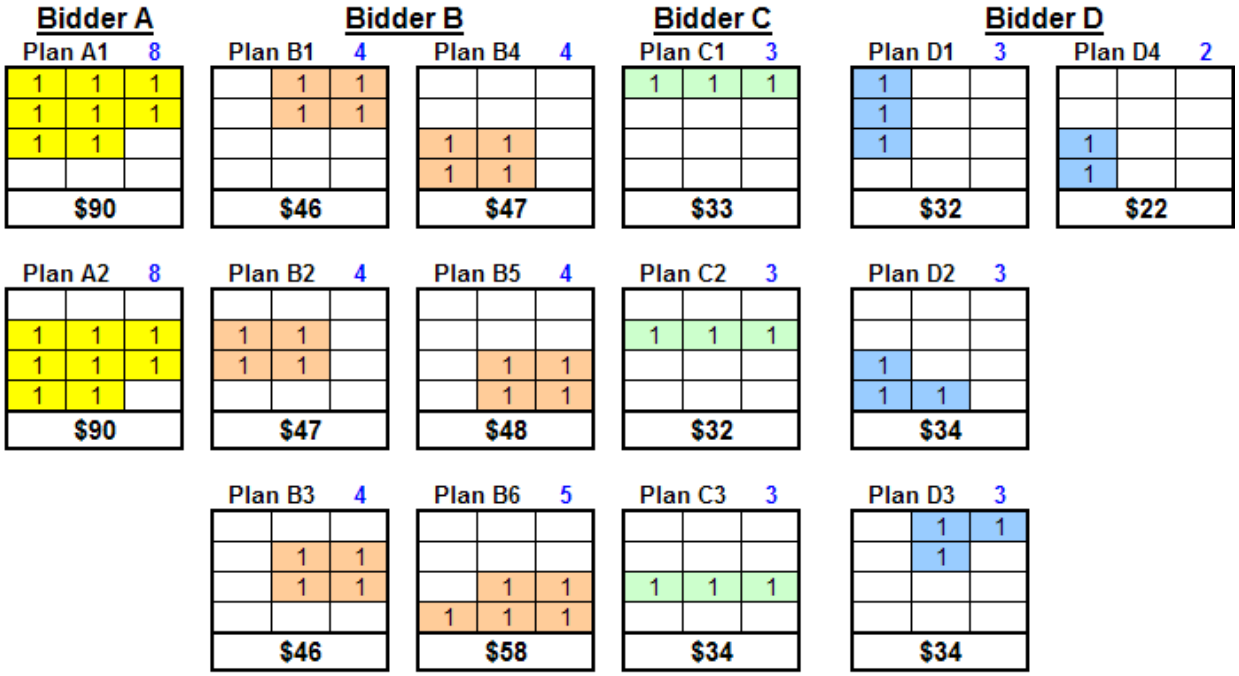
Eligibility in the opening round is established by applying a bid eligibility rule that is enforced prior to the auction. The rule determines the maximum number of points that a bidder is eligible to bid on in any round of the auction based on the bid deposit and the opening round lot price corresponding to a single activity point. In theory, all of the eligible bidders are expected to bid on lots up to their maximum eligibility in the opening round to avoid overpaying until further price discovery occurs. The simplest example is the case where each lot corresponds to a single geographic OCS block worth one activity point each. In this circumstance, a bidder wishing to bid on up to 10 lots (10 points) in the opening round of the auction would be required to post a bid deposit amount of $691,200 just prior to the auction following on the opening price example above. The explanations and examples that follow rely on this simplifying assumption to facilitate an understanding of the auction formats.

Bid deposits are refunded to losing bidders and partial refunds are made in situations where a bidder deposited an amount greater than their final winning bid amount. Basing the bid deposit value on a fraction of the opening round's value may be considered, but in general the minimum bid amounts are not expected to represent a significant burden on credible auction participants and serve to protect the auction from frivolous bidding.

Example

The following example, adapted from Ausubel and Cramton (2011c), illustrates a hypothetical auction for multiple lots applying the SACA format as described above. The example features four bidders (A, B, C, and D) bidding on one or more of 12 lots organized in a 4 x 3 grid. The desired packages of lots and the maximum price each bidder is willing to pay for each in this simplified auction are provided in Exhibit 4.

Exhibit 4 Standard SACA Example: Desired Packages and Prices by Bidder



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 21-22)

Suppose BOEM sets the opening (reserve) price at $10 per lot at the outset of round 1 of the auction and that BOEM will increase prices at the start of each subsequent round based on the number of bids received in the previous round using the following simple approach:

Number of Bids	0	1	2	3	4
Price Increment ($/Lot)	$0	$0	$1	$2	$3

Exhibit 5 below summarizes the progress of the auction round by round which can be stated as follows:

- In round 1, bidders submit bids corresponding to their initial eligibility (plans A1, B6, C1, and D3). Given the presence of overlapping interest in several lots, BOEM provides a summary of demand for each lot and announces the corresponding prices at the outset of round 2. For example, bidders A, C, and D all included the lot in the upper right corner of the lease sale area in their bids. Since there are three bids for that lot, the price in the second round is increased by $2 to $12.
- In round 2, bidders shift their bidding to more affordable options in the south based on the increase in announced prices for the northern lots (plans A2, B6, C3, and D2). Indeed, the auction price increases caused the value of several of the packages bid on in Round 1 to exceed the bidder's budget, such as plans A1, C1, and D3. Again, due to the presence of overlapping interest in several lots, BOEM provides a summary of demand for each lot and announces the corresponding prices at the outset of round 3.

- In round 3, bidders A and D drop out of the auction because they can no longer obtain any of their desired packages at the announced prices. Bidder B reduced its demand by 1 lot since it could no longer afford its 5-lot package, and bidder C shifted its bid since it could no longer afford either of its other packages. At this point there is no longer overlapping demand for any individual lot and the auction ends with bidders B and C winning their final round packages. The sale results in revenues of $78 with 5 lots unsold. The unsold lots illustrate how significant "undersell" can occur.

Exhibit 5 Standard SACA Example: Bidding by Round

Prices | **Bids by Round and Bidder** | **Demand**

Round 1

Prices		
10.0	10.0	10.0
10.0	10.0	10.0
10.0	10.0	10.0
10.0	10.0	10.0

Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 3		
1	1	1				1	1	1		1	1
1	1	1								1	
1	1			1	1						
			1	1	1						
$80			$50			$30			$30		

Demand		
2	3	3
1	2	1
1	2	1
1	1	1

Round 2

Prices		
11.0	12.0	12.0
10.0	11.0	10.0
10.0	11.0	10.0
10.0	10.0	10.0

Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 3		
1	1	1									
1	1	1		1	1	1	1	1	1		
1	1		1	1	1				1	1	
$82			$51			$31			$30		

Demand		
0	0	0
1	1	1
3	3	3
3	3	1

Round 3

Prices		
11.0	12.0	12.0
10.0	11.0	10.0
12.0	13.0	12.0
12.0	12.0	10.0

Bidder A 0			Bidder B 4			Bidder C 3			Bidder D 0		
						1	1	1			
				1	1						
				1	1						
$0			$47			$31			$0		

Clock Outcome		
0	0	0
1	1	1
0	1	1
0	1	1
$78		

Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 23-25)

To illustrate how exit bids could affect the outcome, consider a scenario where bidder D desired a fourth package consisting of the 2 open southwestern lots but was only willing to pay $22 for it, or $2 below the price of the package in round 3. As shown in Exhibit 6, an exit bid on this package would be successful since: a) the lots in the package do not overlap with other lots with active bids, and b) the auction is at an end in the absence of overlapping demand for any lot. The exit bid results in higher auction revenues of $100 rather than $78 without the exit bid.

Exhibit 6 Standard SACA Example: Successful Exit Bid

Round 3 (Successful Exit Bid)

Prices		
11.0	12.0	12.0
10.0	11.0	10.0
12.0	13.0	12.0
12.0	12.0	10.0

Bidder A 0			Bidder B 4			Bidder C 3			Bidder D 2		
						1	1	1			
				1	1				1		
				1	1				1		
$0			$47			$31			Exit Bid: $22		

Previous Value: **$20**
Current Value: **$24**

Clock Outcome		
0	0	0
1	1	1
1	1	1
1	1	1
$100		

Source: BOEM adaptation of example from Ausubel and Cramton (2011c)

Alternatively, consider a scenario where bidder D submits an exit bid in round 3 at its maximum value for the same package it bid on in round 2. As shown in Exhibit 7, this bid is ignored because of the overlap with one of bidder B's active bids at the current round's price.

Exhibit 7 Standard SACA Example: Unsuccessful Exit Bid

Round 3 (Unsuccessful Exit Bid)

11.0	12.0	12.0
10.0	11.0	10.0
12.0	13.0	12.0
12.0	12.0	10.0

Bidder A 0		
$0		

Bidder B 4		
	1	1
	1	1
$47		

Bidder C 3		
1	1	1
$31		

Bidder D 3		
1		
1	1	
Exit Bid: $34		

Previous Value: **$30**
Current Value: **$36**

Clock Outcome		
0	0	0
1	1	1
0	1	1
0	1	1
$78		

Source: BOEM adaptation of example from Ausubel and Cramton (2011c)

Building on the previous example of an unsuccessful exit bid, consider a scenario where bidder B values the package it bids on in round 3 at only $46 and submits a corresponding exit bid as shown in Exhibit 8. Bidder B's exit bid overlaps with the exit bid submitted by bidder D. In this instance, bidder B would still win its desired lots since auction revenues ($76) are greater than if bidder D were the winner ($65).

Exhibit 8 Standard SACA Example: Competing Exit Bids

Round 3 (Competing Exit Bids)

11.0	12.0	12.0
10.0	11.0	10.0
12.0	13.0	12.0
12.0	12.0	10.0

Bidder A 0		
$0		

Bidder B 4		
	1	1
	1	1
Exit Bid: $46		

Previous Value: **$41**
Current Value: **$47**

Bidder C 3		
1	1	1
$31		

Bidder D 3		
1		
1	1	
Exit Bid: $34		

Previous Value: **$30**
Current Value: **$36**

Clock Outcome		
0	0	0
1	1	1
0	1	1
0	1	1
$76		

Source: BOEM adaptation of example from Ausubel and Cramton (2011c)

Assessment

This format allows for a simple bidding procedure where bidders indicate interest with a simple yes/no response at the prices announced by BOEM in each round and the format is readily transparent with respect to how each winner has won. Under this format keeping track of and validating the bids received and determining the next-round prices is relatively straightforward. BOEM also maintains control over the pace of the auction based on its choice of the size of the price increases that bidders will face between rounds. In addition, from the bidders' perspective, there are no unpleasant surprises about paying too much for the winning package or not winning any blocks.

However, the format requires bidders to engage in bidding strategies that could result in a less than optimal set of blocks in the winning package than may have occurred if they were allowed to bid on all of the packages they are interested in winning in the auction. As demonstrated in the illustrative example above, this auction format has the potential for "undersell" whereby

some high-value lots remain unclaimed at the end of the auction which decreases the auction's efficiency. Allowing bidders to submit exit bids can only be expected to offset a portion of any undersell, and in an extreme case "no sell" can occur where all bidders drop out from one round to the next and no exit bids are submitted by bidders exiting the auction. Further, any blocks that were not leased at the end of the auction would only be available to bidders in subsequent competitive or non-competitive allocation processes.

Multiple Lots: Simultaneous Ascending Clock Auction (SACA) Format [Alternative]

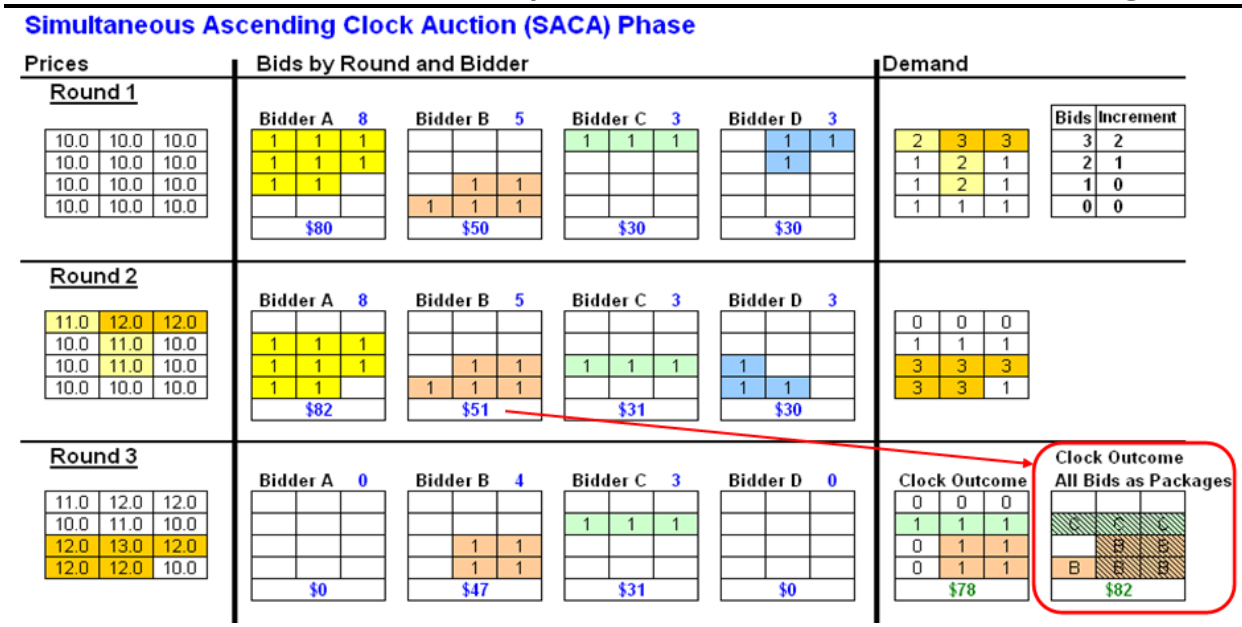
The basic SACA framework can be amended to partially mitigate the potential for significant undersell and to prevent the possibility of "no sell." This amended approach preserves the lot assignments resulting from the prevailing bids in the final round of the SACA, i.e., a bidder who survives through the final round of the SACA is guaranteed award of the lots in its final bid. The key difference to the standard SACA approach described in the previous section is that BOEM would also evaluate all of the bids received throughout the auction to see if any non-overlapping package bids were received that would increase auction revenue and reduce the number of unsold lots.

The bids from previous rounds are treated as all-or-nothing package bids, i.e., only the combined value of the lots matters to the auctioneer rather than the values of the individual lots. For bidders with a prevailing winning bid in the final round of the SACA a non-overlapping bid is one that includes their prevailing lot assignment plus any additional adjacent, unsold lots that do not overlap with one of the other prevailing winning bids. This is the case since prevailing winning bidders may only win one contiguous set of lots in the auction. For the remaining bidders a non-overlapping bid is one that does not overlap with any of the lots already assigned in the final round of the SACA. If two package bids would result in the same incremental revenue, preference would be given first to the bid associated with a prevailing winning bid, second to the bid that would result in the greatest area being leased, and third to the winner of a random draw.

Example

The final round of the auction concludes as in the SACA example above (see Exhibit 5). Now, however, BOEM looks over all the bids received to maximize seller revenue, subject to the condition that the prevailing bids in the final round are included in the winning set of lots. From the previous example, the bids submitted by bidders A and D all overlap with the prevailing winning bids and are not considered further. Bidder C did not bid on a package that expanded upon its prevailing winning bid. However, bidder B did submit such a bid in the second round that does not overlap with bidder C's prevailing bid and increases auction revenue by $4 to $82.

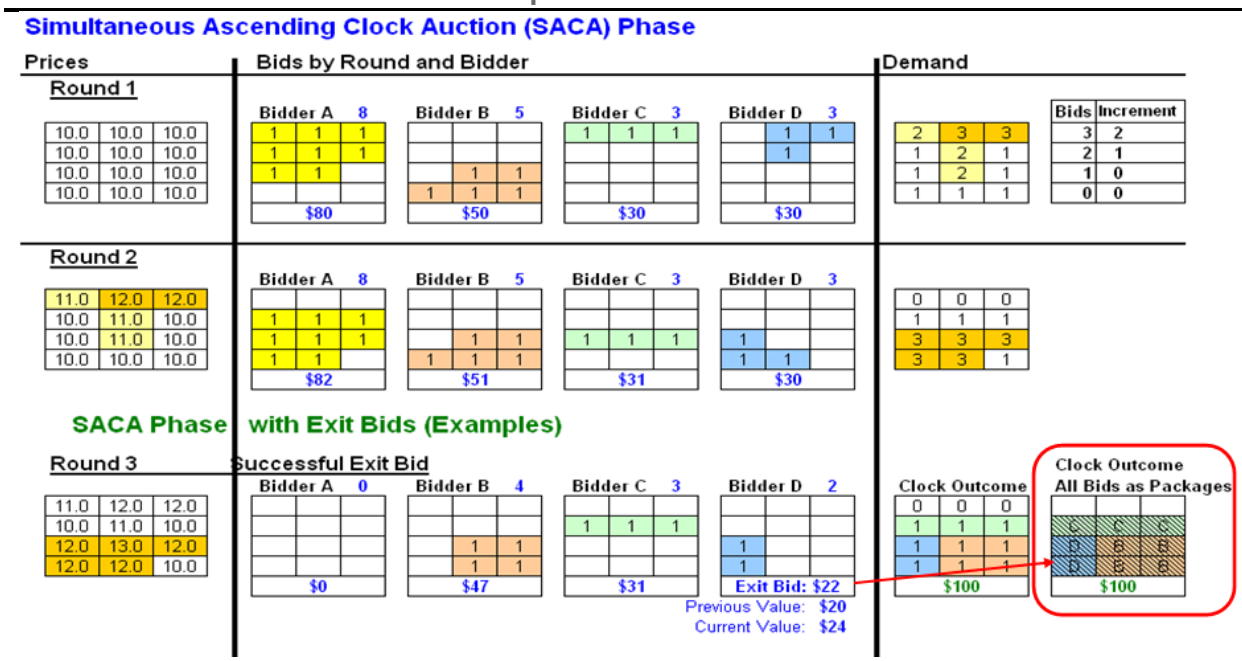
Exhibit 9 Alternative SACA Example: Clock Outcome with All Bids as Packages



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 25-26)

To illustrate how this rule interacts with the exit bids, consider the same three examples of a SACA with exit bids as outlined in Exhibit 6 to Exhibit 8. In the first example (Exhibit 6) bidder D's exit bid is given precedence over the package assignment rule and the auction ends as it would have before since none of the bids received could have preserved the prevailing winners, including bidder D, and increased revenues as shown in Exhibit 10.

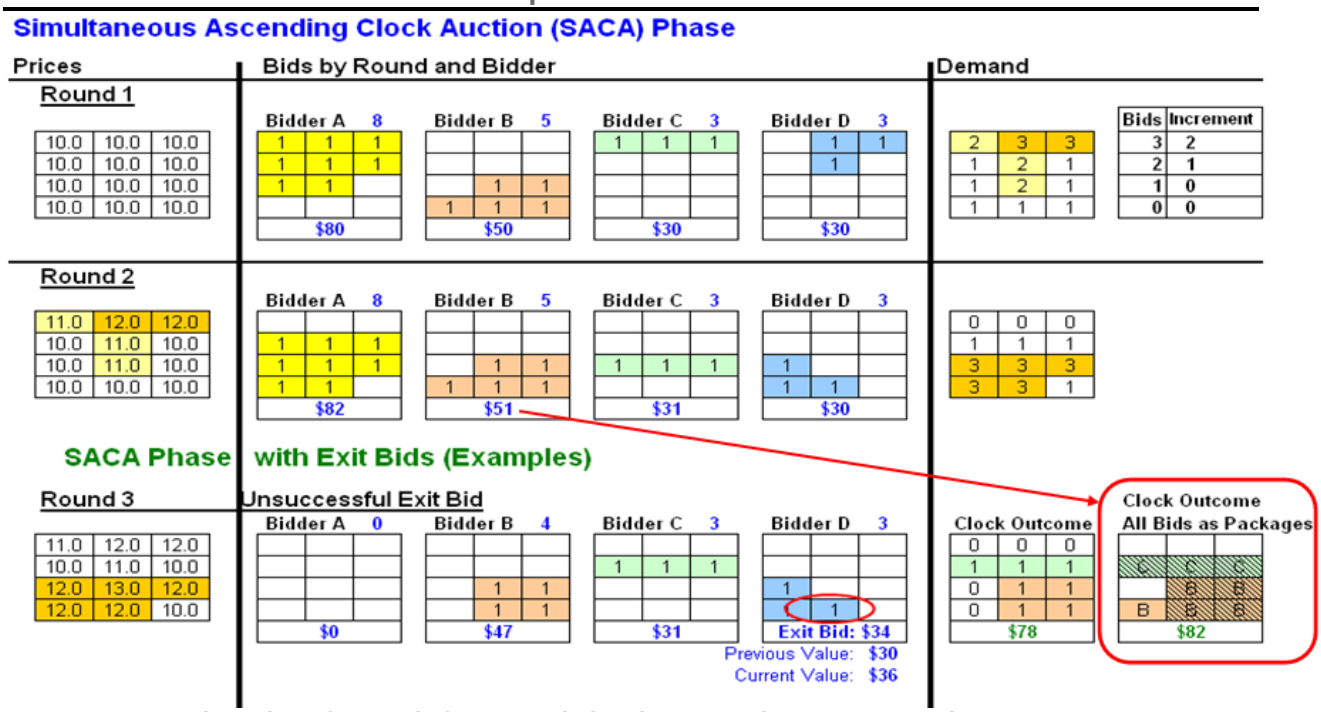
Exhibit 10 Alternative SACA Example: Successful Exit Bid



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 25-26)

Next consider the case from Exhibit 7 where bidder D's exit bid conflicted with bidder B's prevailing bid in the final round. Bidder D's bid is rejected allowing bidder B's bid from round 2 to come into play as before as shown in Exhibit 11.

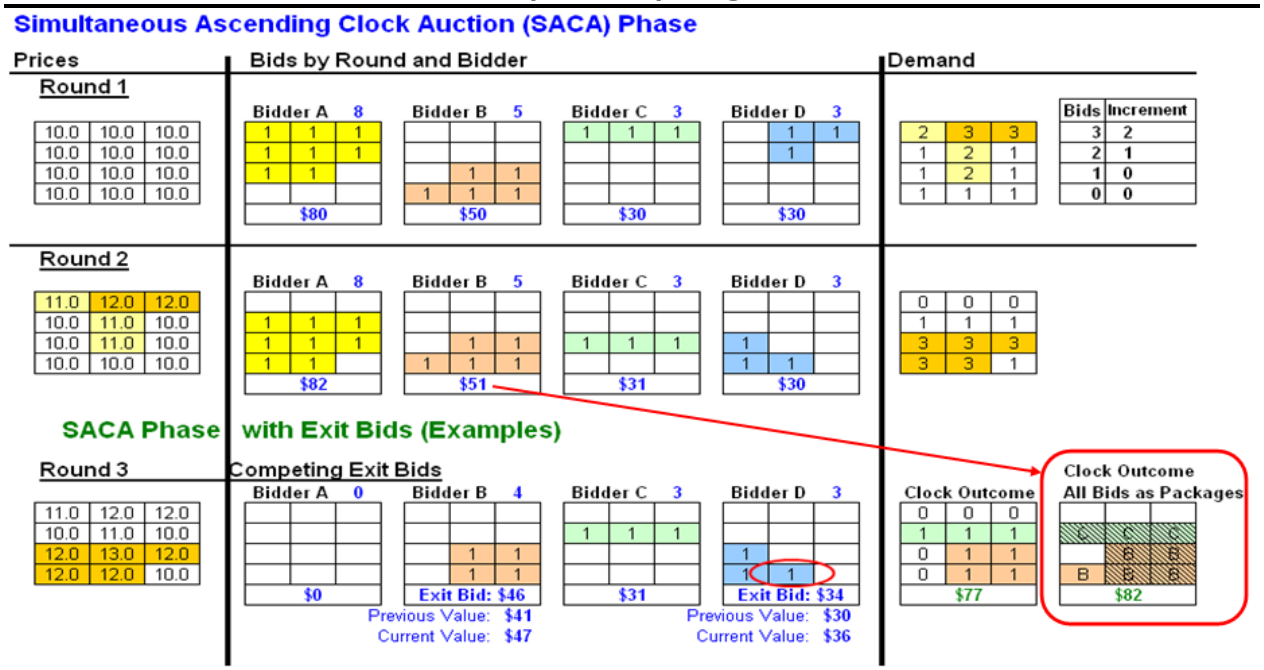
Exhibit 11 Alternative SACA Example: Unsuccessful Exit Bid



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 25-26)

Finally, consider the case from Exhibit 8 where both bidders B and D submit overlapping exit bids in the final round, but where bidder B's exit bid value is greater than bidder D's so bidder B has the prevailing bid. This allows bidder B's bid from round 2 to come into play as before since they are once again a provisional winner in the SACA phase as demonstrated in Exhibit 12.

Exhibit 12 Alternative SACA Example: Competing Exit Bids



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 25-26)

Assessment

This approach retains all of the advantages of the SACA format, addresses "no-sell" directly, and would at least partially mitigate the potential for undersell in the auction. The potential for undersell is still a significant concern with this format and bidding strategies in the auction are still complex since bidders cannot express their full range of preferences for specific packages in the auction. On balance, however, we find this simple, transparent ascending clock auction approach suitable for initial offshore wind energy competitive sales.

Package Clock Auction Format

This auction format represents an extension of the previous multiple-lot SACA format [standard] designed to more fully address the issue of undersell by allowing bidders to bid on all of the lot configurations, or packages, they are interested in leasing, and allowing BOEM to select the most-efficient, revenue-maximizing set of non-overlapping package bids from all the bids received. The auction proceeds with a SACA auction as before but without the option for exit bids. Once the SACA phase closes bidders are allowed to submit additional all-or-nothing package bids during a supplemental, sealed-bid round. Bid values for the additional package bids are constrained based on how each bidder bid during the SACA phase. The supplemental package bids are pooled with the bids from the SACA phase which are also treated as package bids to determine the winners. The winning set of non-overlapping packages is that which results in the greatest auction revenues at the prices bidders offer for them. The prices paid are calculated on a "second-price" basis to encourage bidders to bid their full value for each package.

Supplemental Bidding Rules

All bidders may submit as many supplemental bids as they like in the supplemental bid round regardless of the round when they stopped bidding in the SACA phase of the auction. However, the amount bidders may offer for each of the packages is constrained based on the preferences they revealed during the SACA phase, hence the reference to such rules as "revealed preference." Such rules are necessary to prevent the auction from reverting to a single-round, sealed-bid format with bidders simply going through the motions during the SACA phase since the outcome of that phase would otherwise have no impact on the supplemental round.

The simplest interpretation of such rules is to think of the bidder who reduces their activity from 8 to 6 lots in round 2 of the SACA phase. In doing so the bidder reveals to the auctioneer that there was no other package with activity between 6 and 8 lots that was preferable to the package with just 6 lots at the prices in that round. The bidding rules hold the bidder to this revealed preference in the supplemental bid round. In this case, the bidder would apply the lot prices in round 2 to determine the maximum value of any packages with more than 6 lots for which it may bid on in the supplemental bid round.

The general concept is that the maximum bid for such packages is limited to the value of the package in the last round where the bidder was eligible to bid for a package of that size (or activity points). For example, consider a scenario where there are three lots being offered. Bidder X reduces the number of lots she is bidding on from 3 to 2 in round 5 at which point the lots are valued at $15, $10, and $5 each. If she submits a bid during the supplemental round for all three lots, the most she may offer for the package is limited to the value of the lots in the round where she was last eligible to bid on all three lots (round 5) when the lots had a combined value of $30.

Bidders who bid in the final clock round of the SACA phase have not yet revealed how much they are willing to pay for either their final package bid or other package bids of equal or lesser size. Accordingly, they are allowed to increase their maximum bid on their final package bid from the SACA phase by as much as they want. However, the bidder has revealed that they preferred their final-round lot configuration to all of the other configurations of equal or lesser size based on the stated auction prices in the final SACA round. This implies that the bidder should not be willing to pay more than the relative difference in value between the final-round package and any of the alternative packages of equal or lesser size at the final-round prices. If the bidder increases their final-round package bid price in the supplemental round, this relative difference in value to the alternative packages should be preserved.

For example, if a bidder's final-round package is valued at $10 and an alternative of equal size is valued at $8 based on the SACA final-round prices, the relative difference in that round between the packages is -$2. If the bidder increased their final-round package bid to $15, the most the bidder would be allowed to bid on the alternative package would be increased to $13 ($15 – $2). A more thorough discussion of the revealed preference rules, including an example using activity points which adds some additional complexity, is provided in Ausubel and Cramton (2011c), Sections 6.2.14 and 6.2.15.

Second Pricing

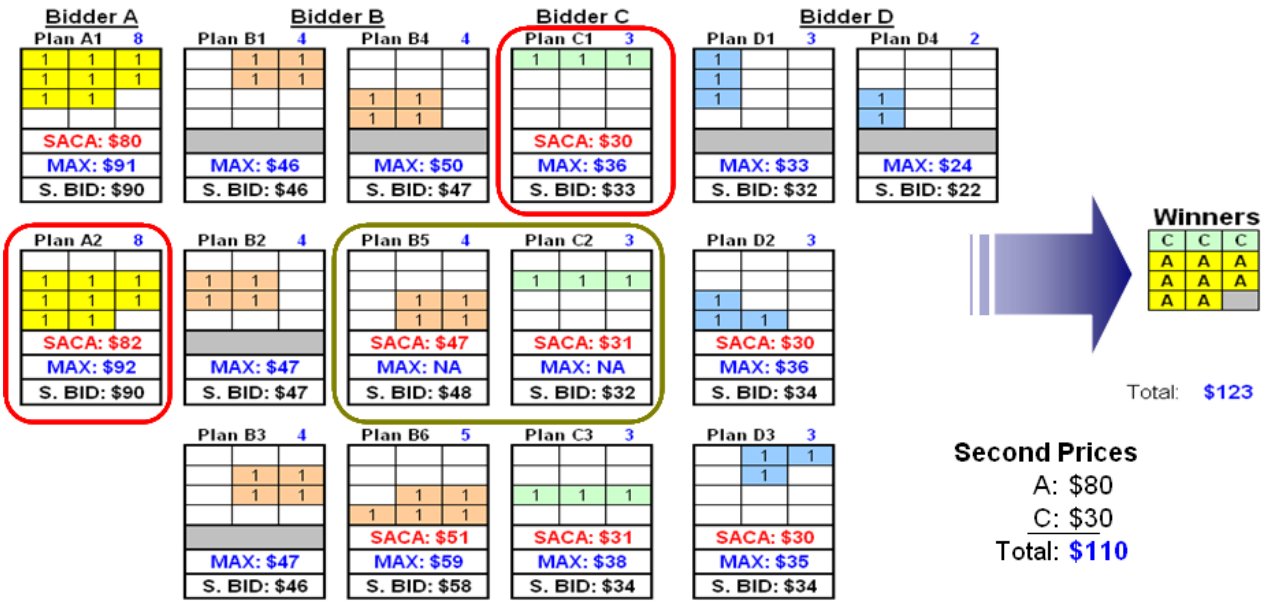
It may be preferable to determine the final prices paid for each package using a second price approach when the sealed-bid round is introduced. Second pricing is easiest to illustrate in the case of an auction for a single-lot using a sealed-bid approach. For example, if three bids of $10, $20, and $30 are submitted, the bidder who offered $30 wins the auction based on the bid values. In a first price auction the winner would be required to pay the $30 amount of their bid. However, in a second price auction the winning bidder is only required to pay the second highest bid amount of $20. This result approximates a competitive market clearing price since a bid of $20.01 would have still won the auction. Each bidder is therefore incentivized to submit bid prices up to their maximum value for each package since the prospect of paying significantly more than the next-highest bidder is eliminated, and since all other bidders will be compelled to follow suit.

The concept is similar for a multiple-lot auction, where the second price represents the smallest price that the winner can pay such that no other combination of bidders would have a higher value from their bids. By comparison, a purely ascending auction is essentially a second price auction since the bidding stops when the second-highest bidder drops out of the auction. For a more complete theoretical discussion of second pricing in multiple-lot situations refer to Ausubel and Cramton (2011a) Section 6.2 and Appendix A. By encouraging bidders to bid "truthfully" up to their actual values for each package they bid on this format avoids surprise outcomes such as the winner's curse noted above, and need not necessarily lead to lower auction revenue to the extend bidders do not shade their bids. More importantly, the efficiency of the auction is improved since the leases are won by those who truly value them the most.

Example

The example proceeds in the same way as the standard SACA format example above without exit bids. Once the SACA phase is complete the bidders submit their supplemental round package bids based on their maximum value for each package. The supplemental bids are pooled together with the package bids received during the SACA phase in order to determine the most-efficient, revenue-maximizing set of packages subject to each bidder receiving only one contiguous lease area. The graphic in Exhibit 13 summarizes the pool of bids received in all rounds of the auction. Each matrix shows which lots are included in the package, along with the maximum bid submitted for the package during the SACA phase (red; first row); the maximum amount the bidder is allowed to bid for the lot based on the revealed-preference rules described above (blue; second row); and the price bid for the package in the supplemental round (black; third row). The SACA phase concluded when plans B5 and C2 emerged as the remaining, non-overlapping bids. However, since all of the packages bid during the auction may now be considered, plans C1 and A2 emerge as the revenue-maximizing set of packages, resulting in a total auction value of $123 with one lot left unsold. The second prices were estimated separately by Ausubel and Cramton (2011c) where bidder A pays $80 and bidder C pays $30 for a total of $110 in auction revenue. This result compares to $78 using the standard SACA approach.

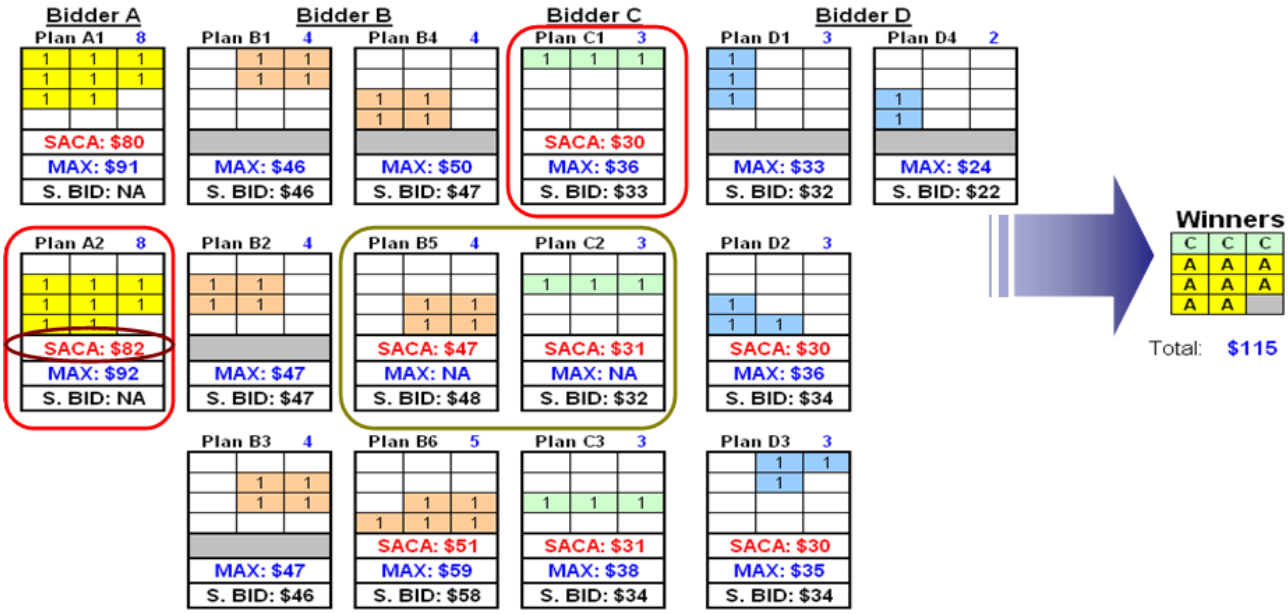
Exhibit 13 Package Clock Example: Full Supplemental Round Bidding



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 26-28)

Now consider a scenario in which Bidder A chooses not to submit supplemental package bids for its two package bid options as demonstrated in Exhibit 14. Bidder A still emerges as a winner along with bidder C, again for plans A2 and C1 since these two options maximize the total auction value, albeit at a lower value of $115.

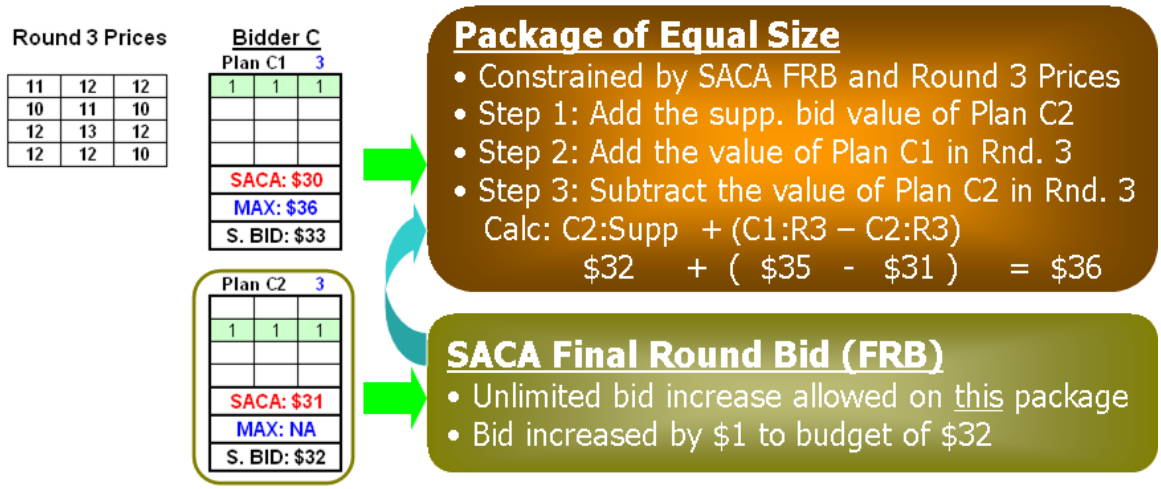
Exhibit 14 Package Clock Example: No Supplemental Rounds Bids from Bidder A



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 25-26)

The maximum bid constraints under the revealed preference rules for the supplemental bids are illustrated for a bidder with a SACA final round bid (plan C2) in Exhibit 15. Bidder C may increase the amount of that bid by as much as she wants, and increases it to her budget of $32 for the package. The maximum bid constraint for a package of equal size, say plan C1, is calculated based on the relative value of plan C1 to the bidder's final round bid, plan C2, at the final round prices, and then adding the difference to the supplemental bid for plan C2. The value of plan C1 in round 3 is $35 while the value of plan C2 in round 3 is only $31, or a relative difference of +$4. This relative difference is then added to the supplemental bid for plan C2 of $32 to determine the maximum bid price of $36 for plan C1 in the supplemental round.

Exhibit 15 Package Clock Example: Max. Supp. Round Bids for Bidder C



Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 31-34)

Finally, consider the case where a bidder wishes to bid on package larger than their eligibility at the conclusion of the SACA phase as shown in Exhibit 16. Bidder A dropped out of the auction in round 3 in which its eligibility was 8 lots. Bidder A is now constrained to bidding at round 3 prices for its packages in the supplemental round. For example, its plan A1 would have been valued at $91 and at round 3 prices.

Exhibit 16 Package Clock Example: Max. Supp. Round Bids for Bidder A

Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 31-34)

Assessment

The package clock format is at least as efficient as the SACA format and helps to mitigate undersell by making it easy for bidders to submit a final offer on all of the lease options consistent with their business plans. The price discovery process during the SACA phase enables bidders to bid up to their valuation for each of the lots and to submit informed final package bids during the supplemental round, while the application of the second-price for determining the price bidders actually pay encourages bidders to bid up to their valuation for each of the packages they submit.

However, the format relies on complex solution algorithms that may make the results seem less than transparent to some bidders. This appearance could require further analysis and explanation by BOEM to explain the outcomes to bidders and resolve the questions bidders may have. Also, bidders may perceive the additional activity rules associated with the supplemental round as too complicated, although this can be addressed through training via mock auctions. Considerable theoretical work has been conducted on package auctions and auction services are readily available for conducting auctions using the approach described above. In addition, package clock approaches are also being applied to pending international spectrum auctions in the United Kingdom, Australia, and Canada.

Ascending Package Auction Format

BOEM considered an alternative package bidding format that does not rely on the clock to set prices for the lots in each round. This auction format is conducted as a series of rounds. Each round begins with a determination by BOEM of each bidder's eligibility based on the sufficiency of the bid deposit amount and activity in the previous round. Bidders are then allowed to submit a package bid for a preset window of time. The package consists of a contiguous set of lots, where each lot in the set must have at least one common border with another lot in the set. When the bidding window closes, BOEM determines the provisionally winning bidder(s) at the conclusion of each round as the set of non-overlapping packages offering the greatest bid value to the federal government. Certain information regarding the provisionally winning bids is released to the bidders to assist them in determining whether and how to bid in the next round. In addition, bidders are informed of the overlapping interest in each lot in a manner similar to the method described for the SACA format. Bidders are then informed of their eligibility status for continuing to bid and the next round commences. Winning package bid(s) are automatically carried forward into the next round. Bidding stops when no incremental bids are received in a given round.

Determination of Provisional Winners

When the bidding window closes, BOEM will determine the provisionally winning bidder(s) at the conclusion of each round as the set of non-overlapping packages offering the greatest aggregate bid value to the federal government. Provisionally winning bids are binding on the bidder offering them and are automatically carried forward into the next round of bidding. The provisionally winning bidders cannot reduce their package size or amount offered for that package in subsequent rounds until they are outbid. In the second and subsequent rounds, losing bidders may submit revised bids following the activity rules and bidding constraints described below, or withdraw from the auction by ceasing to bid altogether. If a provisionally-winning bidder from the previous round is outbid in the current round, that bidder may submit a revised

bid in the subsequent round along with the other currently losing bidders. However, any changes in the composition and magnitude of the provisionally winning bids, or indeed any bids, from a previous round to the current round must result in the revenue maximizing solution for the current round being greater than in the previous round. Otherwise, the current solution defaults to the optimal solution in the previous round.

A bidder who withdraws a provisionally winning bid would be subject to a default penalty equal to the value of its provisionally-winning bid. In this manner, a bidder has no incentive to withdraw until after the conclusion of the auction, as it can only benefit by holding on to its bids until it is either outbid or the auction ends, thereby possibly allowing another bidder to outbid it without incurring a default penalty. Should a provisional winner withdraw its bid, the auction could be simply re-started from the nearest round where the defaulted bidder was not a provisional winner, or continued for at least one more round without the blocks in the withdrawn bid being attributed as part of the current provisionally winning set of packages, but eligible to receive bids in the next round.

Ties in the solution sets of packages for determining the maximum aggregate revenue to the seller in a given round or at the end of the auction sale will be broken based on the following ordering of decision criteria within the tied solution sets: a) highest dollar revenue per lease block; b) highest single package bid; or c) second highest or lower order package bid as needed.

Information Policy

To facilitate auction efficiency, certain information about the bidding behavior in the most recently-completed round must be conveyed to bidders prior to the opening of the next round of the auction. The exact content of this information will be disclosed to bidders in advance of the auction. This information would include, at a minimum, a mapping of the aggregation of the set of provisionally winning blocks and its total bid value, along with the number of bids received for each block in the lease sale area, including blocks not in the set of the provisionally winning package bid aggregation. BOEM may also elect to provide the composition of each of the provisionally winning individual packages. The bid prices being offered by the provisionally winning bidders for their individual packages is less likely to be announced between rounds absent a clock feature for automatically incrementing bids. The identities of the provisional winning bidders between rounds will not be disclosed in any event.

Activity Rules

Bidders must remain “active” in each round of the auction. A bidder is considered “active” if it has a provisionally-winning bid from the preceding round or submits an acceptable revised bid which meets the auction rules. This acceptable bid does not necessarily need to be a provisionally-winning bid in the current round. Bidders are only allowed to bid on a number of whole blocks equal to or less than their eligibility at the start of each round. A bidder’s eligibility is permanently reduced in all subsequent rounds in the event they bid less than their eligibility in the current round of the auction, and any bidder not holding a provisionally-winning bid that elects not to bid in a round is out of the auction and cannot re-enter the auction in a subsequent round.

Bidding Constraints

If bidding on the same exact package area for which the bidder has previously submitted a bid, the bidder typically must offer a bid price at a certain percentage greater than the amount previously tendered. The minimum percentage increase will be specified by BOEM for the round depending on the nature of bidding thus far in the auction. Typically the rate of increase required will be between 5% and 15%. A bidder has the option of increasing its bid on this same package by only one-half of the specified increment, but if it does and gets outbid then it cannot bid further on any tracts included in that package. Of course bidders must also bid an amount greater than or equal to the minimum bid price per acre or block for any package on which they have not previously submitted a bid. More importantly, as noted above, bidders must be cognizant of the requirement that any changes in the composition or magnitude of bidding in a subsequent round must result in an increase in the aggregate bid prices for the revenue maximizing set of packages. Otherwise, the current solution defaults to the optimal solution in the previous round.

Stopping Rule

The auction ends when, for 3 consecutive rounds, the composition and prices of the provisionally winning packages and the identities of the provisionally winning bidders for these packages, remains the same under the terms of the auction.

Assessment

This format accommodates bidding on a range of packages which significantly reduces the complexity of the strategies that bidders need to consider and reduces the potential for exposure to the acquisition of undesired lease configurations. We could capture the complexity inherent in the rules described above with a bid interface that lets the bidder know whether a tentative bid is qualified or not. Also, this auction format does not require complex solution algorithms to determine the winners, and keeping track of and validating the bids received and determining the next-round prices is relatively straightforward, although obviously less so compared to simultaneous ascending clock auction format.

However, this package bidding format has the potential to be prolonged over a considerable period of time as bidders experiment with a range of packages relative to the other simultaneous ascending formats. The ability to employ a second pricing rule to encourage truthful bidding, and hence minimize bid shading, may be possible but only if a complex solution algorithm is developed to support such price determinations. Price discovery is less than perfect since the composition of the individual packages and the high bids for those packages might not be revealed owing to other potential adverse consequences. If both sets of data are revealed between rounds, a minimum bidding increment rule would likely be required for new package bids overlapping known provisionally winning packages. Such a rule would be needed to move the auction along without inadvertently requiring bidders to raise their bids by disproportionally large amounts from round to round. Resolution of these issues is still in progress.

Mapping WEAs to Auction Options

BOEM expects that the initial wave of auctions to support offshore wind development on the OCS will be for the WEAs adjacent to Maryland, New Jersey, Virginia, Massachusetts, and Rhode Island. The RFI, Call, and other inquiries have indicated the presence in each WEA of considerable overlapping interest from up to 10 or more bidders. The Bureau may choose to offer a WEA as either a single lot capable of supporting only one project or as an area comprised of many diverse lots capable of supporting two or more viable projects. BOEM may also encounter a situation where bidders may desire lots to support projects spanning two adjacent WEAs.

The WEAs cover large, more diverse areas and are each capable of supporting multiple projects inclusive of project buffers:[9]

- Maryland: 14 OCS blocks spanning 8 whole blocks and 11 partial blocks and covering approximately 126 square miles.
- Virginia: 24.375 blocks spanning 22 whole and 4 partial blocks covering approximately 219.4 square miles.
- New Jersey: 62.25 blocks spanning 43 whole and 34 partial blocks covering approximately 560.3 square miles.
- Rhode Island: 36.8125 blocks spanning 31 whole and 10 partial blocks covering approximately 331.3 square miles.
- Massachusetts: 145.125 blocks spanning 132 whole and 19 partial blocks covering approximately 1,306.1 square miles.

BOEM would be inclined to offer these areas using a multiple-lot, simultaneous ascending clock or package clock auction format. .

By comparison, the Cape Wind project occupies approximately 5.1 blocks to support 468 MW of capacity but does not take into account the impact of buffer zones since no other projects will be located within its vicinity. The blocks necessary to allow adequate downwind recovery between projects may be substantial and should be taken into account when assessing the ability of WEA to support multiple projects.

Application of Multiple Factor Auction (MFA) Formats

BOEM may find it advantageous in certain, very specific circumstances to use a MFA format. The Bureau proposes to conduct an opening phase in the auction that would allow bidders to submit their responses to a limited number of “yes/no” technical evaluation factors that are evaluated by an independent review panel. Each factor would be worth a set percentage discount where the bidder’s total discount is the sum over all of the factors for which they received a “yes” score from the panel. Each bidder would be informed by BOEM of its total discount at the conclusion of the opening phase so it can incorporate the discount into its bidding strategies. The second phase of the auction would then be conducted on a cash bonus basis using one of the

[9] WEA definitions are as of the time this document was created and may be subject to change based on evolving consultations with stakeholders.

standard auction formats described in the previous sections. Each bidder would be allowed to deduct its percentage discount from its final cash bonus amount that emerged from the standard auction. Note that the amount that any bidder actually has to pay is determined separately from the determination of the set of winning bidders in the standard auction.

In the opening phase, our preference is for clear, objective factors that tend to indicate a higher probability of success in developing an offshore wind project on the OCS. These factors would expand upon consideration of the technical and financial capability factors of the bidders that are already evaluated by BOEM through its bidder qualification process. Such factors may include durable financial commitments, developments on a limited lease within the proposed lease sale area, successful participation in a competitive request for proposal process for offshore wind in an adjacent state, or completion of scientific investigations within the proposed lease area prior to the announcement of the lease sale. Some examples of potential factors are:

- Do you currently hold a firm financial commitment for the sale of at least 100 MW of power from a proposed offshore wind development in the lease sale area in the form of either:
    - A firm purchase power agreement (PPA) that has been approved by the state utility commission or its equivalent; OR
    - An ocean renewable energy credit (OREC) approved by the appropriate state agency?
- Have you completed installation of a meteorological measurement tower on a BOEM limited lease located within the lease sale area?

BOEM is not likely to offer a total discount of more than 25 percent on the basis of non-monetary factors. The technical and financial qualifications already screen out non-viable bidders, and even modest discounts are likely to have a significant impact on auction results. Excessive discounts can lead to reduced participation from bidders who cannot achieve a sufficient discount, or bidders may feel compelled to invest their limited capital in efforts to qualify for a greater discount. Additionally, bidders who satisfy the technical criteria will most likely face a lower cost of capital or subsequent development costs once they obtain the lease. The technical factors would then be reinforcing pre-existing advantages.

The auction formats described earlier in this notice are considered sufficient to meet the agency's needs in a wide variety of contexts. Multiple-factor auctions are therefore being contemplated for use only in a narrow range of circumstances:

> [D]uring the time that [BOEM] has been promulgating this rule, the States of Delaware, New Jersey, and Rhode Island have conducted competitive processes and have selected companies to develop wind resources on the OCS. We believe that the pre-existing State processes are relevant to the competitive processes that [BOEM] is required to conduct following approval of this rule. We intend to do so by using a competitive process that considers, among other things, whether a prospective lessee has a power purchase agreement or is the certified winner of a competitive process conducted by an adjacent State. *74 Fed. Reg. 19,663 (Apr. 29, 2009).*

The discount itself represents the percentage reduction in the winning offer price by which the bidder may reduce the amount it actually is required to pay at the conclusion of the auction. For example, consider an ascending clock auction for a single lot conducted using an MFA approach. Suppose there are three factors and bidder X earns a bid discount of 20% under the MFA criteria, and a competitor Y earns a 10% discount in the opening phase of the auction. If the announced auction price in a given round is $420,000, bidder X would only have to pay that amount less its 20% discount, or $336,000. In contrast, bidder Y would have to pay $378,000 based on its 10% discount resulting in an advantage to bidder X.

Exhibit 17 Example of MFA Discount Calculation

	Bidder X	Bidder Y
Factor 1 (15%)	Yes [15%]	No [0%]
Factor 2 (5%)	Yes [5%]	Yes [5%]
Factor 3 (5%)	No [0%]	Yes [5%]
Total Discount	20%	10%
Cash Bonus in Auction	**$420,000**	
(Less) Discount	($84,000)	($42,000)
Cash Outlay by Bidder	**$336,000**	**$378,000**

Source: BOEM

Examples

The following illustrative examples show the application of the MFA discount method to the standard multiple-lot SACA format example above. The bidders face the same cash budget constraints for their desired packages as before, but face an alternative MFA phase outcome at the start of the standard auction phase that they account for in their bidding. In the first example, the panel evaluates three factors and awards bidders A and C a total discount of 20% and 25%, respectively, with bidder B receiving a relatively minor discount of 2% and bidder D receiving no discount at all.

Exhibit 18 MFA Scoring Favoring Bidders A and C

Multiple Factor Summary

	Bidder A	Bidder B	Bidder C	Bidder D
1 Holds an OREC or PPA?	YES 20%	NO 0%	YES 20%	NO 0%
2 Installed met tower?	NO 0%	NO 0%	YES 3%	NO 0%
3 Other work?	NO 0%	YES 2%	YES 2%	NO 0%
Total Discount	20%	2%	25%	0%

Source: BOEM

In each round of the example shown below the bidders bid at the stated auction prices (Bid Amount row below each matrix) but would only have to pay the stated auction price less their discount (Payment Amount row below each matrix) if the auction were to end. The auction proceeds as before, but now in round 3, bidder A is able to stay in the auction because she would only be required to pay $74, which is still $16 below her budget of $90, as shown in Exhibit 4.

Bidder B is able to stay in on all five of its blocks one more round, into round 3, as well, due to its 2% discount. Without a discount bidder D is not so fortunate and still drops out in round 3 as before. As the auction progresses, bidder B eventually drops out in round 5 since he can no longer afford any of his desired packages, and bidder C moves to its northern package, allowing the auction to end with bidders A and C winning their desired leases resulting in auction revenues of $109 compared to the auction bid amount of $138 and the previous outcome of $78 where the auction concluded at the end of round 3.

Exhibit 19 SACA Bidding by Round with MFA Favoring Bidders A and C

Simultaneous Ascending Clock Auction (SACA) Phase

Prices | Bids by Round and Bidder | Demand

Round 1

Prices			Bidder A (20%) 8			Bidder B (2%) 5			Bidder C (25%) 3			Bidder D (0%) 3			Demand		
10.0	10.0	10.0	1	1	1				1	1	1		1	1	2	3	3
10.0	10.0	10.0	1	1	1								1		1	2	1
10.0	10.0	10.0	1	1			1	1							1	2	1
10.0	10.0	10.0				1	1	1							1	1	1
Bid Amount:			$80			$50			$30			$30					
Payment Amount:			$64			$49			$23			$30					

Bids	Increment
3	2
2	1
1	0
0	0

Round 2

Prices			Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 3			Demand		
11.0	12.0	12.0													0	0	0
10.0	11.0	10.0	1	1	1										1	1	1
10.0	11.0	10.0	1	1	1		1	1	1	1	1	1			3	3	3
10.0	10.0	10.0	1	1		1	1	1				1	1		3	3	1
Bid Amount:			$82			$51			$31			$30					
Payment Amount:			$66			$50			$23			$30					

Round 3

Prices			Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 0			Demand		
11.0	12.0	12.0													0	0	0
10.0	11.0	10.0	1	1	1				1	1	1				2	2	2
12.0	13.0	12.0	1	1	1		1	1							1	2	2
12.0	12.0	10.0	1	1		1	1	1							2	2	1
Bid Amount:			$92			$59			$31			$0					
Payment Amount:			$74			$58			$23			$0					

Round 4

Prices			Bidder A 8			Bidder B 4			Bidder C 3			Bidder D 0			Demand		
11.0	12.0	12.0				1	1		1	1	1				1	2	2
11.0	12.0	11.0	1	1	1	1	1								1	2	2
12.0	14.0	13.0	1	1	1										1	1	1
13.0	13.0	10.0	1	1											1	1	0
Bid Amount:			$99			$47			$35			$0					
Payment Amount:			$79			$46			$26			$0					

Round 5

Prices			Bidder A 8			Bidder B 0			Bidder C 3			Bidder D 0			Clock Outcome			Previous Clock Outcome		
11.0	13.0	13.0							1	1	1				1	1	1	0	0	0
11.0	13.0	12.0	1	1	1										1	1	1	1	1	1
12.0	14.0	13.0	1	1	1										1	1	1	0	1	1
13.0	13.0	10.0	1	1											1	1	0	0	1	1
Bid Amount:			$101			$0			$37			$0			$138			$78		
Payment Amount:			$81			$0			$28			$0			$109					

Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 23-25)

A significantly different outcome can occur based on the distribution of the discounts from the first phase of the auction. Consider a scenario where bidders B and D receive discounts of 22%

and 25% respectively, and bidders A and C receive no discount at all. Without a discount, bidder A is once again forced to drop out in round 3, while bidder D is now able to stay in because she would only be required to pay $25, which is still $7 below her budget of $32. Bidder B is also able to stay in for its 5-block package through the remainder of the auction. Eventually, bidder C feels the pinch and drops out in round 5, leaving bidders B and D winning their desired lots resulting in auction revenues of $72 compared to the auction bid amount of $94.

Exhibit 20 SACA Bidding by Round for MFA Favoring Bidders B and D

Multiple Factor Summary

	Bidder A	Bidder B	Bidder C	Bidder D
1 Holds an OREC or PPA?	NO 0%	YES 20%	NO 0%	YES 20%
2 Installed met tower?	NO 0%	NO 0%	NO 0%	YES 3%
3 Other work?	NO 0%	YES 2%	NO 0%	YES 2%
Total Discount	0%	22%	0%	25%

Simultaneous Ascending Clock Auction (SACA) Phase

Prices | Bids by Round and Bidder | Demand

Round 1

Prices			Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 3			Demand			Bids	Increment
			0%			22%			0%			25%							
10.0	10.0	10.0	1	1	1				1	1	1		1	1	2	3	3	3	2
10.0	10.0	10.0	1	1	1								1		1	2	1	2	1
10.0	10.0	10.0	1	1			1	1							1	2	1	1	0
10.0	10.0	10.0				1	1	1							1	1	1	0	0
Bid Amount:			$80			$50			$30			$30							
Payment Amount:			$80			$39			$30			$23							

Round 2

Prices			Bidder A 8			Bidder B 5			Bidder C 3			Bidder D 3			Demand		
11.0	12.0	12.0													0	0	0
10.0	11.0	10.0	1	1	1										1	1	1
10.0	11.0	10.0	1	1	1		1	1	1	1	1	1			3	3	3
10.0	10.0	10.0	1	1		1	1	1				1	1		3	3	1
Bid Amount:			$82			$51			$31			$30					
Payment Amount:			$82			$40			$31			$23					

Round 3

Prices			Bidder A 0			Bidder B 5			Bidder C 3			Bidder D 3			Demand		
11.0	12.0	12.0										1			1	0	0
10.0	11.0	10.0							1	1	1	1			2	1	1
12.0	13.0	12.0					1	1				1			1	1	1
12.0	12.0	10.0				1	1	1							1	1	1
Bid Amount:			$0			$59			$31			$33					
Payment Amount:			$0			$46			$31			$25					

Round 4

Prices			Bidder A 0			Bidder B 5			Bidder C 3			Bidder D 3			Demand		
11.0	12.0	12.0										1			1	0	0
11.0	11.0	10.0							1	1	1	1			2	1	1
12.0	13.0	12.0					1	1				1			1	1	1
12.0	12.0	10.0				1	1	1							1	1	1
Bid Amount:			$0			$59			$32			$34					
Payment Amount:			$0			$46			$32			$26					

Round 5

Prices			Bidder A 0			Bidder B 5			Bidder C 0			Bidder D 3			Clock Outcome			Previous Clock Outcome		
11.0	12.0	12.0										1			1	0	0	0	0	0
12.0	11.0	10.0										1			1	0	0	1	1	0
12.0	13.0	12.0					1	1				1			1	1	1	1	2	2
12.0	12.0	10.0				1	1	1							1	1	1	1	2	2
Bid Amount:			$0			$59			$0			$35			$94			$78		
Payment Amount:			$0			$46			$0			$26			$72					

Source: BOEM adaptation of example from Ausubel and Cramton (2011c, pp. 23-25)

Assessment

The most relevant alternative for conducting an MFA is the standard request for proposals (RFP) format. Under this format bidders typically submit separate technical and financial sealed-bid packages. The technical and financial factors are scored and weighted to arrive at an aggregate overall score for each bidder that determines the outcome of the auction. Alternatively, the technical scores may result in a bid credit or discount that is applied to the cash bonus offered.

BOEM favors the discount method used in conjunction with one of the standard auction formats described above to an RFP format for several reasons. First, the discount approach avoids issues with using a sealed-bid approach to determine the winners by allowing overlapping interests to be resolved without resorting to arbitrary allocations or a winner-takes-all approach while offering an approach consistent with any of the proposed standard auction formats that are specifically designed to resolve overlapping interests in the most efficient way. Second, the discount approach minimizes the potential for controversy about the factors and the weights assigned to them, and bidders can generally ascertain the level of discount they can expect to receive vis-à-vis other bidders. Third, the discount approach improves the transparency of the auction by relying on objective evaluation factors that incorporate adjacent-state processes in an impartial manner while minimizing the incentive for bidders to expend capital prior to the auction.

References

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