Description of auction format for allocation of aquaculture licenses in Norway – bidder perspective

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The Norwegian Ministry of Trade, Industry and Fisheries (the Ministry) proposes to employ a **simultaneous clock auction format** for the allocation of aquaculture licenses in Norway. The auction will be used to allocate new licenses in conjunction with the release of new production capacity across multiple production areas.

The Ministry also proposes specific auction regulations that will apply in relation to this auction.

The proposed auction format and the specific auction regulations that will apply are described in the following document, from the perspective of a bidder.

When the live auction is conducted, the auction format and the associated specific auction regulations will be implemented in electronic auction software accessible via a regular web browser. Preliminary screenshots of the graphical interface are included in this document to provide a sense of how the system will work in practice.

1 Description of auction format

The simultaneous clock auction for aquaculture licenses in Norway will consist of a series of auction rounds.

At the start of each round, the auctioneer will announce a set of prices, which will be the current round prices per ton MAB for new licenses in each production area. These prices will be clearly displayed in the bidder's interface.

During each round, all bidders will then indicate the number of tons MAB that they would be interested in purchasing in each production area at the current round prices that have been specified by the auctioneer.

At the end of each auction round, the auctioneer will then check whether aggregate demand (i.e. demand summed across all bidders) within each production area is either a) above supply (i.e. above the amount of capacity, which is available, in tons MAB), or b) below or equal to supply.

Depending on the level of aggregate demand in each production area, the auctioneer will determine whether to proceed to a new auction round.

If there is at least one production area in which there is excess demand (i.e. a production area in which bidders have indicated aggregate demand for more tons MAB than there is capacity available), the auctioneer will commence a new auction round. If there are no production areas in which there is excess demand, the auction will end. The auction will thus proceed until there are no production areas in which there is excess demand.

The round prices that will apply in each auction round will be determined in the following manner:

- In round 1, the prices in each production area will be equal to the reserve prices (i.e. the pre-announced minimum price per ton MAB in each production area, as determined by the Ministry).
- In all following rounds, the round price in each production area will increase (relative to the previous round price) if there was excess demand in the previous round, and otherwise remain the same.[1]

When the auction ends, each bidder will, for each production area, have won licenses corresponding to the number of tons MAB for which it indicated demand in the final auction round. Winning bidders will pay for these licenses according to the final round prices.

2 Bidding interface

To submit bids in each auction round, bidders will employ electronic auction software, which can be accessed via a regular web browser.

New capacity will be released in eight production areas in conjunction with the 2018 allocation. This means that the auctioneer will announce eight prices in each auction

[1] The Ministry reserves the right to deviate from this price rule in certain exceptional cases, for example if there are competition concerns (in which case the Ministry reserves the right to increase the price in a production area, even if there is not excess demand).

round. Bidders must then specify eight numbers in response in every auction round, indicating the number of tons MAB that they demand in each production area, at the specified current round prices.

A preliminary graphic overview of the interface, which bidders will use to place their bids in each auction round, can be seen in Figure 1 in the Appendix.

The bidder interface thus displays, for each production area:

- the price per ton MAB in the previous round[2]
- the demand which the bidder indicated in the previous round
- some information regarding the level of aggregate demand (i.e. summed across all bidders) in the previous round (more on this in section 0)
- the price per ton MAB in the current round
- the demand which the bidder is indicating in the current round (can be edited)
- the total price which the bidder would have to pay for licenses if the auction were to end following the current round, given the price per ton MAB in the current round and the demand which the bidder is indicating in the current round

Aggregate information is also displayed, including:

- the total demand which the bidder indicated in the previous round, summed across all production areas
- the total demand which the bidder is indicating in the current round, summed across all production areas
- the total price which the bidder would have to pay for licenses if the auction were to end following the current round, summed across all production areas, given the prices per ton MAB in the current round and the demand which the bidder is indicating in the current round in each production area

The interface also displays information such as:

- the time remaining in the current round to submit a bid
- information regarding when the current auction round commenced and when it is scheduled to end
- the total supply of the capacity release in each production area, measured in terms of tons MAB

[2] In round 1, the price per ton MAB in the previous round, the demand which the bidder indicated in the previous round, and information regarding the level of aggregate demand in the previous round naturally cannot be displayed in the bidding interface, as there will have been no previous round at this point.

3 Bidding constraints

Several constraints will limit the specific bids that each bidder can place in each auction round:

- **Constraint #1:** Bidders cannot increase their total demand relative to the total demand that they expressed in the previous auction round, measured by the total number of tons MAB, summed across all production areas (the so-called "activity rule").

- **Constraint #2:** Bidders cannot decrease their demand within a production area relative to the demand that they expressed in the previous auction round, measured in tons MAB, if the price associated with that specific production area has not increased from the previous round.

- **Constraint #3:** Bidders cannot place a bid for more tons MAB than is available within each production area (i.e. a bid cannot exceed the available capacity release in tons MAB).

- **Constraint #4:** Bidders cannot place a bid for a total number of tons MAB, summed across production areas, which exceeds its individual cap, as measured in tons MAB, as determined by size of its deposit submitted prior to the auction.

Bidders will also be unable to submit "invalid" bids that contain e.g. negative numbers or symbols other than numbers.

Subject to these constraints, bidders can bid as they see fit in each auction round, and can, for example, switch the composition of their demand between different production areas as the relative price of different production areas changes.

This means that a bidder can, for example, bid for 100 tons MAB in production area 10 in round 1, and then opt to bid for 100 tons MAB in production area 11 instead in round 2 (as long as the price has increased in production area 10 from round 1 to round 2, see constraint #2). This flexibility should enable bidders to reflect substitutable preferences for different production areas.

3.1 Constraint #1: Illustrative example

If a bidder attempts to breach the first constraint, i.e. the "activity rule", by entering a combination of bids so that its total demand, measured in tons MAB summed across all production areas, exceeds the total demand that it expressed in the previous round, the auction software will display an error message, see Figure 2 in the Appendix.

The auction software system will not allow a bidder to submit a combination of bids across production areas in which total demand in terms of number of tons MAB increases compared to the previous round. The purpose of this constraint, the "activity rule", is to prohibit bidders from bidding dishonestly.

Usually, buyers want more of any product only when the price is lower. Thus, it would be considered unusual for any bidder in this auction to want to increase its demand in terms of tons MAB if the price per ton MAB did not go down.

The "activity rule" prohibits bidders from increasing their demand during the auction because prices can only ever increase or remain unchanged as the auction proceeds. The "activity rule" thus should not prevent bidders from expressing most reasonable types of preferences, whereby higher auction prices yield the same or lower demand.

There may be some instances in which the "activity rule" does prohibit bidders from expressing preferences that could be reasonable. For example, a bidder could potentially be indifferent between purchasing 500 tons MAB in one production area and purchasing 250 tons MAB in another production area. A bidder with preferences such as these would not be able to switch its demand back and forth between the production areas in response to changes in the relative price over several auction rounds. The bidder would essentially be "stuck" as soon as it switched to bidding in the production area in which it demanded 250 tons MAB as the "activity rule" would render the bidder unable to "step back up" to 500 tons MAB in the original production area in subsequent auction rounds. However, we see this limitation as a necessary compromise in order to hold an auction, which will lead to an outcome fairly quickly.

3.2 Constraint #2: Illustrative example

If a bidder attempts to breach the second constraint by entering a bid in a production area that is lower than the demand that it expressed in that production area in the previous round, despite the fact that the price has not increased in that production area relative to the previous round, the auction software will display an error message, see Figure 3 in the Appendix.

The auction software system thus will not allow a bidder to submit any bid in which it attempts to reduce demand in any production area in which prices remain unchanged.

3.3 Constraint #3: Illustrative example

If a bidder attempts to breach the third constraint, by entering demand for a number of tons MAB, which exceeds the total number of tons MAB that is available in a certain production area, the auction software will display an error message, see Figure 4 in the Appendix.

The auction software system thus will not allow a bidder to submit a bid for more tons MAB than is available in the associated production area, in any auction round.

3.4 Constraint #4

If a bidder attempts to breach the fourth constraint, by entering demand for a total number of tons MAB, summed across all production areas, which exceeds its individual cap, as measured in tons MAB, as determined by size of its deposit submitted prior ot the auction, the auction software will display an error message.

This constraint will only be binding in round 1. In all following rounds, any attempt to breach constraint #4 would also breach the "activity rule" (constraint #1), as long as the bids in round 1 were correctly constrained according to constraint #4, the individual bidder cap.

The auction software system thus will not allow a bidder to submit a bid for more tons MAB than it is allowed to according to its individual cap, as determined on the basis of its deposit submitted prior to the auction, in any auction round.

4 Information rule

At the start of each new auction round (except for round 1)[3], bidders will be provided with some information regarding the level of aggregate demand that was indicated within each production area in the previous auction round (see e.g. the interface displayed in Figure 1).

This information is provided to bidders in order to facilitate some price discovery, so that bidders can gauge the extent to which other bidders were interested in licenses at the previous round prices. Bidders can use this information to update their valuations.

Specifically, bidders will be informed regarding whether aggregate demand in each production area in the previous auction round was in the range:

- Above 200% of supply
- Above 150% and up to 200% of supply
- Above 120% and up to 150% of supply
- Up to 120% of supply

This information rule is aimed at providing a sufficient level of transparency so as to enable a satisfactory level of price discovery, whilst also masking information that would allow bidders to directly observe and deduce other individual bidders' bids.

[3] The round 1 interface naturally cannot contain any information on the level of aggregate demand in the previous round since there was no previous round.

No other information regarding bids from previous rounds will be provided to bidders.

5 Suggested price increments

If aggregate demand in a production area exceeds supply, the auctioneer will increase the price of licenses in that production area, relative to the previous round price.[4]

Price increments between auction rounds should ideally be large enough to facilitate a relatively fast auction process but slow enough to ensure efficiency (i.e. so that bidders can accurately reflect their preferences in their bids).

Towards achieving a satisfactory balance, suggested price increments can be a function of excess demand from the previous round. If excess demand in the previous auction round was relatively large, then prices can be increased quite substantially in the current round, whereas if excess demand in the previous auction round was relatively small, then prices should be increased only a little.

Specifically, the following structure for suggested price increments is proposed to apply in the auction:

- If aggregate demand within a production area was above 200% of supply in the previous auction round, the price in that production area should be increased in the current auction round by 10%.
- If aggregate demand within a production area was above 150% and up to 200% of supply in the previous auction round, the price in that production area should be increased in the current auction round by 6%.
- If aggregate demand within a production area was above 120% and up to 150% of supply in the previous auction round, the price in that production area should be increased in the current auction round by 4%.
- If aggregate demand within a production area was up to 120% of supply in the previous auction round (and if there was excess demand), the price in that production area should be increased in the current auction round by 2%.

The auctioneer will maintain the ability to deviate from the suggested formula for price increments outlined above as it sees fit during the auction.

6 Regulation that applies to inactive bidders

Bidders must submit bids in all auction rounds in order to remain active in the auction. If a bidder does not place a bid in any single auction round, then this will be interpreted as a bid for zero tons MAB in all production areas in that auction round.

[4] The Ministry reserves the right to deviate from this rule in certain exceptional cases.

Due to the "activity rule", see section 3.1, a bidder that misses a single round would subsequently be unable to place positive bids in any production area in all following auction rounds and the bidder would thus essentially have exited the auction.

The Ministry may, at its discretion, decide to offer back-up procedures for bidding in case that a bidder experiences technical problems (e.g. fax or telephone bidding). However, bidders should not rely on the availability of such back-up procedures and should ensure that they have available redundant systems that they can use in response to any technical issues that they may encounter.

7 Length of auction rounds and rounds per day

Auction rounds should be as short as is necessary to ensure that all bidders have had ample time to consider their bids and register them in the auction software system. Very long auction rounds would minimise the probability of mistakes, but this consideration must be balanced with the consideration that the auction should be concluded relatively quickly.

In practice, it is most important that auction rounds are longer during the beginning of the auction when bidders may still be adapting to the auction format and auction software system.

A proposed bidding structure is the following:

- Day 1 (5 bidding rounds):
  - 9.00am-10.50am: Bidding round 1, 10.50am-11.00am: Break
  - 11.00am-11.50am: Bidding round 2
  - 11.50am-1.00pm: Lunch break
  - 1.00pm-1.50pm: Bidding round 3, 1.50pm-2.00pm: Break
  - 2.00pm-2.50pm: Bidding round 4, 2.50pm-3.00pm: Break
  - 3.00pm-3.50pm: Bidding round 5, 3.50pm-4.00pm: Break

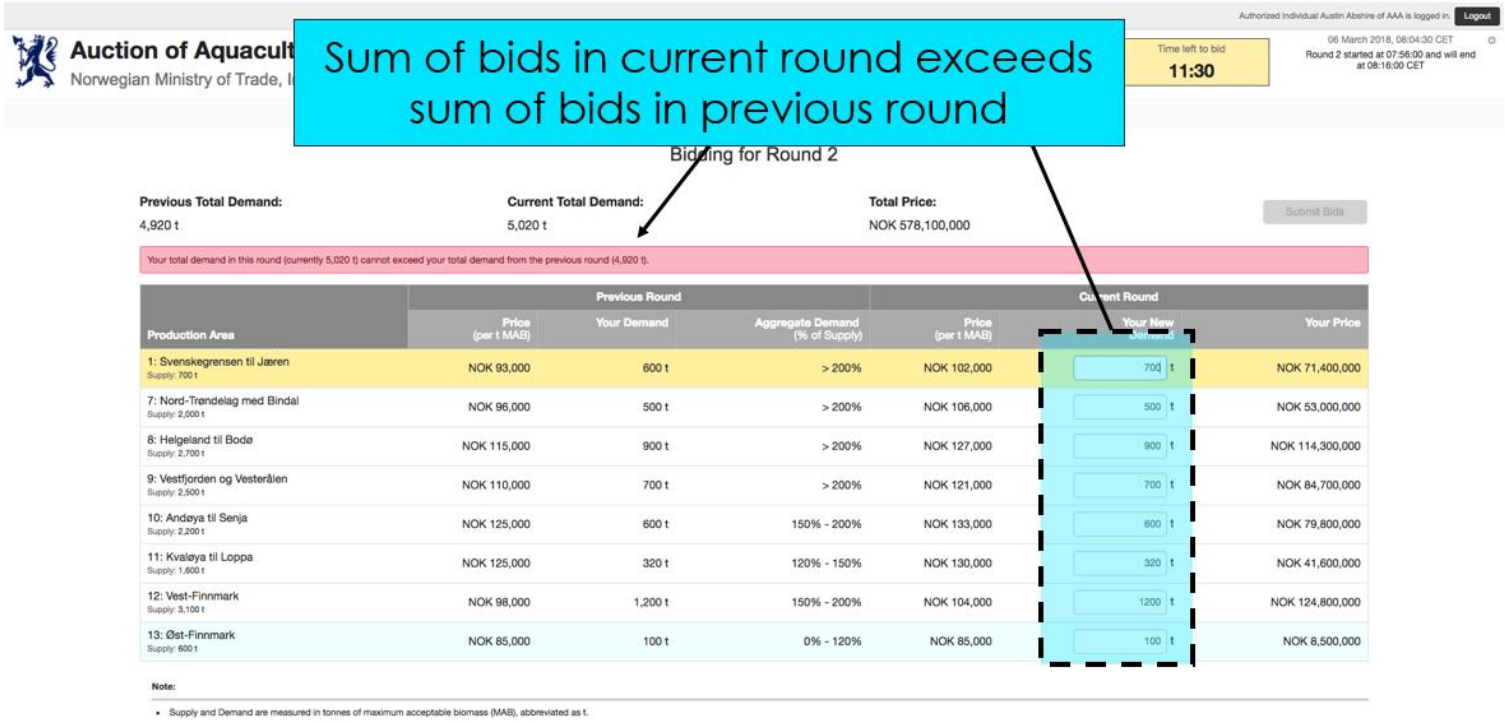
- Day 2 and onwards (12 bidding rounds per day):
  - 9.00am-9.20am: Bidding round, 9.20am-9.30am: Break
  - 9.30am-9.50am: Bidding round, 9.50am-10.00am: Break
  - 10.00am-10.20am: Bidding round, 10.20am-10.30am: Break
  - 10.30am-10.50am: Bidding round, 10.50am-11.00am: Break
  - 11.00am-11.20am: Bidding round, 11.20am-11.30am: Break
  - 11.30am-11.50am: Bidding round
  - 11.50am-1.00pm: Lunch break
  - 1.00pm-1.20pm: Bidding round, 1.20pm-1.30pm: Break
  - 1.30pm-1.50pm: Bidding round, 1.50pm-2.00pm: Break
  - 2.00pm-2.20pm: Bidding round,2.20pm-2.30am: Break

- 2.30pm-2.50pm: Bidding round, 2.50pm-3.00pm: Break
- 3.00pm-3.20am: Bidding round, 3.20pm-3.30pm: Break
- 3.30pm-3.50pm: Bidding round

The auctioneer reserves the right to deviate from this structure during the live auction. For example, the auctioneer may decide to deviate if it becomes apparent that many bidders are still active in many production areas, and are submitting bids only just before the bid round deadline (indicating time pressure), or if only two bidders remain active and are submitting bids in only a single production area (indicating little need for lengthy bidding rounds).

Appendix: Figures

Figure 1 Bidder interface (preliminary)

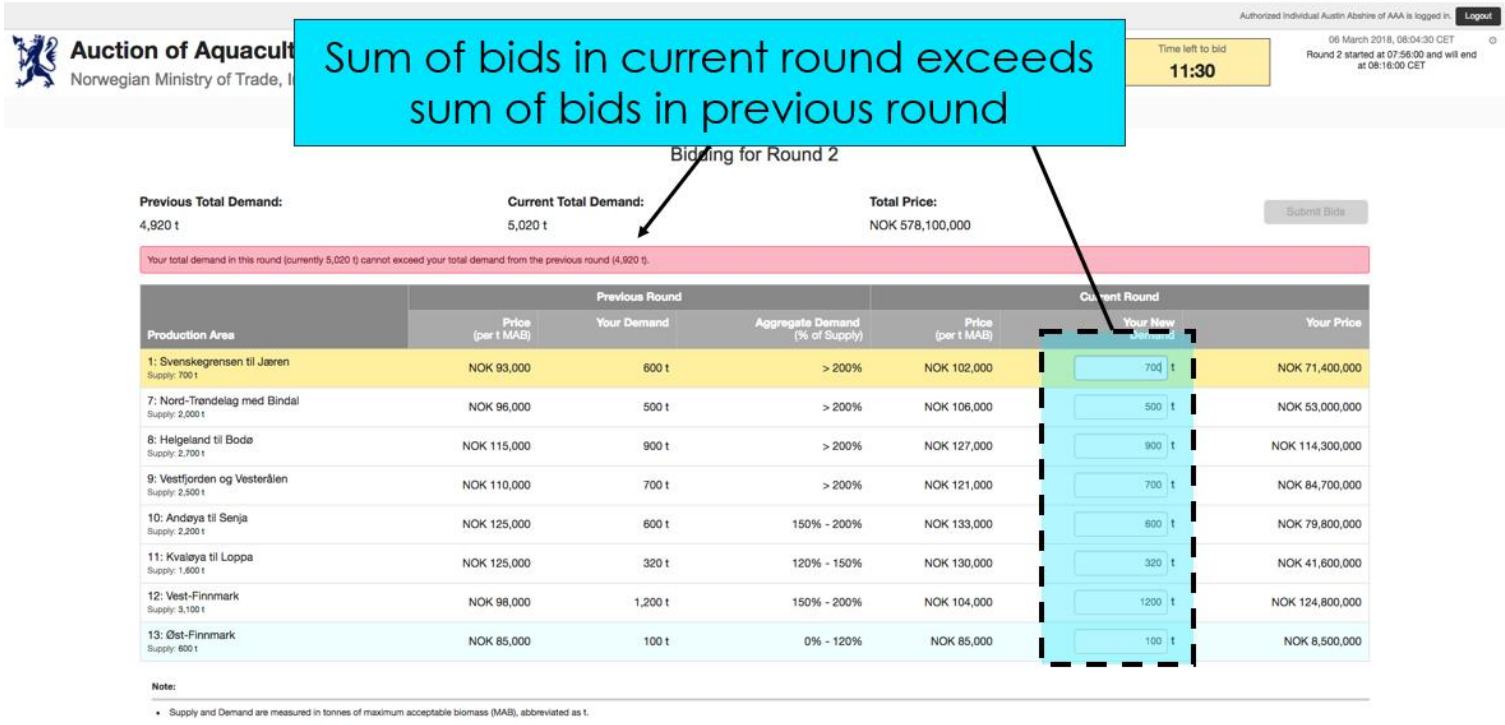


Note: The blue box highlights the area of the bidder interface where the bidder must type in eight numbers, one for each production area, corresponding to the number of tons MAB that it demands in each production area, given the current round prices (indicated in the column to the left of the blue box).

This screenshot represents a preliminary graphic overview of the interface and is subject to change.
The prices displayed are purely illustrative, and do not necessarily reflect the Ministry's valuations or relevant starting prices for the actual auction.

Source: Copenhagen Economics, Innovative Auctions

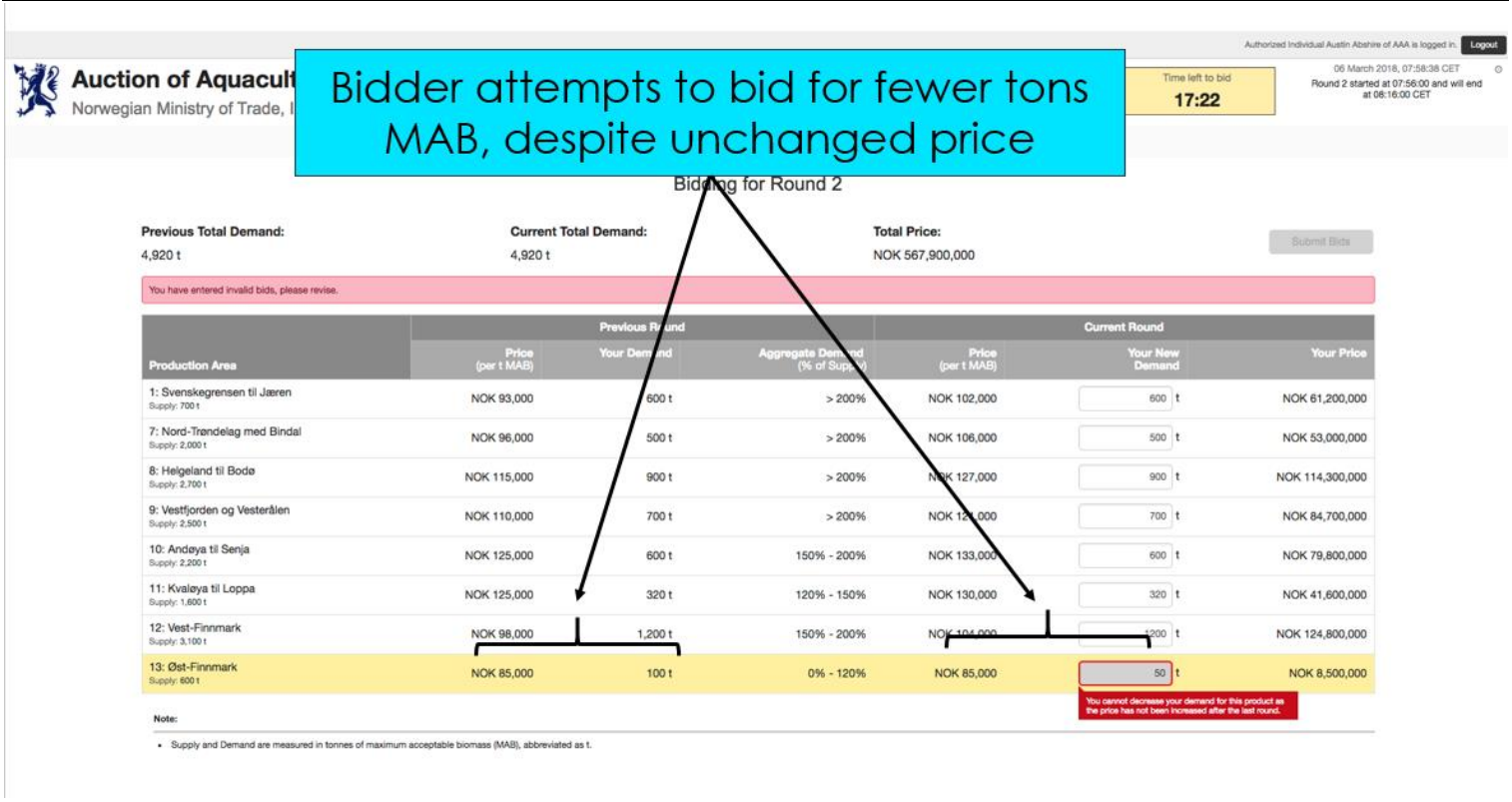
Figure 2 Constraint #1: bidder attempts to place a bid that breaches the "activity rule"



Note: This screenshot represents a preliminary graphic overview of the interface and is subject to change.
The prices displayed are purely illustrative, and do not necessarily reflect the Ministry's valuations or relevant starting prices for the actual auction.

Source: Copenhagen Economics, Innovative Auctions

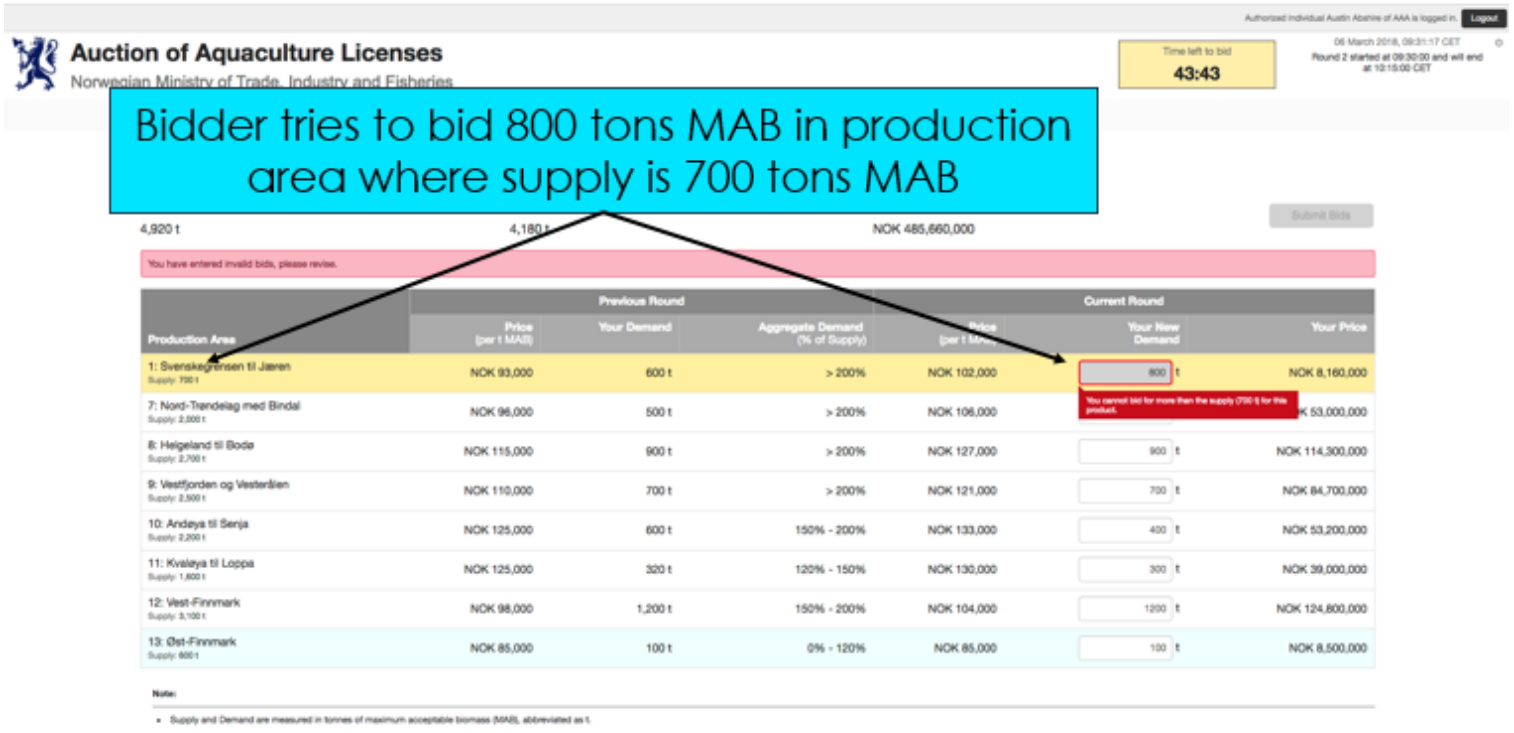
Figure 3 Constraint #2: bidder breaches constraint regarding unchanged price



Note: This screenshot represents a preliminary graphic overview of the interface and is subject to change.
The prices displayed are purely illustrative, and do not necessarily reflect the Ministry's valuations or relevant starting prices for the actual auction.

Source: Copenhagen Economics, Innovative Auctions

Figure 4 Constraint #3: bidder places bid that breaches supply



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Source: Copenhagen Economics, Innovative Auctions