Bidding mechanics - clock auction and CMRA

Bidding mechanics under the shortlisted auction formats for the award of spectrum in the 6 GHz, 8 GHz, low 10 GHz, high 10 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz and 38 GHz bands

Prepared by DotEcon on behalf of the Norwegian Communications Authority (Nkom)

Introduction

This online seminar provides an overview of the bidding mechanics under the two auction formats shortlisted by Nkom for the auction

The seminar intends to cover the differences between the two formats, and the main implications for bidders when bidding in the auction

The seminar does *not* intend to repeat the contents of the consultation document, or to cover all of the details of the auction rules

We expect to have some time to answer questions after the presentation, but we will only cover simple questions about the auction mechanics

Any other questions, or questions that may require a longer response, may be addressed at a later stage

Overview

1. Similarities and differences between the clock auction and the CMRA

2. Implications for bidders

3. Bid submission in a clock auction

4. Bid submission in a CMRA

5. Switching in a clock auction

6. Switching in a CMRA

7. Q & A

Similarities (bidding mechanics)

- Proceeds in rounds
- Auctioneer announces prices, bidders indicate demand at prevailing round prices
- Whilst a bidder is active, it will not leave empty-handed
- Pay amount of winning bid

Differences (bidding mechanics)

	Clock auction	CMRA
Bid submission	Single bid per round (*preferred package at round prices*)	**Basic:** Single bid per round (*preferred package at round prices*) **Optional:** Multiple bids in the same round (*close substitutes at round prices, or at key switching points*)
Activity rules	Eligibility based activity rule requires pre-set 'exchange rates' for switching Once a bidder loses eligibility, it cannot switch back (*relaxed if activity requirement <100%*)	Revealed preference based activity rule requires that bid differentials must reflect prices at which bidders dropped demand Depending on price developments bidder may switch back, even if it lost eligibility

Motivation for the CMRA

Additional flexibility to submit multiple bids means that bidders can offer **alternatives** in the same round

Additional flexibility is **optional** as the bidder can submit only headline bids

Activity rule provides **flexibility to switch** back and forth between packages provided relative prices change, but not if relative prices do not change

CMRA helps to resolve **coordination** problems when there is no excess demand overall, but there is excess demand for specific categories due to several bidders switching at the same time

➔ Even if bidders do not submit additional bids, the CMRA allows for the auction to close if it is possible to accept the headline bid for a bidder from a previous round
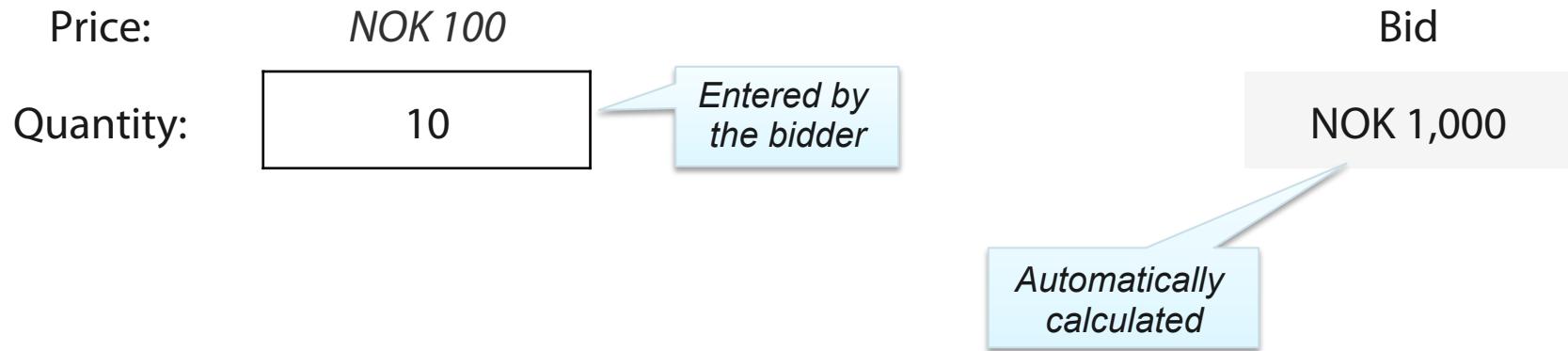
Bid submission

Clock auction

Bid submission in a clock auction (single lot category)

Price: *NOK 100*

Quantity:

Bid

Announced by auctioneer

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Bid submission in a clock auction (single lot category)

Price: *NOK 100*

Quantity: 10 — *Entered by the bidder*

Bid

NOK 1,000 — *Automatically calculated*

Bid submission in a clock auction (multiple lot categories)

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Quantity:				

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Quantity:	10			NOK 1,000

Bid submission in a clock auction (multiple lot categories)

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Quantity:	5	5		NOK 750

Bid submission

CMRA

Bidding in a CMRA

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Headline bid:				

Additional bids:

Bidding in a CMRA

	A lots	B lots	C lots	Bid
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Headline bid:	10			NOK 1,000

Additional bids:

> *Automatically calculated*

Bidding in a CMRA

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Headline bid:	10			NOK 1,000

Additional bids:

A lots	B lots	C lots	Bid
5	5		NOK 750

> *Entered by the bidder (but constrained to be between 90% and 100% of round prices)*

Bidding in a CMRA

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Headline bid:	10			NOK 10,000

Additional bids:

A lots	B lots	C lots	Bid	
5	5		NOK 750	
5		5	NOK 700	✔

Bidding in a CMRA

	A lots	B lots	C lots	Bid
Price:	NOK 100	NOK 50	NOK 50	Bid
Headline bid:	10			NOK 10,000

Additional bids:

A lots	B lots	C lots	Bid	
5	5		NOK 750	
5		5	NOK 700	
	10		NOK 600	✗
8			NOK 600	✗

> *Above round prices (NOK 500)*

> *Below 90% of round prices (NOK 720)*

Bidding in a CMRA

	A lots	B lots	C lots	
Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid
Headline bid:	10			NOK 10,000

Additional bids:

A lots	B lots	C lots	Bid	
5	5		NOK 750	
5		5	NOK 700	
	10		NOK 500	✔
8			NOK 750	✔

Switching

Clock auction

Eligibility adjustments in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 100	NOK 50	NOK 50	Bid	Activity
20	Quantity:					

Limits the maximum activity of the bidder in the round

Eligibility adjustments in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid	Activity
20	Quantity:	10			NOK 1,000	20

Above 75% of eligibility, so keep same eligibility for next round

Eligibility adjustments in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 105	NOK 50	NOK 50	Bid	Activity
20	Quantity:	8			NOK 840	16

Below bidder's eligibility, but still above 75% of eligibility, so keep same eligibility for next round

Eligibility adjustments in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 110*	*NOK 50*	*NOK 50*	Bid	Activity
20	Quantity:	6			NOK 660	12

Below 75% of eligibility, so bidder loses eligibility Eligibility for next round is (12 / 75% =) 16

Switching in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 50*	*NOK 50*	Bid	Activity
16	Quantity:	8			NOK 920	16

Bidder can switch back to a larger package (marginally increase demand) even though prices went up

Switching in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 50*	*NOK 50*	Bid	Activity
16	Quantity:	8 ➡	16		NOK 800	16

1 ➡ 2

Bidder can increase quantity if it switches from lot categories with more eligibility points to lot categories with fewer eligibility points

Switching in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 55*	*NOK 50*	Bid	Activity
16	Quantity:		16 →	16	NOK 800	16

1 → 1

> *Bidder can switch on a lot per lot basis between categories with the eligibility points*

Switching in a clock auction

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 115	NOK 55	NOK 50	Bid	Activity
16	Quantity:		16 ⟷	14	NOK 800	16/14

The 75% activity requirement allows bidder to switch back and forth between packages with slightly different eligibility (e.g. suppose that there are fewer C lots so that the bidder cannot bid for as many, or that the bidder would not require as many C lots as B lots)

Above 75% of eligibility, so keep same eligibility for next round

Switching

CMRA

Eligibility adjustments in a CMRA

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid	Activity
20	Headline bid:					

Bids for packages with greater eligibility than the bidder's eligibility are subject to a relative cap

Eligibility adjustments in a CMRA

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 100*	*NOK 50*	*NOK 50*	Bid	Activity
20	Headline bid:	10			NOK 1,000	20

Not less than eligibility, so keep same eligibility for next round

Eligibility adjustments in a CMRA

| Eligibility	Price:	A lots (2 E.P.) NOK 105	B lots (1 E.P.) NOK 50	C lots (1 E.P.) NOK 50	Bid	Activity
20	Headline bid:	8			NOK 840	16
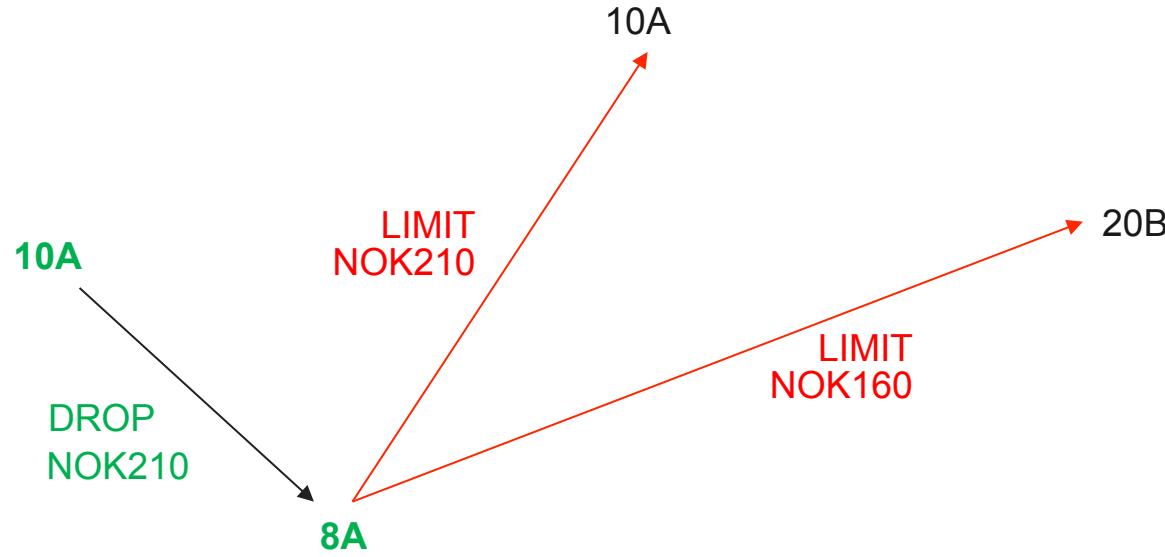
Less than eligibility, so reduce eligibility for next round

*This is an **eligibility-reducing bid**, so creates a **relative cap** on packages with eligibility above 16 and up to 20, anchored at the prices in this round*

*For instance, if the bidder wishes to make further bids for **10 A lots** (as an additional bid), then it can only offer up to NOK 105 per lot above 8 lots*

*In a similar way, if the bidder wishes to bid for **20 B lots** later in the auction, then its bid for 20 B lots shall not exceed its highest bid for 8 A lots + the price difference between 20 B lots and 8 A lots in this round, which is NOK 160*

10A

LIMIT
NOK210

20B

10A

LIMIT
NOK160

DROP
NOK210

8A

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Eligibility adjustments in a CMRA

Eligibility	Price:	A lots (2 E.P.) NOK 110	B lots (1 E.P.) NOK 50	C lots (1 E.P.) NOK 50	Bid	Activity
16	Headline bid:	6			NOK 660	12

*With a further reduction the bidder creates additional relative caps*
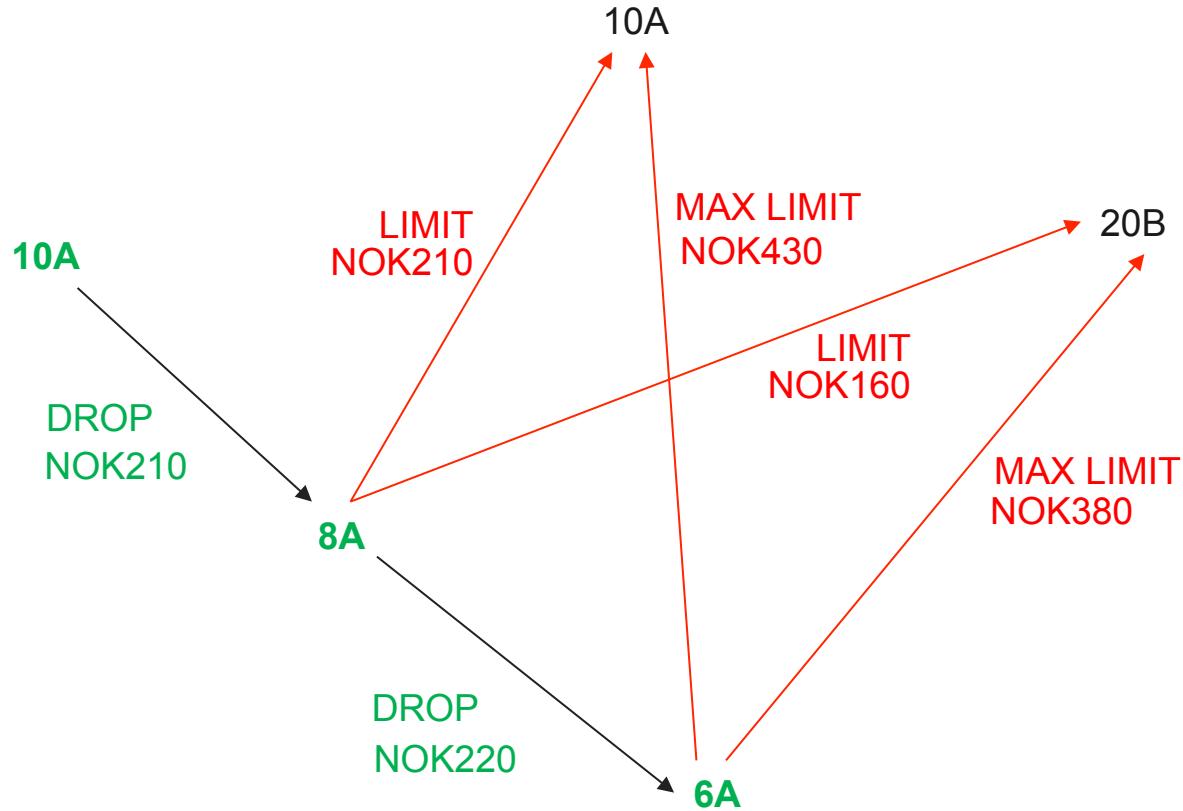
For instance:
- *if the bidder wishes to make further bids for **8 A lots**, then it can only offer up to NOK 110 per lot above 6 lots*
- *if it wishes make further bids for **10 A lots**, then it can only offer up to NOK 110 per lot between 6 lots and 8 lots, and up to NOK 105 per lot above 8 lots.*

*In a similar way, if the bidder wishes to bid for **20 B lots** later in the auction, then its bid for 20 B lots:*
- *shall not exceed its highest bid for 8 A lots + NOK 160, and*
- *its highest bid for 8 A lots cannot exceed its highest bid for 6 A lots + NOK 220*
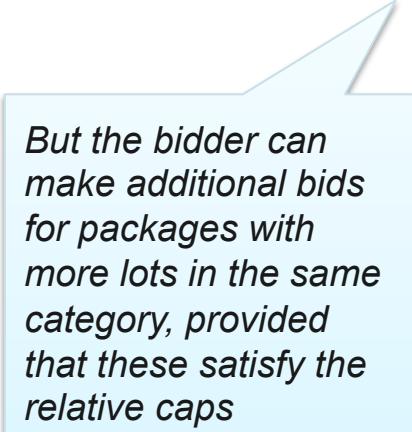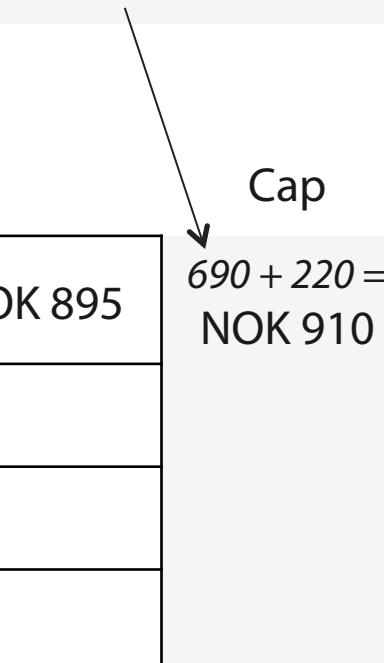
10A

10A

LIMIT
NOK210

MAX LIMIT
NOK430

20B

DROP
NOK210

LIMIT
NOK160

MAX LIMIT
NOK380

8A

DROP
NOK220

6A

Switching in a CMRA

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 115	NOK 50	NOK 50	Bid	Activity
12	Headline bid:	6			NOK 690	12

Bidder cannot increase its headline bid demand in the same category if prices have increased (unless reducing demand in other categories)

Switching in a CMRA

	Price:	A lots (2 E.P.) NOK 115	B lots (1 E.P.) NOK 50	C lots (1 E.P.) NOK 50	Bid	Activity
Eligibility						
12	Headline bid:	6			NOK 690	12

Additional bids:

				Cap
8			NOK 895	690 + 220 = NOK 910

> *But the bidder can make additional bids for packages with more lots in the same category, provided that these satisfy the relative caps*

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 50*	*NOK 50*	Bid	Activity
12	Headline bid:	6			NOK 690	12

Additional bids:

Cap

A lots	B lots	C lots		Cap
8			NOK 895	NOK 910
10			NOK 1,100	*895 + 210 =* NOK 1,105

Switching in a CMRA

Eligibility	Price:	A lots (2 E.P.) NOK 115	B lots (1 E.P.) NOK 50	C lots (1 E.P.) NOK 50	Bid	Activity
12	Quantity:	6 →	12		NOK 600	12

1 → 2

Bidder can increase quantity if it switches from lot categories with more eligibility points to lot categories with fewer eligibility points

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 115	NOK 55	NOK 50	Bid	Activity
12	Quantity:		12 ➡	12	NOK 600	12

1 ➡ 1

Bidder can switch on a lot per lot basis between categories with the same eligibility points

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 55*	*NOK 50*	Bid	Activity
12	Quantity:		12 ⟷	10	NOK 500	10

The activity rules allow bidders to switch back and forth between packages with different eligibility, but only if the caps are satisfied

The bidder loses eligibility when switching from 12 B lots to 10 C lots, so its bids for 12 B lots will be subject to a relative cap:

Bid(12 B) ≤ Bid(10 C) + 160

Switching in a CMRA

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	NOK 115	NOK 55	NOK 55	Bid	Activity
10	Quantity:		12 ⟵	10	NOK 660	12

Switch back is allowed as

Bid (12 B) = 660

Bid(10 C) ≥ 500
(from previous headline bid)

So cap is ≥ 500 + 160 = 660

The bid is allowed even if it has activity above the bidder's eligibility, but its eligibility in the next round continues to be 10

Switching in a CMRA

Eligibility	Price:	A lots (2 E.P.) NOK 115	B lots (1 E.P.) NOK 55	C lots (1 E.P.) NOK 60	Bid	Activity
10	Quantity:		12	← 10	NOK 660	12

Bid still allowed

Bid of NOK 500 for 10 C lots remains valid even if it falls below 90% of round prices (in this case NOK 540), because it determines relative caps

Switching in a CMRA

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)		
Eligibility	Price:	*NOK 115*	*NOK 60*	*NOK 60*	Bid	Activity
10	Quantity:		12	10	NOK 720	12

*Bid **only** allowed if bidder raises its bid for 10 C lots to at least NOK 560 to satisfy relative caps (by submitting an additional bid)*

(If the highest bid for 10 C is left at 500, then the relative cap on 12 B would be 500 + 160 = 660, so a bid of 720 would not be allowed)

		A lots (2 E.P.)	B lots (1 E.P.)	C lots (1 E.P.)	Bid	Activity
Eligibility	Price:	*NOK 115*	*NOK 65*	*NOK 60*		
10	Quantity:		12 ←	10	NOK ~~780~~	12

*Switch **not** allowed as this would require a bid for 10 C lots of at least NOK 620, but this is above round prices so the bidder cannot submit this bid*

Questions

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