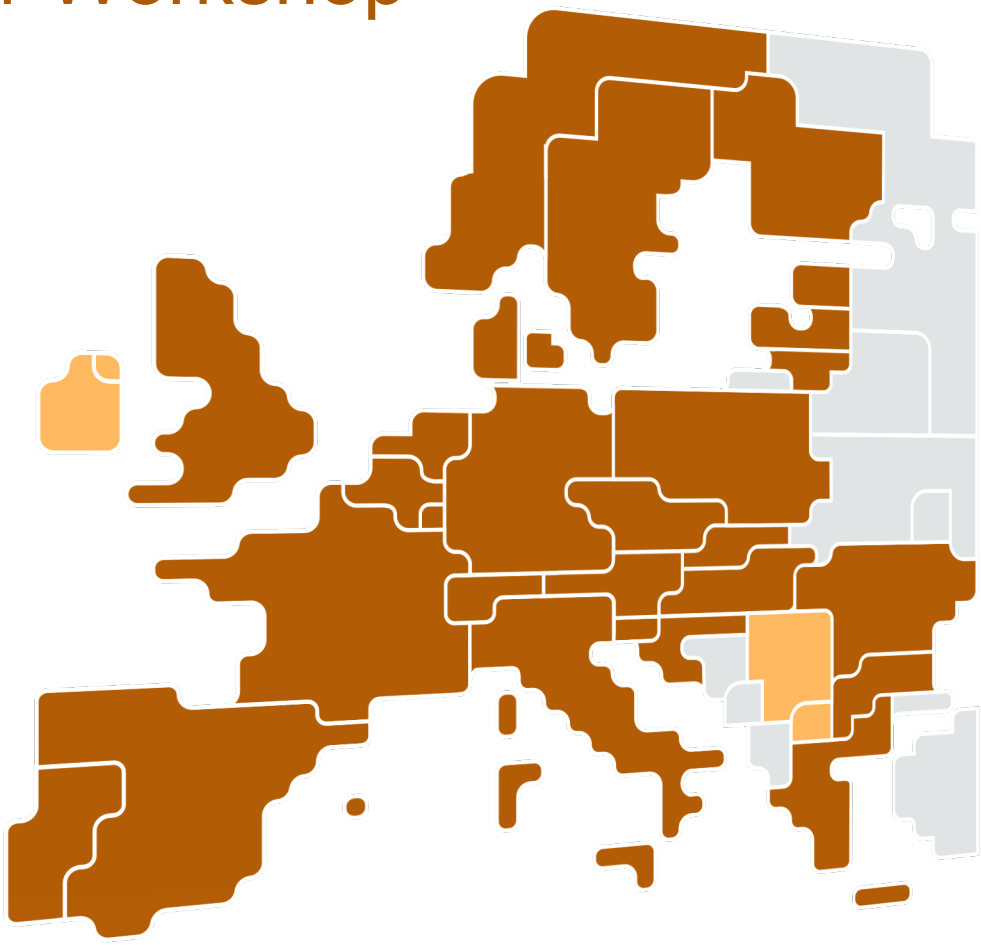
MARI Stakeholder Workshop

18 December 2020

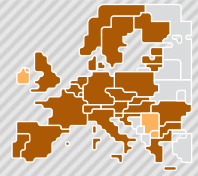
Teleconference



1. Welcome and introduction

Agenda Stakeholder Workshop

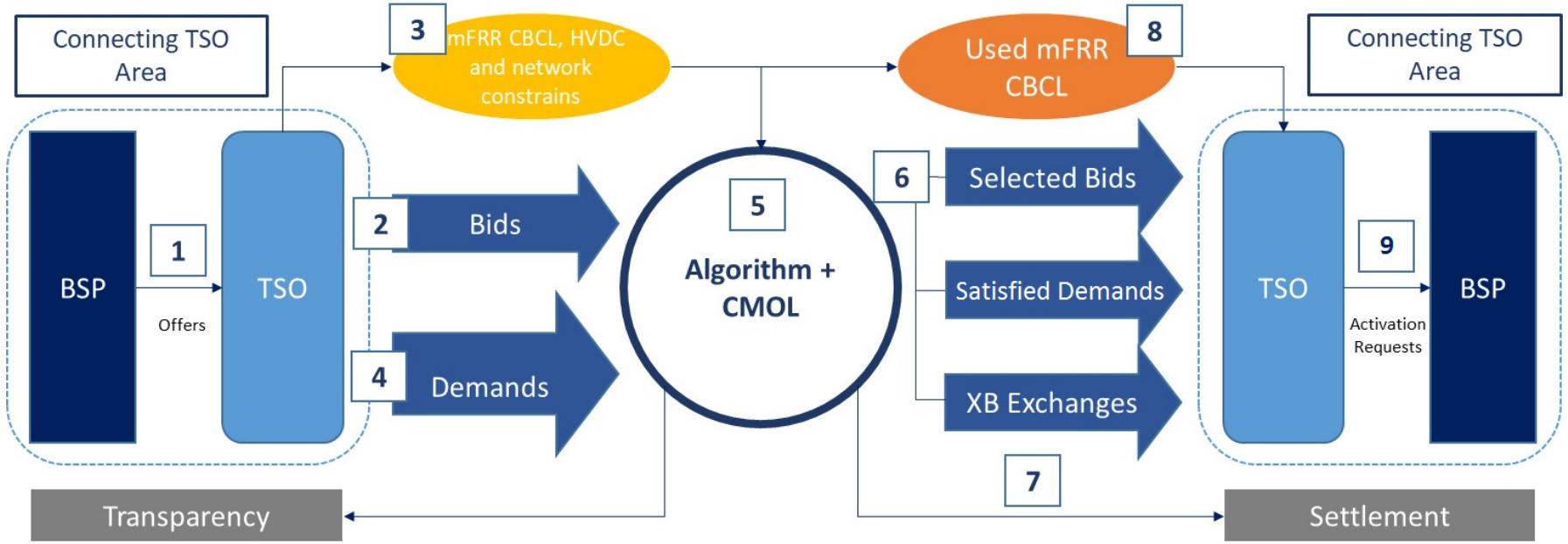
D. CHIM



	SUBJECT	WHO	TIMING
1	Welcome & Introduction	D. CHIM	
2	Functioning rules for Guaranteed Volume	D. CHIM	
3	Technical and Conditional Linking	D. CHIM	
4	AOF rules which has an impact on the selection of the bids	D. CHIM	
5	Accession roadmap	D. CHIM	
#	Closure	D. CHIM	

The mFRR process

General Process of mFRR Activation



1. TSOs receive bids from BSPs in their imbalance area
2. TSOs forward standard mFRR balancing energy product bids to the mFRR Platform
3. TSOs communicate the available mFRR cross border capacity limits (CBCL) and any other relevant network constraints as well HVDC constraints
4. TSOs communicate their mFRR balancing energy demands
5. Optimization of the clearing of mFRR balancing energy demands against BSPs' bids
6. Communication of the accepted bids, satisfied demands and prices to the local TSOs as well as the resulting XB exchanges
7. Calculation of the commercial flows between imbalance areas and settlement of the expenditure and revenues between TSOs
8. Remaining mFRR CBCL are sent to the TSOs
9. TSOs send activation requests to BSPs in their imbalance area

2. Functioning rules for Guaranteed Volume

Introduction: View of macro process

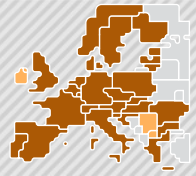
- In **order to keep system's balance**, it is of utmost importance that TSOs can have access when required to a **sufficient reserve capacity on FRR at any time** in accordance with the FRR dimensioning rules.
- In particular, when unforeseen incidents or unexpected demands in real time occur, TSOs need to have an access to a required volume of **"mFRR direct activatable bids"** to perform the Frequency Restoration Process **within the Time To Restore Frequency (TTRF).**
- Therefore, **TSOs will secure enough balancing energy** bids for the direct activation process from their own LFC area **as Guaranteed Volume (GV)** and/or in cooperation with other TSOs (if case of exchange or sharing of reserves agreements).
- Basic principle: TSOs will mark as **direct activation only (unavailable for SA run)** the necessary, the **least competitive, direct activatable volume** of bids and, if required, request an activation through the Platform.
  - This principle can be split into 2 macro steps as follows:

Step 1: marking a volume of bids as DA only (GV)

TSOs identify the volume to be guaranteed and submit the bids marked as direct activation only (GV) unavailable to the SA run

Step 2: activation of bids marked as DA only (GV) via the platform

AOF selects the bids part of GV to be activated in DA run



2. Functioning rules for Guaranteed Volume

The principles applied for step 1

- All TSOs are able to receive two activation types of bids from BSPs:
  - Eligible for scheduled activation only
  - Eligible for scheduled and direct activation

- Each TSO **identify locally** the volume wanted to guarantee in their Local Merit Order List (LMOL) and identify the bids that **need to be marked as DA only for GV purpose**.

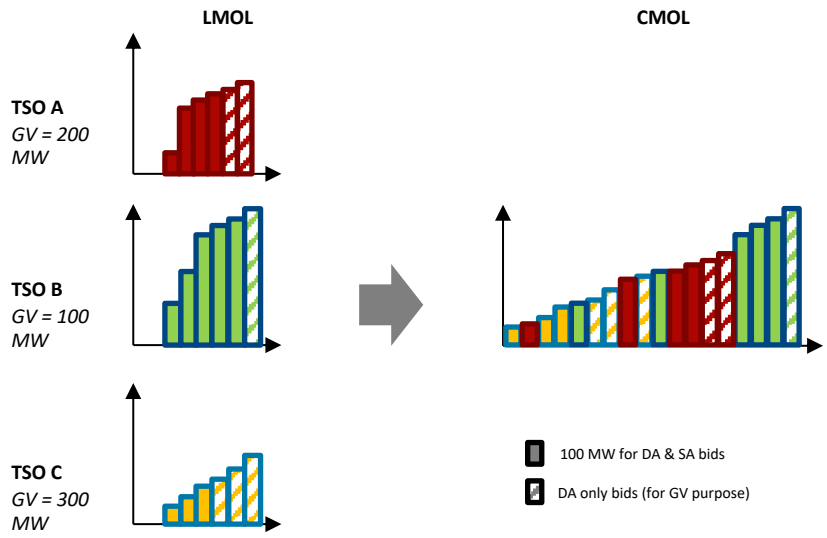
The following principles apply:

- Direction: TSOs will independently identify the upward and downward volume
- Choice of bids: Changes of bids as DA only (GV), in order to respect operational security limits will be possible for the **least competitive** standard mFRR balancing energy product bids of the connecting TSO from “schedule and direct activation” type of bids of their LMOL, according Art.9 (8) - MARI IF
- Volume: On local responsibility of each TSO, according with GV dimensioning rules (defined maximum volume), adapted to specific conditions of each system
- Transparency: GV bids will be published in a specific transparency report generated by MARI platform, at latest 30 min. after each ISP

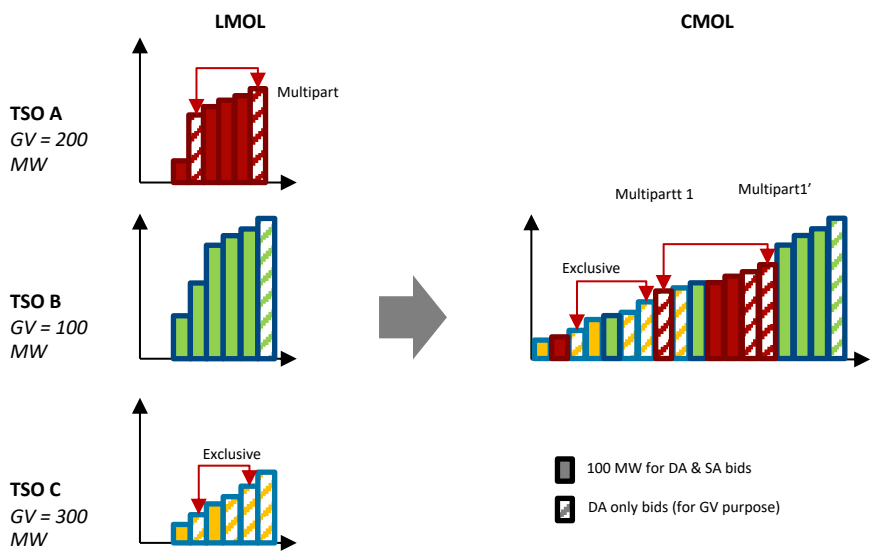
2. Functioning rules for Guaranteed Volume

Illustration of marking bids unavailable for GV

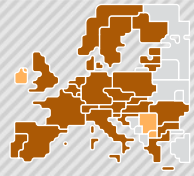
Example 1: case with simple bids



Example 2: case with complex bids



- The marking of simple bids for GV is rather simple and only consider volume (example 1).
- The marking of complex bids (multipart and exclusive bids) for GV is more problematic:
  - When a multipart or exclusive bid is marked for GV, all its components are automatically marked for GV.
- In Direct Activation run all bids which were marked as DA only (for GV) are available for all TSOs.



2. Functioning rules for Guaranteed Volume

Summary

- Guaranteed Volume is **a necessary tool for TSOs to increase system security**.

- The implementation of GV on the MARI platform ensures the **minimum possible interference** in the pan-European, **competitive process of procuring the mFRR balancing energy**.
  - Bids reserved for Guaranteed Volume are not used in Scheduled Activation run.
  - In DA run, all remaining bids (excluding: SA only bids and bids activated in SA run) are put together in order to share amongst all TSOs.

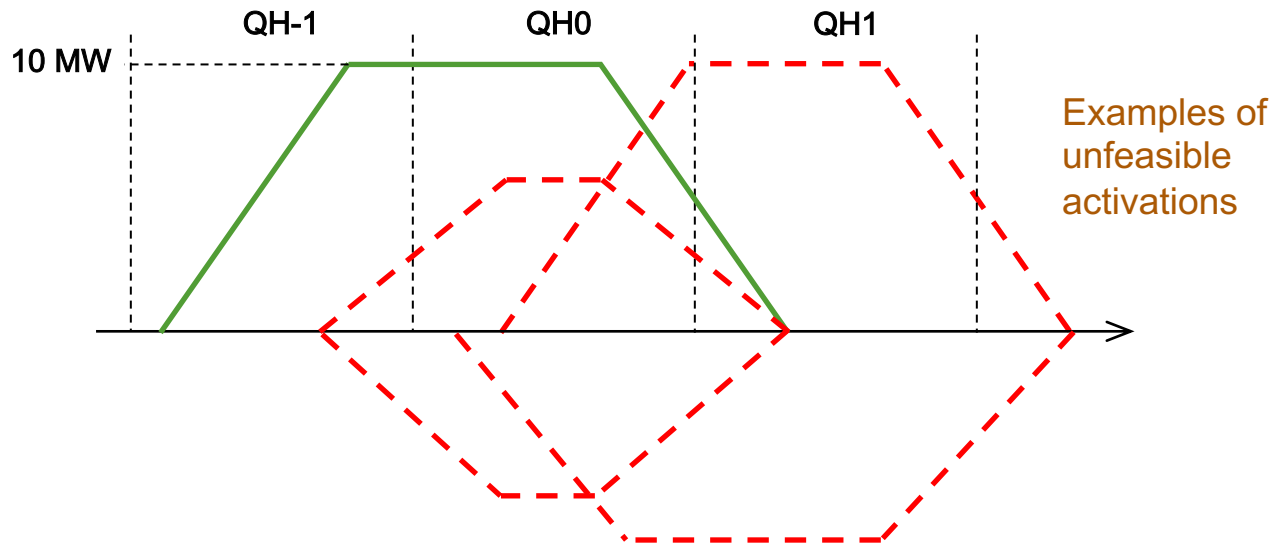
Introduction:

- At gate closing for QH0, the BSP does not know the result of the clearing for DA for QH-1. Therefore, if the bids submitted for QH-1 and QH0 represent the same asset or the same pool the dependencies between those bids have to be communicated to the mFRR platform in order to prevent overlapping or unfeasible activations.

Objective and definition:

- Technical linking ensures that a bid in QH0 is not available for clearing **if the bid in the previous quarter hour was activated in DA**. This is important in order not to activate the same balancing resource twice.
- Technical linkage is the linkage of two bids (simple or complex) in **two subsequent** quarter hours.
- Any bid in QH0 may have technical link to DA bid in QH-1.

Examples:

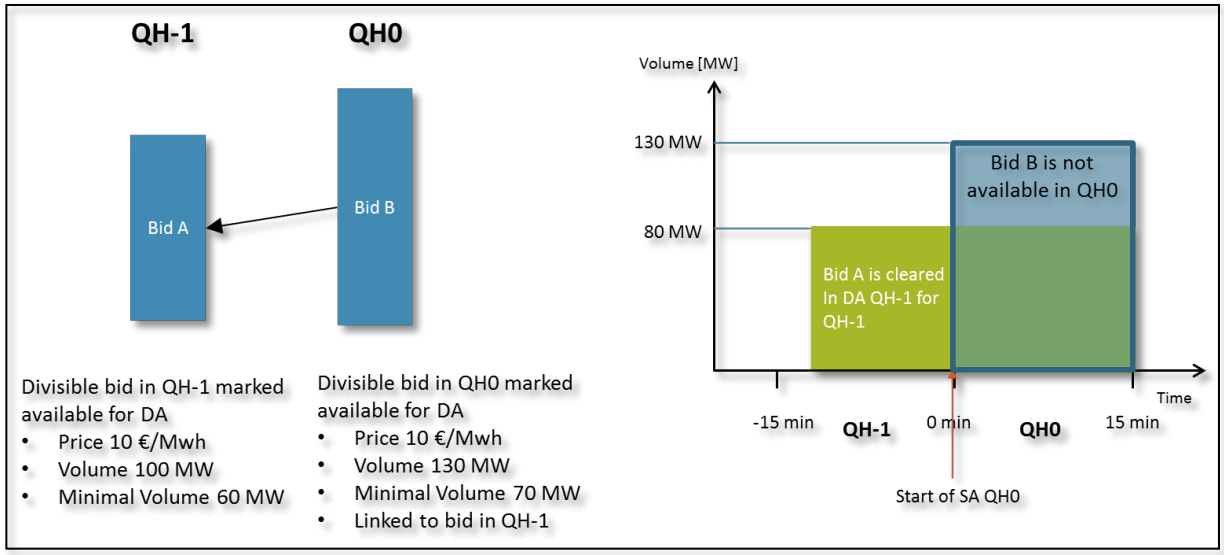


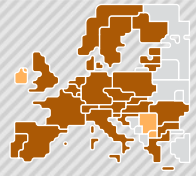
Rule for CMOL function:

- If the bid in QH-1 is subject to DA, the technically linked bid in QH0 will be unavailable (**for SA as well as DA**).

Submission of bids:

- Bids must be identifiable with a unique ID and it remains the responsibility of BSPs to correctly identify their bids, in order to avoid unfeasible activations (e.g. double activation of the same resources)





Introduction:

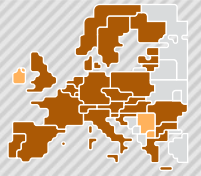
- At gate closing for QH0, the BSPs do not have the knowledge, if their bid in QH-2 was activated in DA or if their bid in QH-1 was activated in SA or DA. Due to constraint of the underlying assets or as a bidding strategy, a bid in QH0 may for example be available / unavailable for clearing if bid in QH-2 was activated in DA or bid in QH-1 was activated in SA.

Objective and definition:

- Conditional linking is a property similar to technical linking and aims to change the availability of a bid in QH0 under certain conditions.
- Conditional linking is a link between (not within one) **two or three** adjacent quarter hours.
- Conditional linking is only applicable to **simple bids**. In a later release of the platform, it can be evaluated, if this function should also include complex bids.
- A given bid in QH0 may have **between zero and three conditional links to bids in QH-1** and/or **between zero and three conditional links to bids in QH-2**. The bid in QH0 becomes either completely unavailable or unavailable for direct activation when at least one of those links indicate unavailability.

Submission of bids :

- Responsibility of the BSPs to ensure that the conditional linking rules reflect the actual technical availabilities of the underlying assets for activation.

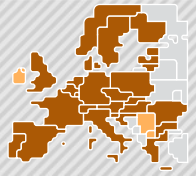


Modelling:

- All bids subject to conditional linking have an initial availability status: they may be either available or unavailable. The conditional linking will turn the initial availability status of bids to the opposite availability status if the condition materializes.
- Types of conditional link:

Nr.	Rule of conditional link[1]	Identification	Code
1	If linked bid is activated, the bid in QH0 is unavailable	u_a	Abb
2	If linked bid is activated, the bid in QH0 is available	a_a	Acc
3	If linked bid is activated in SA, the bid in QH0 is unavailable	u_aSA	Add
4	If linked bid is activated in SA, the bid in QH0 is available	a_aSA	Aee
5	If linked bid is activated in SA, the bid in QH0 is unavailable for DA	uDA_aSA	Aff
6	If linked bid is activated in SA, the bid in QH0 is available for DA	aDA_aSA	Agg
7	If linked bid is activated in DA, the bid in QH0 is unavailable	u_aDA	Ahh
8	If linked bid is activated in DA, the bid in QH0 is available	a_aDA	Aii
9	If linked bid is activated in DA, the bid in QH0 is unavailable for DA	uDA_aDA	Ajj
10	If linked bid is activated in DA, the bid in QH0 is available for DA	aDA_aDA	Akk
11	If linked bid is not activated, the linked bid in QH0 is unavailable.	u_na	All
12	If linked bid is not activated, the linked bid in QH0 is available.	a_na	Amm

- Maximum number of conditional links is 6 (3 between QH0 & QH-1; 3 between QH0 & QH-2).
- Implementation of the rules is the task of individual TSOs. The table contains an example of how to implement the rules.



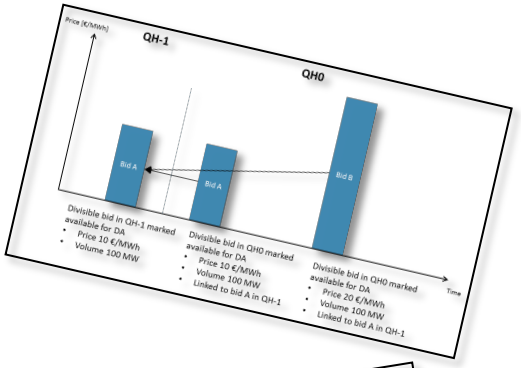
Determination of final bid availability:

- The final availability of a bid for scheduled and/or direct activation may potentially be influenced by up to two different mechanisms, which the mFRR platform will apply in the following descending order of precedence:
  1. Unavailability as foreseen by EB GL art. 29(14), represented by status attribute in BidTimeSeries
  2. Dependencies on associated bids in previous MTU periods due to conditional and/or technical linking, represented by linkedBidIdentification and Linked_BidTimeSeries
- If a bid is subject to both conditional and technical linking and those links would yield different outcomes, the most restrictive result shall apply.

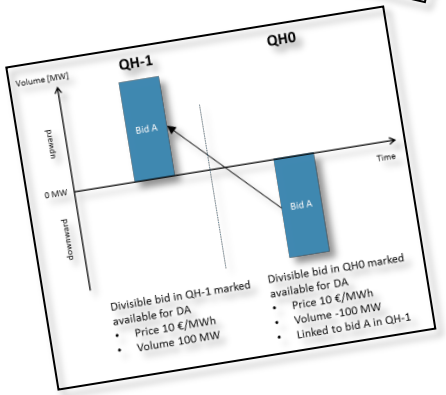
		Initial availability status is available	**Initial availability status is unavailable**
Unavailability by EBGL art. 29(14)		unavailability status from TSO	unavailability status from TSO
Conditional Link + Rule	link 1	At least one bid is unavailable => conditionally linked bid in QH0 unavailable	At least one bid is available => conditionally linked bid in QH0 available
	link 2		
	link 3		
Technical Link	link 4	result from tech. link availability	result from tech. link availability
Final bid availability		At least one condition materialises with unavailability as result => unavailable	At least one condition materialises with unavailability as result => unavailable

Common use cases:

- **Start-up Costs** (economical reason)
  - Conditional bids may be used to model Start-up Costs between[1] MTUs.
  - A BSP submit two upward bids (both of 10MW) with different price.
  - First bid includes start-up & variable costs, second bid with variable costs.
  - The activation of these bids over the MTUs is conditional to the activation of the preceding MTU



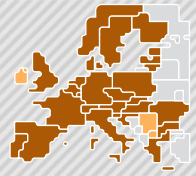
- **Ramping Constraints** (technical reason)
  - Conditional bids may be used where an asset is not able to deliver on an upward bid in QH0 and on a downward bid in QH1.
  - The activation of bids over the MTUs is conditional to the upward and downward ramp-rates of the BSP's power plant.
  - To avoid the occurrence of unfeasible and overlapped market solutions.



- **Hydro Pump-Storage & Batteries** (economical reason)
  - Conditional bids may be used to model water prices for a LER[2], which vary depending on the remaining amount of water in the reservoir between[1] MTUs.

1 start-up costs or different costs within MTU may be modeled by multipart (parent-child) bid.

2 LER – limited energy reservoir



3. Technical and Conditional Linking

Combinations between Technical linking and Conditional Linking

Combinations:

- It is permitted to have **technical links between exclusive and multipart bids** in different MTU periods.
- It is permitted to have **both technical and conditional links between simple bids** (i.e. technical and conditional links between two bids are permitted however in such case both must be simple bids)
- Within a QH0, there **may not be more than one bid** having the **same technical link** to bids in QH-1.
- No technical links are allowed within one MTU.
- No conditional links are allowed within one MTU.

Difference between technical and conditional linking:

- Technical linking is linking between two different MTU periods (i.e. bid in QH0 may be technically linked with bid in QH-1).
- Conditional linking is linking between two or three different MTU periods (i.e. bid in QH0 may be conditionally linked with bid in QH-1 and with bid in QH-2).
- Conditional linking only concerns simple bids, while technical linking also concerns complex bids.

4. AOF rules and inputs which has an impact on the selection of the bids

Overview of the AOF

Inputs of AOF

- CMOL, considering availabilities:
  - for SA, **both upward and downward**;
  - for DA, **one CMOL**
- Inelastic and elastic demands from TSOs
- Available CBCL
- Technical profile and net position limits
- Other (desired flow ranges)

Outputs of AOF

- **Cross-border marginal prices (CBMPs)**
- **Satisfied demands**
- Net position of each scheduling area
- Cross-border flows in the interconnectors (AC and HVDC).
- Remaining cross-border capacity
- **Selected bids (and volume)**
- Execution statistics

Objective Functions

1. Maximize Economic Surplus
2. Minimize cross-border exchanges
3. Maximize traded volume

Market Rules

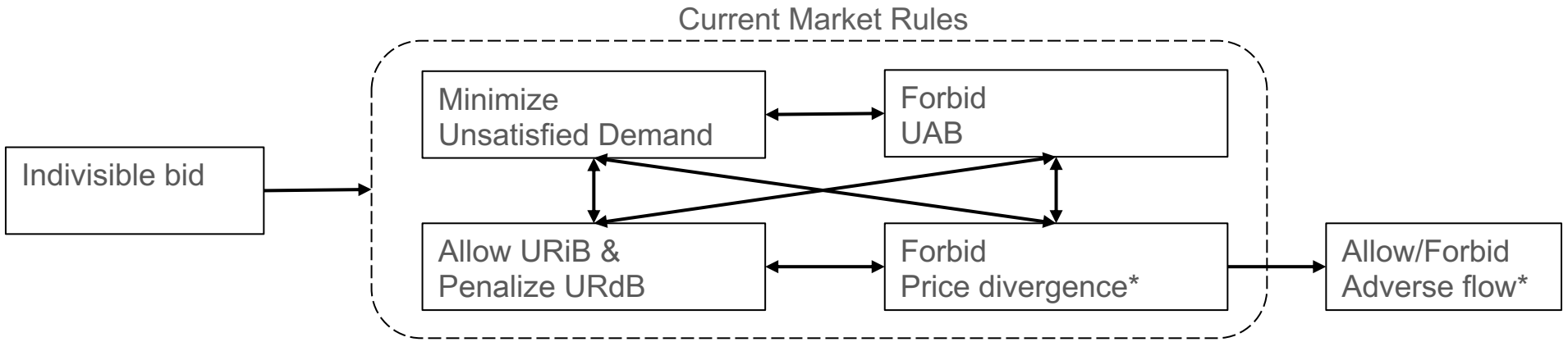
- Maximize satisfaction of inelastic demand
- **Forbid UAB** (unforeseeable accepted bids)
- **Penalization of URdB** (unforeseeable rejected bids)
- Maximize satisfaction of desired flow ranges*
- **Price convergence in uncongested areas***
- **Forbid adverse flows***

* behavior of the AOF in case of DFRs is under analysis

4. AOF rules and inputs which has an impact on the selection of the bids

Context

- The market rules have been discussed and agreed upon amongst the TSOs taking into account:
  - **Impact on algorithm's performance**
  - **Impact on TSO-TSO settlement**
  - **Incentives to market participants**
- All market rules **are interlinked**, a decision on a market rule will have an impact on the probability of occurrence of other market rules.
- All complexities comes from the fact that indivisible bids are allowed
- In general, imposing **a constraint degrades the solution (economic surplus)** to be found by the algorithm
- The following slides aim to **provide an explanation of the market rules and the current design of the TSOs**. The design is **subject to changes** based on additional information becoming available as the algorithm is being developed and tested. TSOs **will keep BSPs informed**.
- The full algorithm description shall be there at the latest 1 month before the Go-Live



UAB: Unforeseeable Accepted Bid
URiB: Unforeseeably Rejected indivisible Bid
URdB: Unforeseeably Rejected fully divisible Bid

Leads to

Mutually influencing

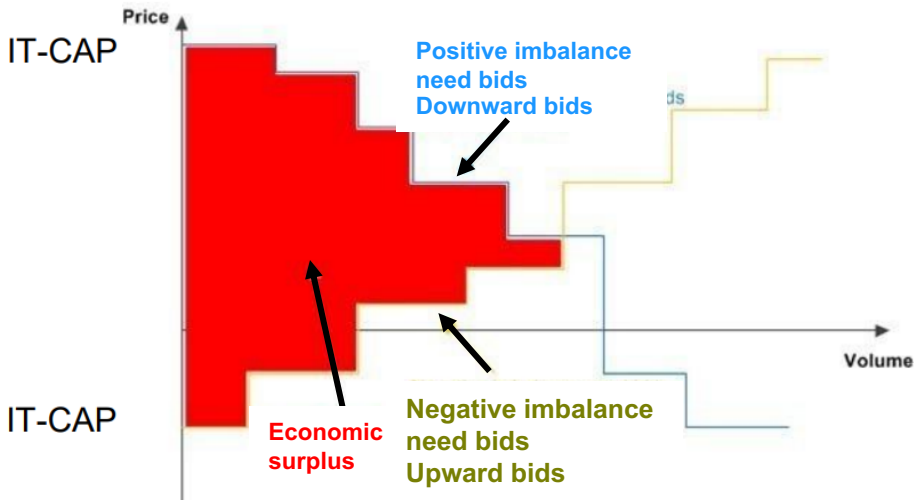
*Market Rules in case of DFR TBC

4.AOF rules and inputs which has an impact on the selection of the bids

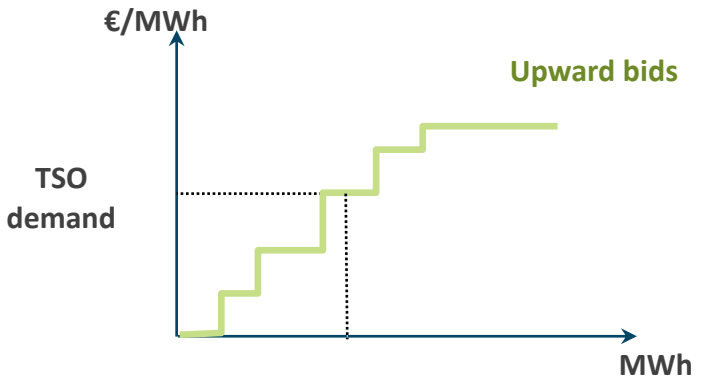
Description of the design and operation of the AOF

The Algorithm Optimization Function (AOF) matches energy demand and supply for all the periods

Scheduled activation



Direct activation

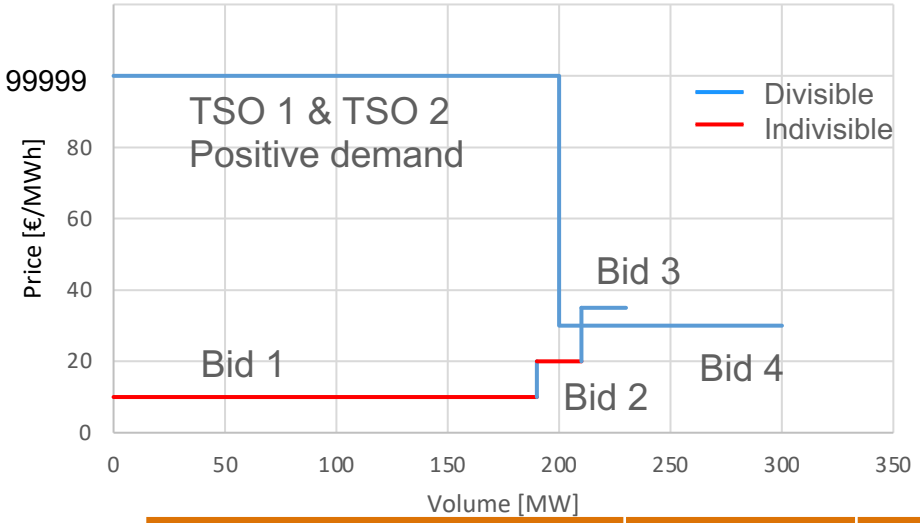


4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Rejected Bids (URB) – indivisible bid/divisible bid

Rule: Allowance of Unforeseeably Rejected (in)divisible bids, i.e. a (in)divisible bid which is in-the-money is not be cleared.

Type	Quantity (MWh)	Price (€/MWh)	Divisibility of Bids
Positive demand (TSO 1)	+100	Inelastic*	--
Positive demand (TSO 2)	+100	Inelastic*	--
Upward Bid (UO BSP1)	+190	10	Indivisible
Upward Bid (UO BSP2)	+20	20	Indivisible
Upward Bid (UO BSP3)	+20	35	Divisible
Downward Bid (UO BSP4)	+100	30	Divisible



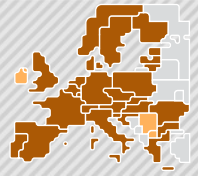
- Divisible bid (partly indivisible) are **treated the same way** as indivisible bids from the AOF point of view
- The presence of **indivisible bid impacts the performance** of the algorithm
- Indivisible bids introduce **unwanted market effects**

Options	CBMP (€/MWh)	Accepted Bid (MW)	Rejected/Not accepted
Option 1: **Allowing** Unforeseen Rejected indivisible Bids	30 (bid 4)	Bid 1 (190), bid 2 (20), bid 4 (-10)	Bid 3
Option 2: **Forbidding** Unforeseen Rejected indivisible Bids	35 (bid 3)	Bid 1, bid 3	Bid 2 (URiB), bid 4

*Economically speaking inelastic demand should be price taker and therefore have an infinite price. From an implementation point of view, the infinite price is modelled by 99'999 €/MWh

4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Rejected Bids (URB) – indivisible bid/divisible bid



Rule: Allowance of Unforeseeably Rejected (in)divisible bids, i.e. a (in)divisible bid which is in-the-money may not be cleared.

Economic surplus (€)						
	Option 1: Allow URiB			Option 2: Disallow URiB		
CBMP	30€/MWh			35€/MWh		
Total	+20'006'400	-8'600	=19'997'800	+20'006'800	-9'150	= 19'997'550
TSO 1 Surplus	+100*99'999	-100*30	=9'996'900	+100*99'999	-100*35	= 9'996'400
TSO 2 Surplus	+100*99'999	-100*30	=9'996'900	+100*99'999	-100*35	= 9'996'400
BSP 1 Surplus	+190*30	-190*10	=3'800	+190*35	-190*10	= 4'750
BSP 2 Surplus	+20*30	-20*20	=200	**(URiB@20€/MWh)**		
BSP 3 Surplus	**Bid not selected @35€/MWh**			10*35	-10*35	=0
BSP 4 Surplus	+10*30	-10*30	=0	**Bid not selected – sufficient volume**		

The TSOs have chosen Option 1: Allow Unforeseeably Rejection of indivisible Bid:

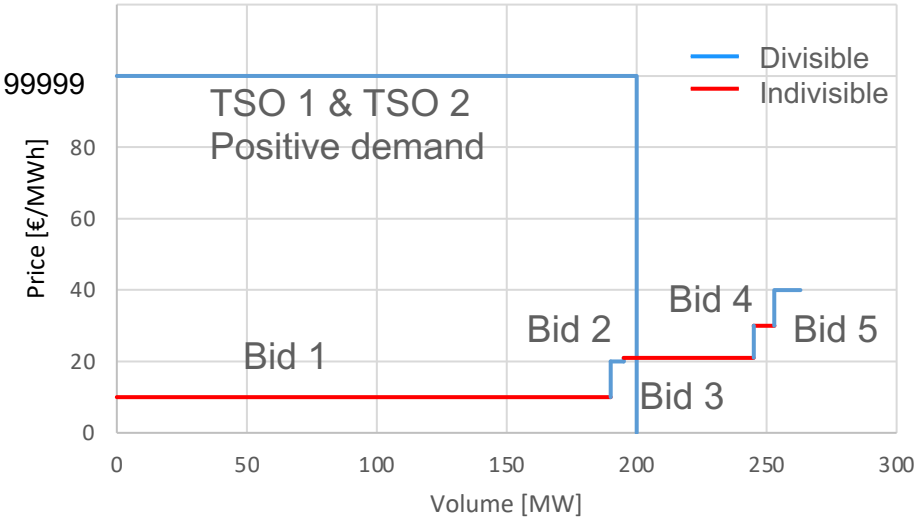
- To incentivize BSPs to bid as less as possible indivisible bid, which leads to reduce impact on algorithm performance.
- Generally better economic surplus.

4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Rejected Bids (URB) – Fully divisible bid

Rule: Penalization of Unforeseeably Rejected fully divisible Bid, i.e. the rejection of fully divisible bid deep in-the-money shall be minimized.

Type	Quantity (MWh)	Price (€/MWh)	Divisibility of Bids
Positive demand (TSO 1)	+100	Inelastic*	--
Positive demand (TSO 2)	+100	Inelastic*	--
Upward Bid (UO BSP1)	+190	10	Indivisible
Upward Bid (UO BSP2)	+5	20	Divisible
Upward Bid (UO BSP3)	+50	21	Indivisible
Upward Bid (UO BSP4)	+7	30	Indivisible
Upward Bid (UO BSP5)	+10	40	Divisible



- Generally, having a **large proportion of fully divisible** bid helps to find a solution (compared to having indivisible bid)
- Fully divisible bid and indivisible bid can theoretically both be rejected (due to better economic surplus) but **does not provide clear and understandable clearing solution to the market.**

Options	CBMP (€/MWh)	Accepted Bid (MW)	Rejected/Not accepted
Option 1: **Allowing** Unforeseen Rejected Divisible Bids	30 (bid 4)	Bid 1 (190), bid 2 (3, Partly activated), bid 4 (7)	Bid 3 (URiB), Bid 5
Option 2: **Forbidding** Unforeseen Rejected Divisible Bids	40 (bid 5)	Bid 1, bid 2 (URdB), bid 5 (5, Partly activated)	Bid 3 (URiB), Bid 4 (URiB)

4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Rejected Bids (URB) – Fully divisible bid [1/2]

Rule: Penalization of Unforeseeably Rejected fully divisible Bid, i.e. the rejection of fully divisible bid deep in-the-money shall be minimized.

Economic surplus (€)						
	Option 1: Allow URdB			**Option 2:** Disallow URdB		
CBMP	30 €/MWh			40 €/MWh		
Total	+20'005'800	-8'170	=19'997'630	+20'007'800	-10'200	= 19'997'600
TSO 1 Surplus	+100*99'999	-100*30	= 9'996'900	+100*99'999	-100*40	= 9'995'900
TSO 2 Surplus	+100*99'999	-100*30	= 9'996'900	+100*99'999	-100*40	= 9'995'900
BSP 1 Surplus	+190*30	-190*10	=3'800	+190*40	-190*10	= 5'700
BSP 2 Surplus	+3*30	-3*20	=30	+5*40	-5*20	=100
BSP 3 Surplus	**URiB @ 21€/MWh**			**URiB @ 21€/MWh**		
BSP 4 Surplus	+7*30	-7*30	=0	**URiB @ 30€/MWh**		
BSP 5 Surplus	**Bid not selected – sufficient volume**			+5*40	-5*40	=0

The TSOs have chosen Option 1: Allow Unforeseeably Rejection of fully divisible Bid but penalize such occurrences to have a trade-off between incentives to BSP and algorithm performance.

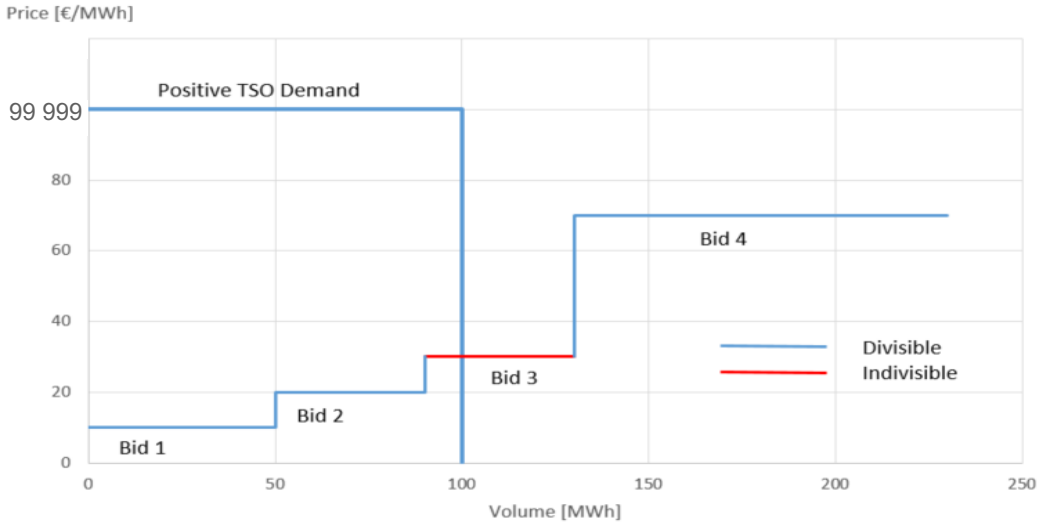
- To incentivize BSPs to bid as much as possible fully divisible bid.
  - Only the marginal bid can be rejected
  - All other fully divisible bids will be accepted.
- A larger penalty is placed on bids which are deeper in-the-money

4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Accepted Bids (UAB) – indivisible bid/divisible bid

Rule: Forbidding Unforeseeably Accepted Bids, i.e. bids which are out-of-the-money are never accepted.

Type	Area	Volume (MWh)	Price (€/MWh)
Positive demand (short TSO)	TSO 1	+100	Inelastic
Upward divisible bid 1	TSO 1	+50	10
Upward divisible bid 2	TSO 1	+40	20
Upward indivisible bid 3	TSO 1	+40	30
Upward divisible bid 4	TSO 1	+100	70



- Having a UAB means **that another bid than the marginal bid sets the CBMP**. The marginal bid is therefore out-of-the-money.
- UAB happens due to indivisible bids and its interaction with the objective function.

Options	CBMP (€/MWh)	Accepted Bid	Rejected/Not accepted
Option 1: Allow UAB	20 (bid 2)	Bid 1, bid 2, bid 3 (UAB)	Bid 4
Option 2: Disallow UAB => Allow URdB	30 (bid 3)	Bid 1, bid 2 (URdB), bid 3	Bid 4
Option 3: Disallow UAB and URdB => Allow URiB	70 (bid 4)	Bid 1, bid 2, bid 4	Bid 3 (URiB)

4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Unforeseeably Accepted Bids (UAB) – indivisible bid/divisible bid

Rule: Forbidding Unforeseeably Accepted Bids, i.e. bids which are out-of-the-money are never accepted

Economic surplus (€)									
	Option1: Allow UAB			**Option: 2 Disallow UAB => Allow URdB**			**Option 3: Disallow UAB and URdB => Allow URiB**		
CBMP	20€/MWh			30€/MWh			70€/MWh		
Total	10'001'900	-3'900	=9'998'000	10'002'900	-4'900	=9'998'000	10'006'900	-9'000	=9'997'900
TSO Surplus	+100*99'999	-100*20	=9'997'900	+100*99'999	-100*30	=9'996'900	+100*99'999	-100*70	=9'992'900
BSP 1 Surplus	+50*20	-50*10	=500	+50*30	-50*10	= 1'000	+50*70	-50*10	= 3'000
BSP 2 Surplus	+10*20	-10*20	= 0	+10*30 **partial URdB of 30 MW**	-10*20	= 100	+40*70	-40*20	= 2'000
BSP 3 Surplus	+40*20	-40*30	=-400 **UAB @30€/MWh**	+40*30	-40*30	=0	**URiB @30€/MWh**		
BSP 4 Surplus	**Bid not selected – sufficient volume**			**Bid not selected – sufficient volume**			+10*70	-10*70	=0

The TSOs have chosen a hybrid solution between Option 2 and 3, i.e. URdB are allowed but penalized and at the same time URiB are allowed.

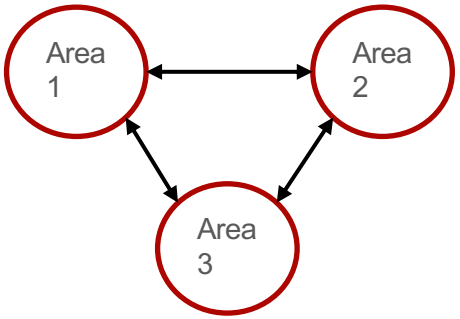
- The rule on URiB is strictly enforced while the market rule on URdB is enforced as much as possible.
- The main rationale is to avoid UAB which leads to complex TSO-TSO settlement process and difficult to explain market clearing results.

4.AOF rules and inputs which has an impact on the selection of the bids

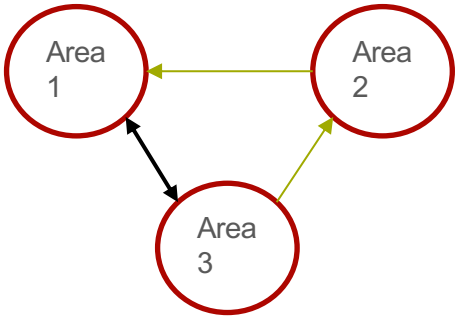
Market rules: Enforce price convergence in uncongested areas*

*Market Rules in case of DFR TBC

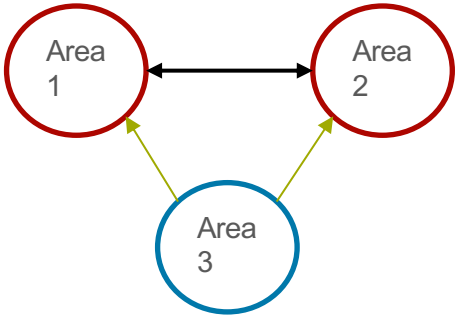
Based on the definition of 'uncongested area' ** and based on the pricing proposal, an uncongested area should have a unique CBMP for the whole area.



- If no allocation constraint or restriction on CBCL, $CBMP_{area1} = CBMP_{area2} = CBMP_{area3}$



- If there are partial restriction, such as $CBCL_{2->3}$ and/or $CBCL_{1->2} = 0$, $CBMP_{area1} = CBMP_{area2} = CBMP_{area3}$ since there is still a "path" within the area to exchange the energy between the 3 areas



- If there is a restriction such as an exchange cannot be done anymore (export from area 1 or 2 to area 3) while it could bring additional surplus, such as $CBCL_{1->3}$ and $CBCL_{2->3} = 0$, then $CBMP_{area1} = CBMP_{area2} \neq CBMP_{area3}$

CBCL from-to

**means the widest area, constituted by bidding zones, where the exchange of balancing energy and the netting of demands is not restricted by the cross-zonal capacities or by the allocation constraints, during a specific market time unit.

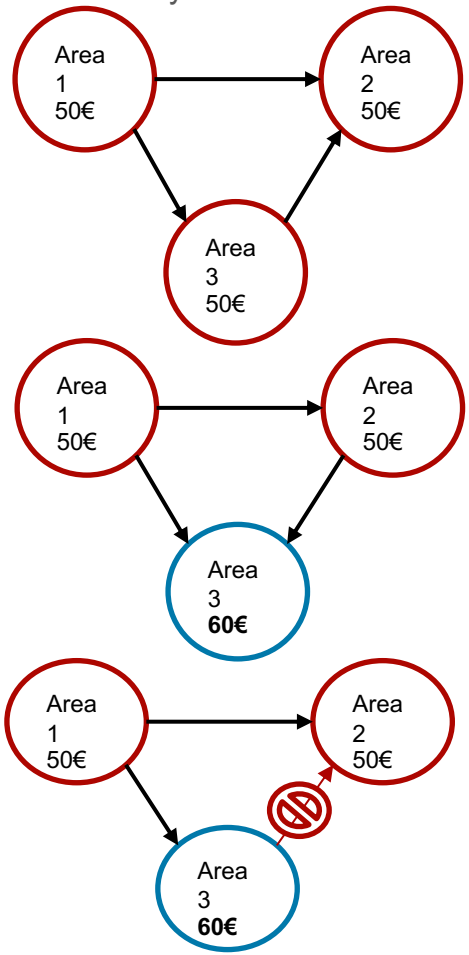
4.AOF rules and inputs which has an impact on the selection of the bids

Market rules: Forbid adverse flows*

*Market Rules in case of DFR TBC

Adverse flow or counter-intuitive flow are flows from high price area to low price area.

- In a general setting, this behaviour is not wishable even though it may increase the economic surplus as it is not an intuitive behaviour.
- In case of Desired Flow Range, counter-intuitive flow may be required to secure the grid. In this specific situation, counter-intuitive flow may be warranted.



No flow restriction since all areas are part of the same uncongested area

Area 3 is importing from both area 1 and area 2 until CBCL = 0 on both border.

Another bid in area 3 has been activated to satisfy the demand and therefore set a different CBMP for area 3.

Export from area 3 to area 2 is not possible since counter-intuitive flows are forbidden (except of DFR).

4. AOF rules and inputs which has an impact on the selection of the bids

Context on allocation constraints

On top of CBCL, additional constraints are necessary for TSOs to secure the grid. The need for those additional constraints comes from:

- Some imperfection in the modelling of the grid and flows (ATC world).
- Operational security limits, other than thermal limits.

3 types of allocation constraints could be implemented in the context of MARI:

- Desired flow range
- Technical Profile
- Net Position Limit

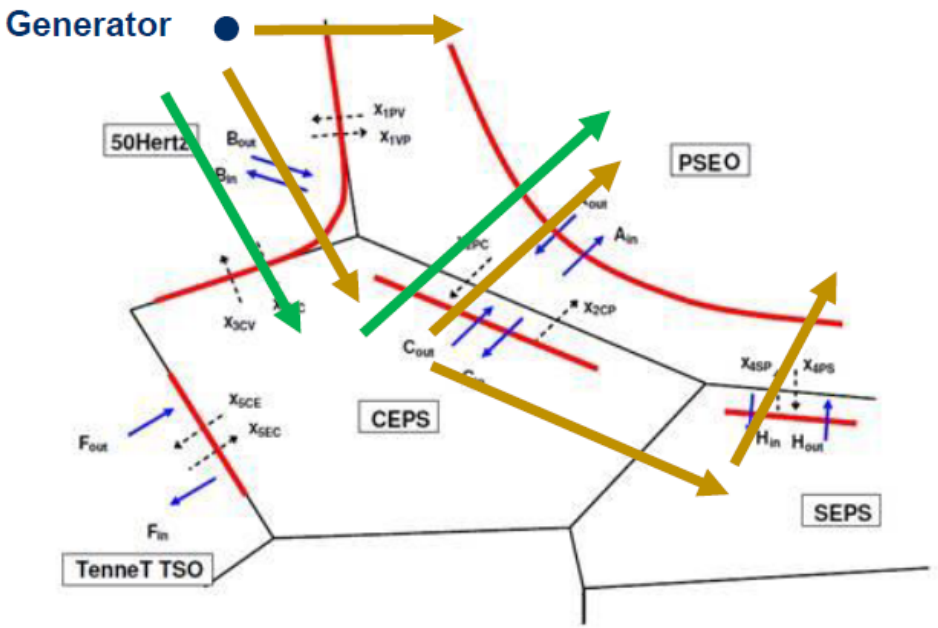
As any constraints and similarly to CBCL, if the constraints are limiting an allocation the MARI region will be split into several uncongested areas and have different CBMPs.

The TSOs will publish transparently the allocation constraint in place, similarly to the CBCL.

Example

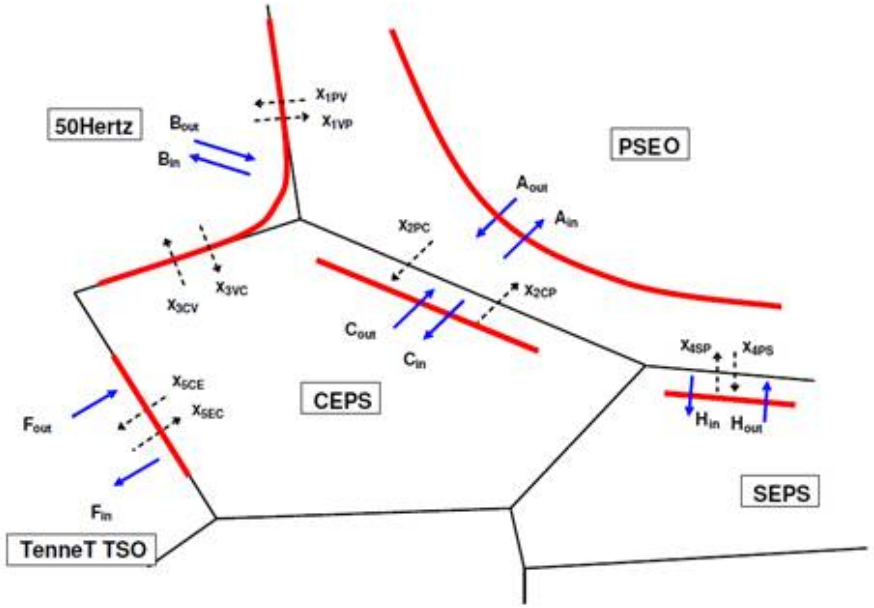
Commercial flow

Physical flow



- In the ATC world (without full coordination of the calculation and allocation process) the allocation of cross zonal capacities takes place without taking into account physical flows
- As an example, real source of energy injection to Poland may be realized from resources located in the other neighbouring bidding zone than it results from the allocation process
- To ensure security of the system operation, capacities offered to the market are calculated for the technical profile, so taking into account unknown location of resources
- It is inefficient to split technical profile into individual borders. The split shall result from the market as market results. Ex ante split can be not in line with market value of the individual borders

Example



- Technical profile refers to the Polish synchronous borders
- Consist of two constraints, common for all synchronous borders:
  - One for import ATCIMP

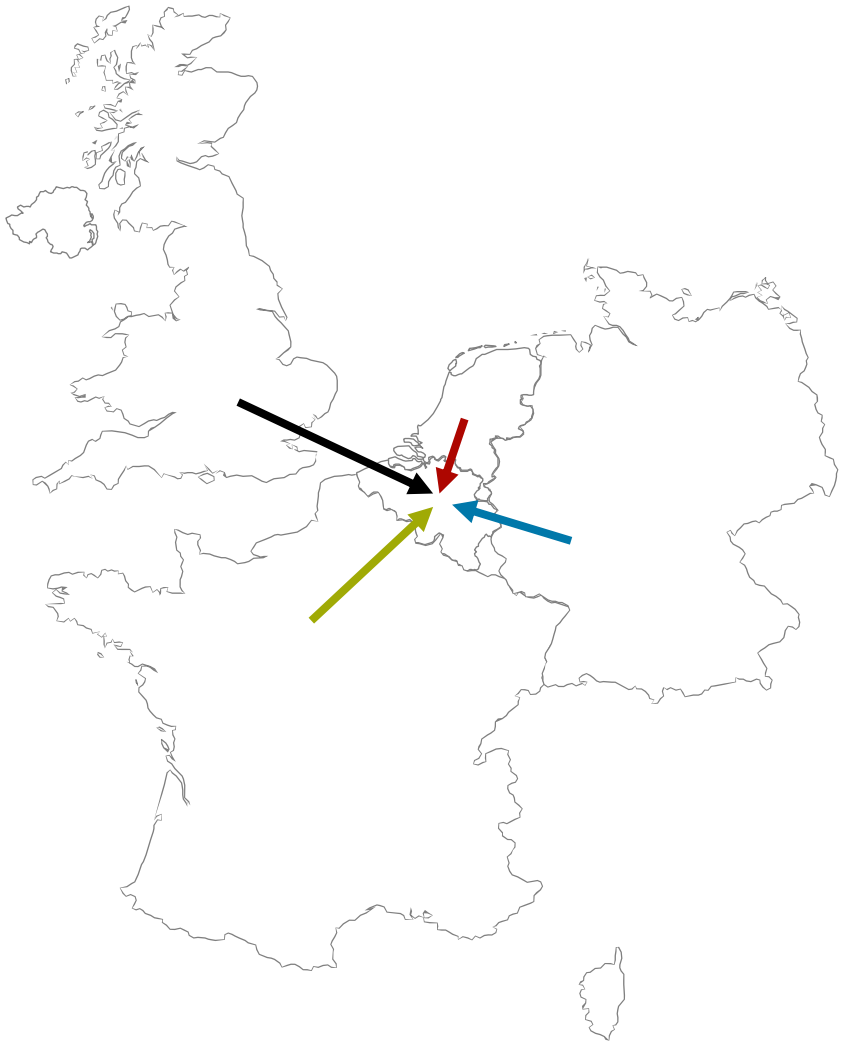
    DE→PL+CZ →PL+SK →PL ≤ ATCIMP
  - One for export ATCEXP

    DE←PL+CZ ← PL+SK ← PL ≤ ATCEXP
- To be applied in all explicit cross-zonal capacity allocation processes
  - Long Term (operational)
  - Day-Ahead (operational)
  - Intraday (in implementation)

4. AOF rules and inputs which has an impact on the selection of the bids

Net Position Limit

Example



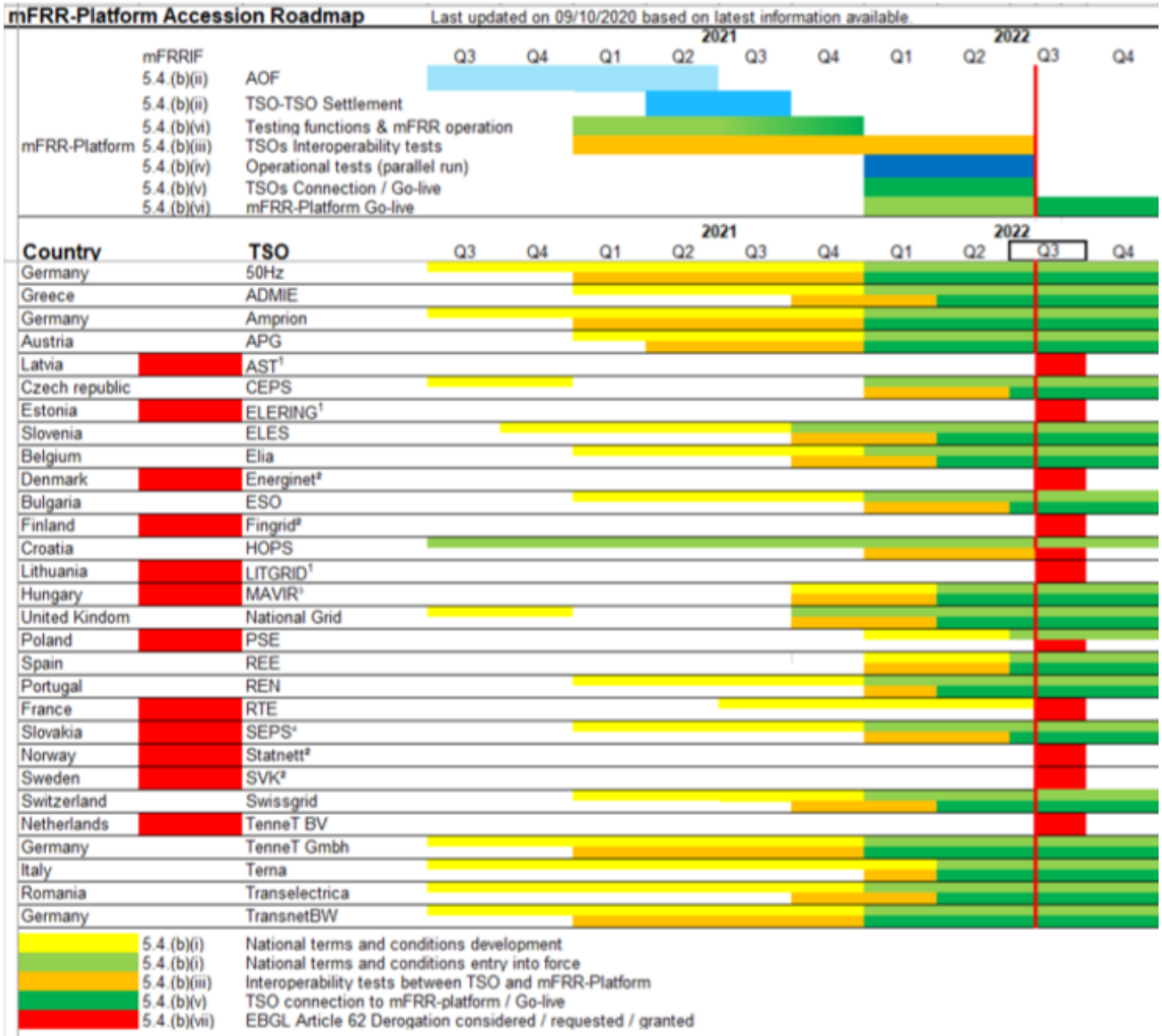
- Elia wishes to implement is a Net Profile Limit on import
  - Maximum import capacity is limited, regardless of the CBCLs available.
- Such limit already exists in previous timeframe and is currently included in Capacity Calculation Methodology.

The limit (constraint) is on **Net Position** :

FR→BE + GB→BE + NL→BE + DE→BE ≤ NP_{Import}

- This constraint is used in order to ensure stability of the system.
- This constraint does not prevent transit flows.

5. Accession roadmap



Accession Roadmap V2

Baltic TSOs connection

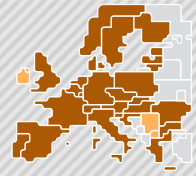
- Expected Q2 2023 – Q2 2024
- Nordic TSOs connection
- Expected Q3 2023 – Q2 2024

RTE, PSE and TenneT NL

- Connection date undisclosed

MAVIR and SEPS

- Considering derogation



Closure

Request for Feedback

- Participants are kindly requested to provide a short feedback to the workshop:
  - Was it complete
  - Was it clear
  - Was it satisfactory
  - If not, or not 100%, to provide comments
- Link to survey will be distributed via the general chat, and will remain open for 1 hour

Start-up Costs example:

- Start-up cost = 9 €/MWh => „Start/up bid“ price = 9 + 1 €/MWh = 10 €/MWh
- Variable cost = 1 €/MWh => „Variable bid“ price = 1 €/MWh
- Bids a0, a1, a2, ..., an are available per default
- Bids b0, b1, b2, ..., bn are unavailable per default

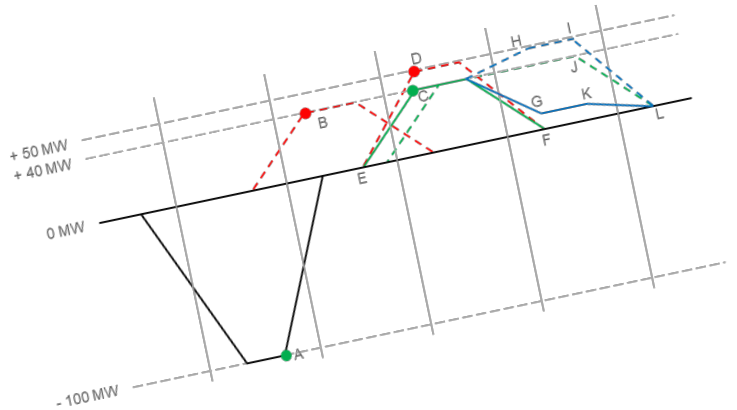
Use Case: **Start-up and Variable Costs**

	QH-2				QH-1				QH-0			
Unique bid Identifier	a0		b0		a1		b1		a2		b2	
Volume	10		10		10		10		10		10	
Price	10		1		10		1		10		1	
Activation type	SA+DA		SA		SA+DA		SA		SA+DA		SA	
Bid Direction	Upward		Upward		Upward		Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Available		Unavailable		Available		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule
					a0	u_a	a0	a_aSA	a1	u_a	a1	a_aSA
					b0	u_a	b0	a_aSA	b1	u_a	b1	a_aSA
									a0	u_aDA	a0	a_aDA
									b0	u_aDA	b0	a_aDA

Legend for Conditional Linking		**Legend for Technical Linking**	
u_a	Linked bid was activated => bid unavailable in QH0		
a_aSA	Linked bid was activated in SA => bid available in QH0		
u_aDA	Linked bid was activated in DA => bid unavailable in QH0		
a_aDA	Linked bid was activated in DA => bid available in QH0		

Ramping Constraints example:

- Min/max range: +50 / - 100 MW
- Ramp rate: +4 MW/min / -10MW/min
- Bids a0, a1, a2, ..., an are available per default
- Bids b0, b1, b2, ..., bn are unavailable per default
- Bids c0, c1, c2, ..., cn are available per default



Use Case: **Ramping Constraints**

	QH-2						QH-1						QH-0					
Unique bid Identifier	a0		b0		c0		a1		b1		c1		a2		b2		c2	
Volume	40		10		100		40		10		100		40		10		100	
Price	10		20		-5		10		20		-5		10		20		-5	
Activation type	SA+DA		SA		SA+DA		SA+DA		SA		SA+DA		SA+DA		SA		SA+DA	
Bid Direction	Upward		Upward		Downward		Upward		Upward		Downward		Upward		Upward		Downward	
Initial availability status	Available		Unavailable		Available		Available		Unavailable		Available		Available		Unavailable		Available	
Conditional Link + Rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule
							c0	u_a	a0	a_a	a0	u_a	c1	u_a	a1	a_a	a1	u_a
													c0	u_aDA	a0	a_aDA	b1	u_a
																	a0	u_aDA
																	b0	u_aDA
Technical Link + Rule							a0	tech.			c0	tech.	a1	tech.			c1	tech.

Legend for Conditional Linking		**Legend for Technical Linking**	
u_a	Linked bid was activated => bid unavailable in QH0	tech.	DA activation in QH-1 => bid unavailable in QH0
a_a	Linked bid was activated => bid available in QH0		
u_aDA	Linked bid was activated in DA => bid unavailable in QH0		
a_aDA	Linked bid was activated in DA => bid available in QH0		

Hydro Pump-Storage & Batteries example:

- Min/max range: +100 / 0 MW
- Bids a0, a1, a2, ..., an are available per default
- Bids b0, b1, b2, ..., bn are unavailable per default
- Bids c0, c1, c2, ..., cn are unavailable per default

3x the same bid with different price

only 1 can be activated

Combinations in SA

QH-2			QH-1			QH-0		
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2
a0	b0	C0	a1	b1	c1	a2	b2	c2

Use Case: **Hydro power plants**

	QH-2					
Unique bid Identifier	a0		b0		c0	
Volume	100		100		100	
Price	10		20		30	
Activation type	SA+DA		SA+DA		SA+DA	
Bid Direction	Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule

	QH-1					
Unique bid Identifier	a1		b1		c1	
Volume	100		100		100	
Price	10		20		30	
Activation type	SA+DA		SA+DA		SA+DA	
Bid Direction	Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule
	a0	u_a	a0	a_aSA		

	QH-0					
Unique bid Identifier	a2		b2		c2	
Volume	100		100		100	
Price	10		20		30	
Activation type	SA+DA		SA+DA		SA+DA	
Bid Direction	Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule
	a1	u_a	a1	a_aSA	b1	a_aSA
	b1	u_a	a0	a_aDA	b0	a_aDA
	a0	u_aDA				
	b0	u_aDA				

	QH+1					
Unique bid Identifier	a3		b3		c3	
Volume	100		100		100	
Price	10		20		30	
Activation type	SA+DA		SA+DA		SA+DA	
Bid Direction	Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule
	a2	u_a	a2	a_aSA	b2	a_aSA
	b2	u_a	a1	a_aDA	c2	a_aSA
	c2	u_a			b1	a_aDA
	a1	u_aDA			c1	a_aDA
	b1	u_aDA				
	c1	u_aDA				

Legend for Conditional Linking		**Legend for Technical Linking**	
u_a	Linked bid was activated => bid unavailable in QH0		
a_aSA	Linked bid was activated in SA => bid available in QH0		
u_aDA	Linked bid was activated in DA => bid unavailable in QH0		
a_aDA	Linked bid was activated in DA => bid available in QH0		