

Design choices for future imbalance pricing in the Nordics with MARI and Picasso

14.12.22

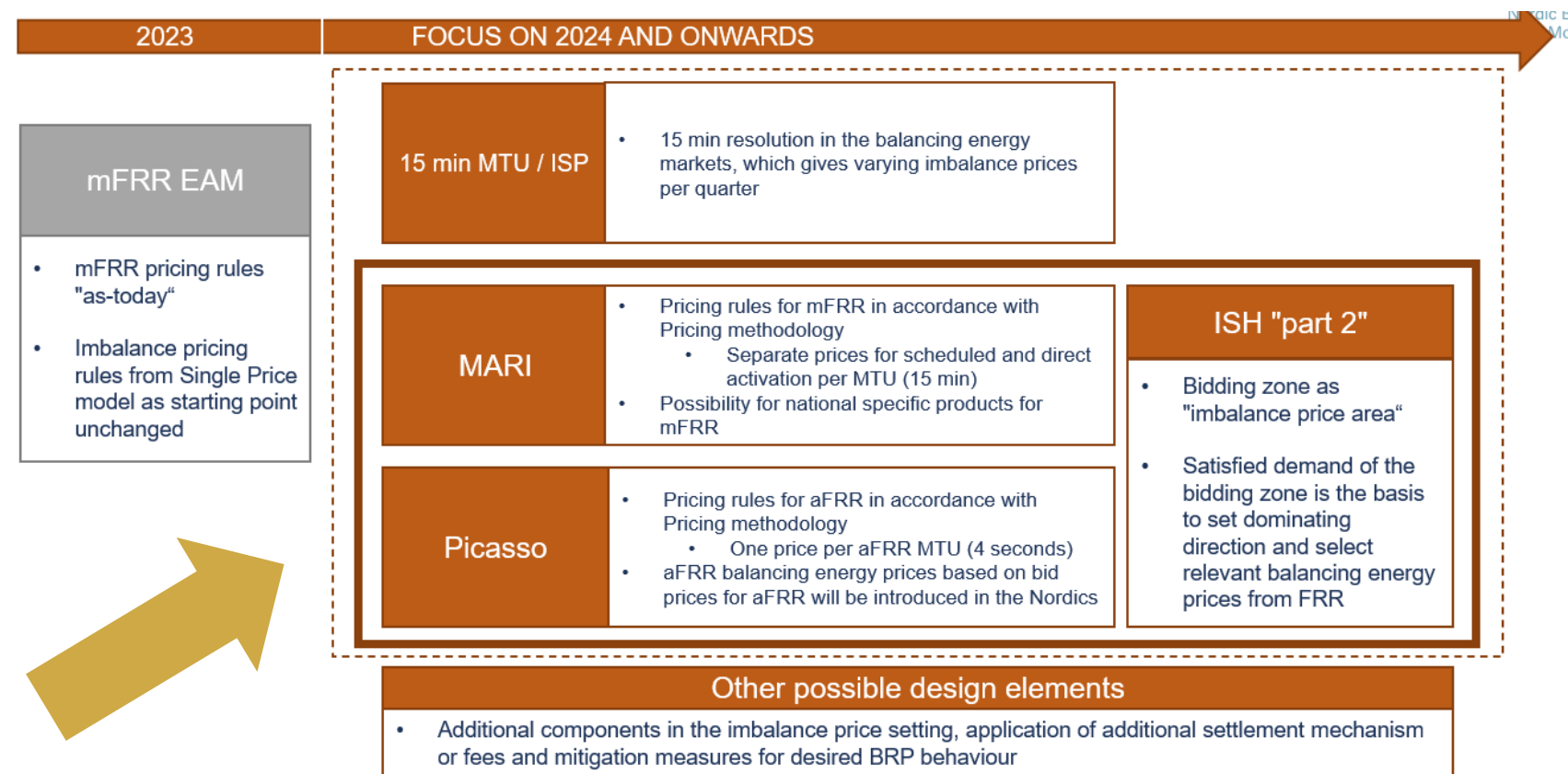
NBM stakeholder reference group

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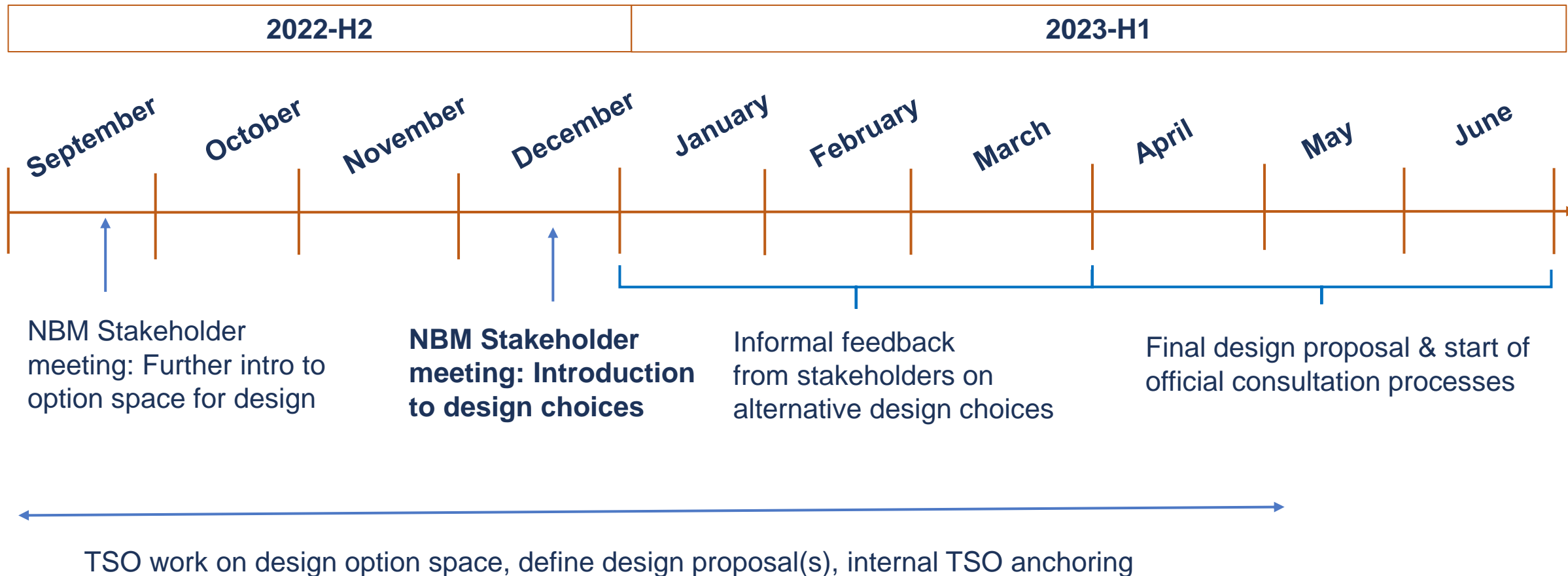
Agenda

- Time line and work so far
- Design options and choices
- Examples
- Summary and preliminary findings
- Next steps

Need for new imbalance pricing design when we enter into MARI and Picasso

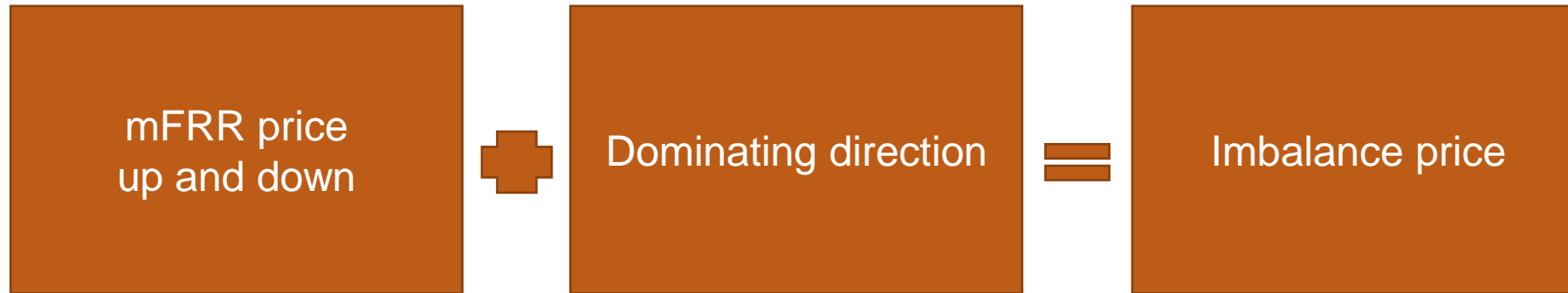


Timeline for TSO work and stakeholder interaction



Design options and key choices we need to make

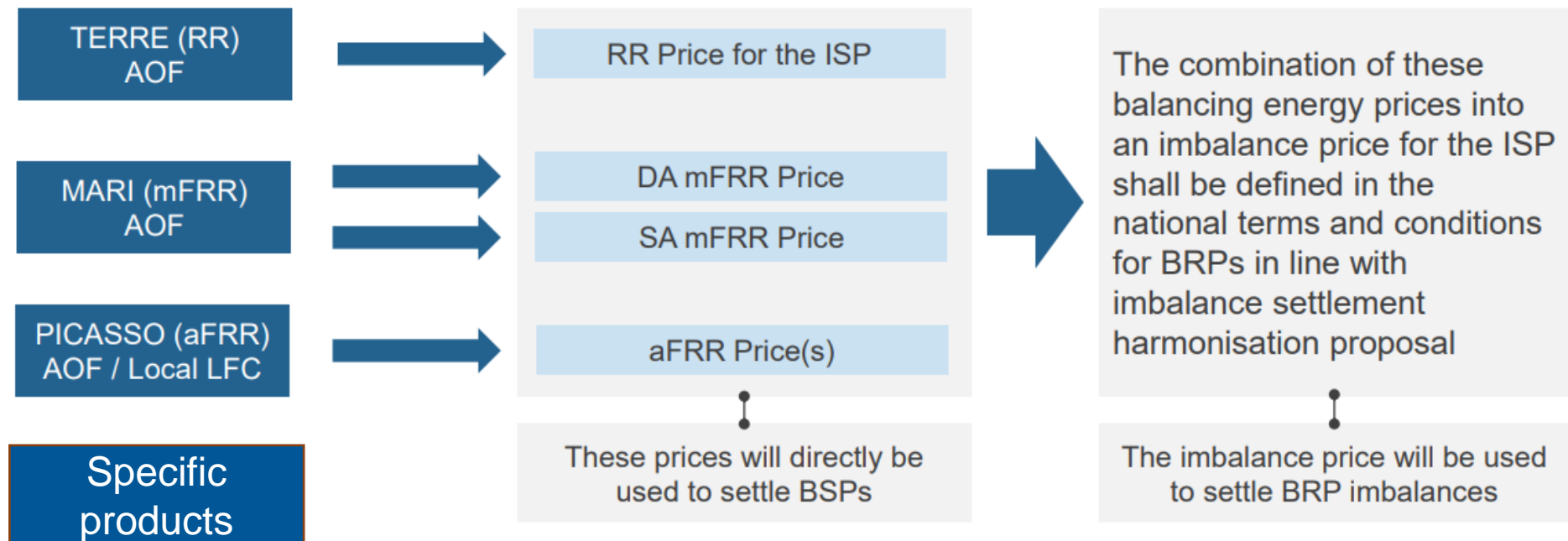
Current design – why can't we keep it?



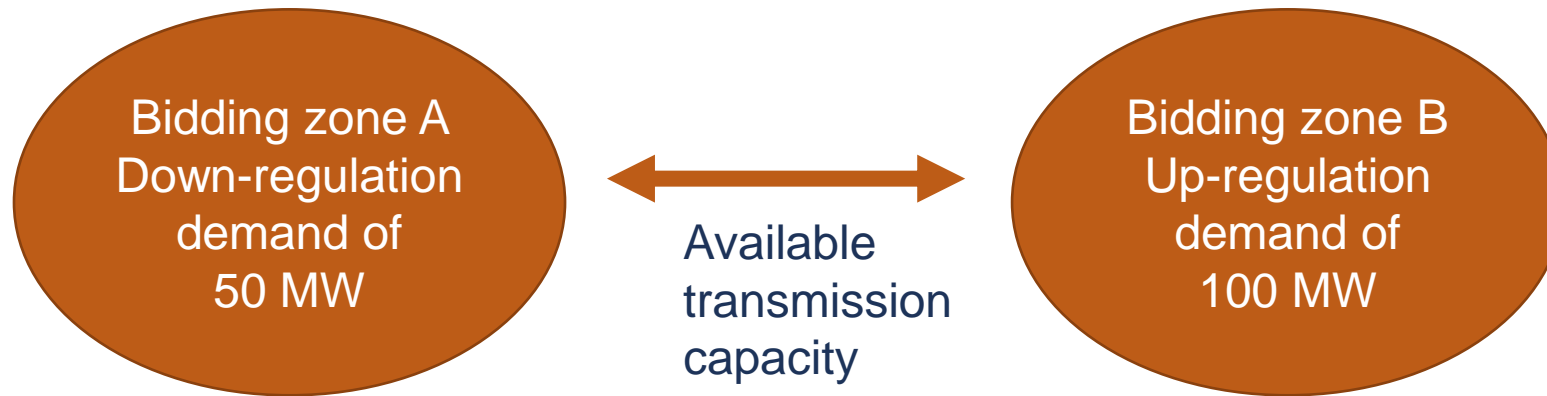
Dominating direction set across bidding zones, which gives the same imbalance price for areas with the same (net) activation direction

Simplicity of only one balancing energy product which sets the price

1) Many balancing energy product prices gives a new frame



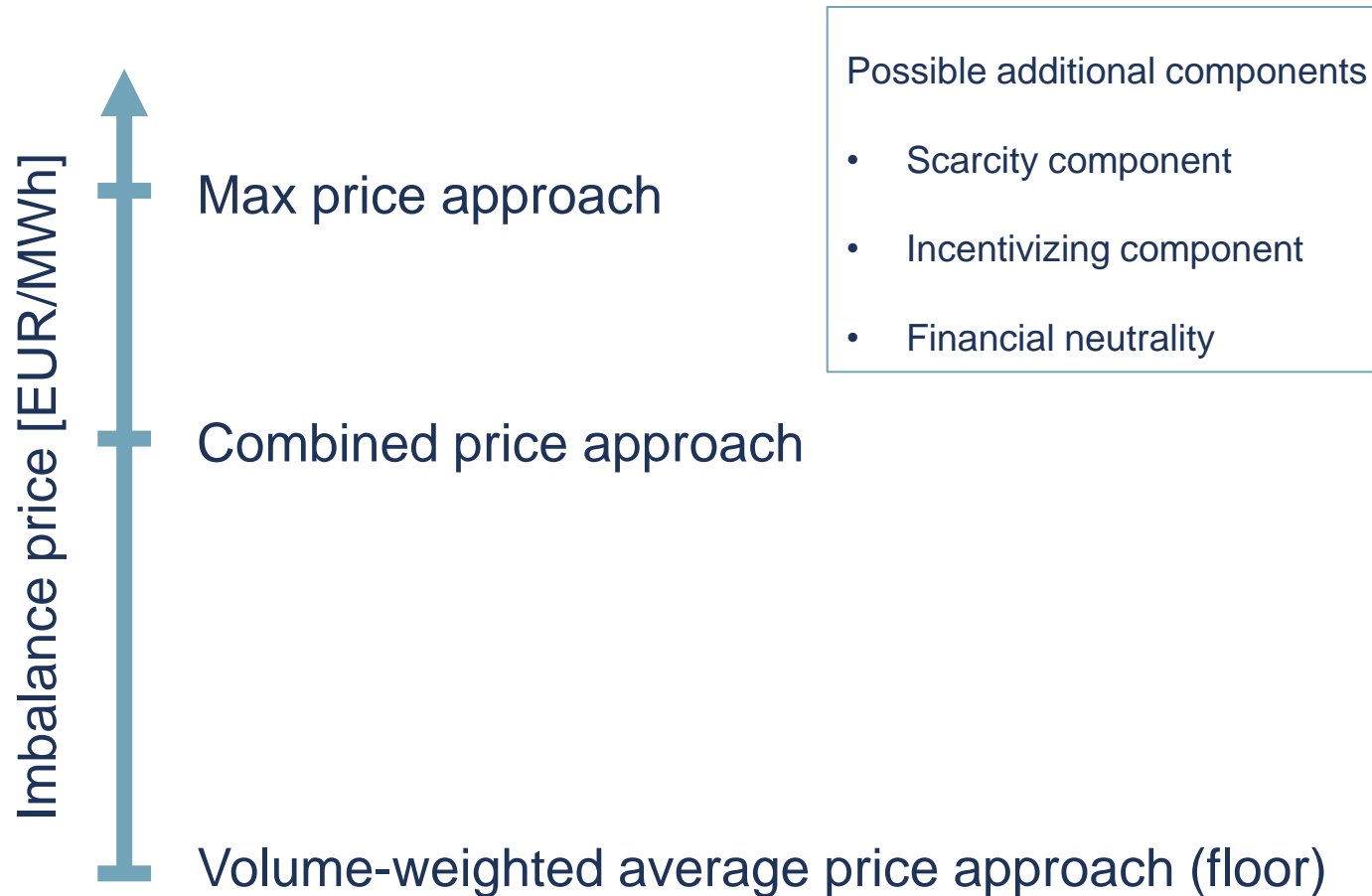
2) Dominating direction shall be set per bidding zone based on (satisfied) demand



Bidding zone A and B are both net-regulated 50 MW in direction up

- Today, bidding zone A and B will get the same imbalance price. In the future, it is likely that the areas will get different imbalance prices (at least if there is a balancing energy price in both directions)
- Also, bidding zones with the same dominating direction may get different imbalance prices, depending on how the imbalance price is set

We see three main options on how to consider the many balancing energy prices



- In addition to the volume-weighted average and max price approach, it is possible to take elements of both into a combined approach
- This may be an attractive design option to handle balancing energy prices from aFRR

What is the issue with aFRR balancing energy prices?

Pricing Proposal

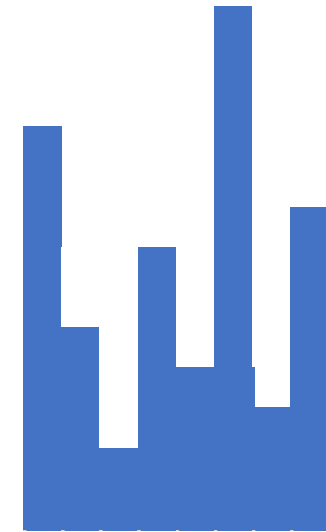
- **Price determination based on central (AOF) bid selection**
- Single CBMP determination in each uncongested area per optimisation cycle of the AOF and activation direction:
 - Highest bid price of all selected positive standard aFRR balancing energy bids.
 - Lowest bid price of all selected negative standard aFRR balancing energy bids.
 - No selected bids: middle point between the lowest positive and highest negative available bids.
- Pricing signal is independent of LFC controller settings and local aFRR activation

Advantages

- Transparency, auditability and robustness of price determination methodology
- Local TSO or BSP (mis)behaviour does not affect price determination

Disadvantages

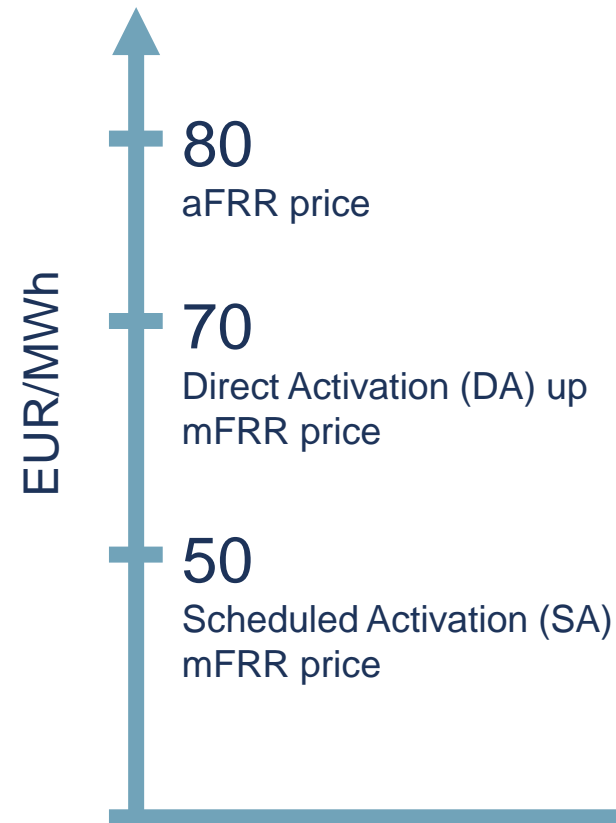
- Additional mechanism for pricing of volumes not covered by AOF required



- One aFRR price per 4 seconds / 225 aFRR prices per 15 min ISP
- aFRR prices may be very volatile and a spike may occur per 15 min ISP
- Is it necessary to somehow dampen the effect of the dynamics in aFRR price setting on the imbalance price?

Misalignment of incentives (simple illustration)

Balancing energy prices to the BSP



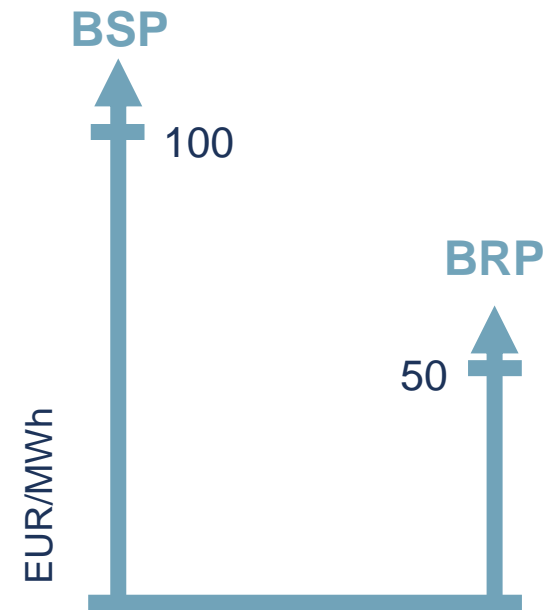
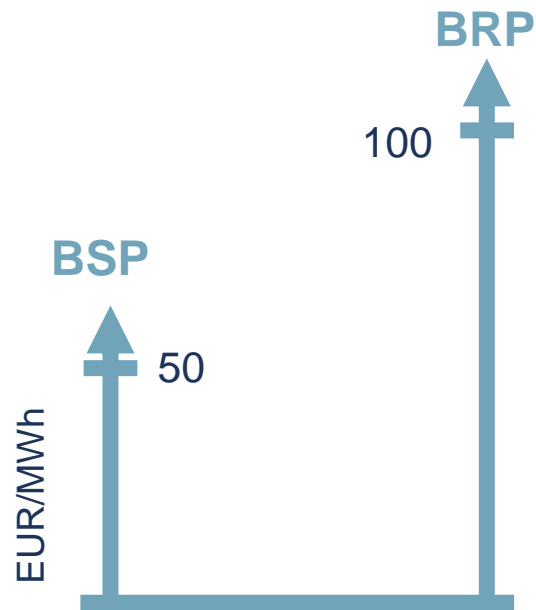
Imbalance price to the BRP



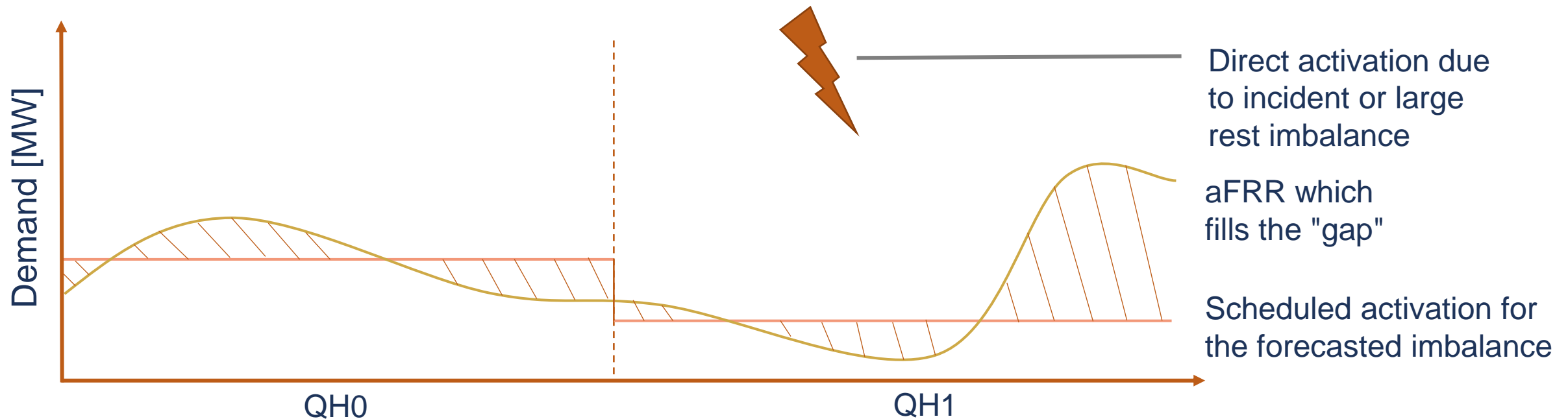
- Due to the design with many different balancing energy prices, there will never be one-to-one between the balancing energy prices to BSPs and the imbalance price to BRPs

The situation leads to design trade-offs

- Imbalance price > Product price
Incentive to keep flexibility available as BRP and manage own imbalances instead
- Product price > Imbalance price
Less incentive to actually deliver for the BSP, possibility for arbitrage profit



Balancing approach for a bidding zone – proactive TSO



- TSOs may select different balancing approaches
- The (satisfied) demand for mFRR (SA and DA) and aFRR will also vary per bidding zone
- As such, the cost of balancing each bidding zone will vary both due to **demand** and **prices**

Take into account prices with a satisfied demand equal to zero?

"Local price" signal versus "Uncongested area" price signal :

- Take into account balancing energy prices for which the bidding zone has a satisfied demand equal to zero or not?

When is this a relevant choice?

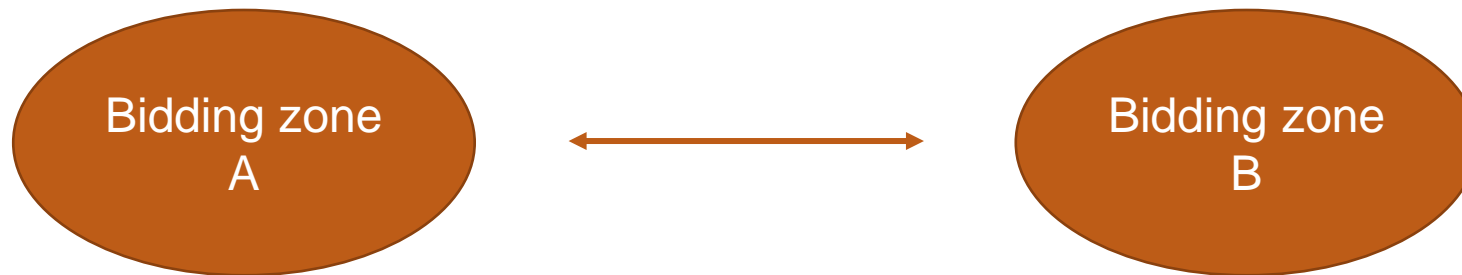
- If choice of max price or combined approach, this is a relevant choice
- In case of volume-weighted average approach, it is mandatory to use the satisfied demand as the weight – no choice

Why would you choose one or the other?

- BSPs in a bidding zone may be activated due to demand elsewhere, even if the bidding zone itself has a demand of zero
- Evaluation of relevant "marginal" price signal?

What will be the effect if imbalance prices become more local and vary between bidding zones?

- Will it lead to more moving of imbalances?
- The imbalance price would give different information than today



Expectations for use of Value of Avoided Activation (VoAA)

(d) 'value of avoided activation' means a reference price that can be calculated by the TSO or TSOs of a given imbalance price area after the balancing energy gate closure time for a given ISP, at least when there is **no balancing energy demand** for that imbalance price area for that ISP or **no balancing energy activation** for that imbalance price area for that ISP.



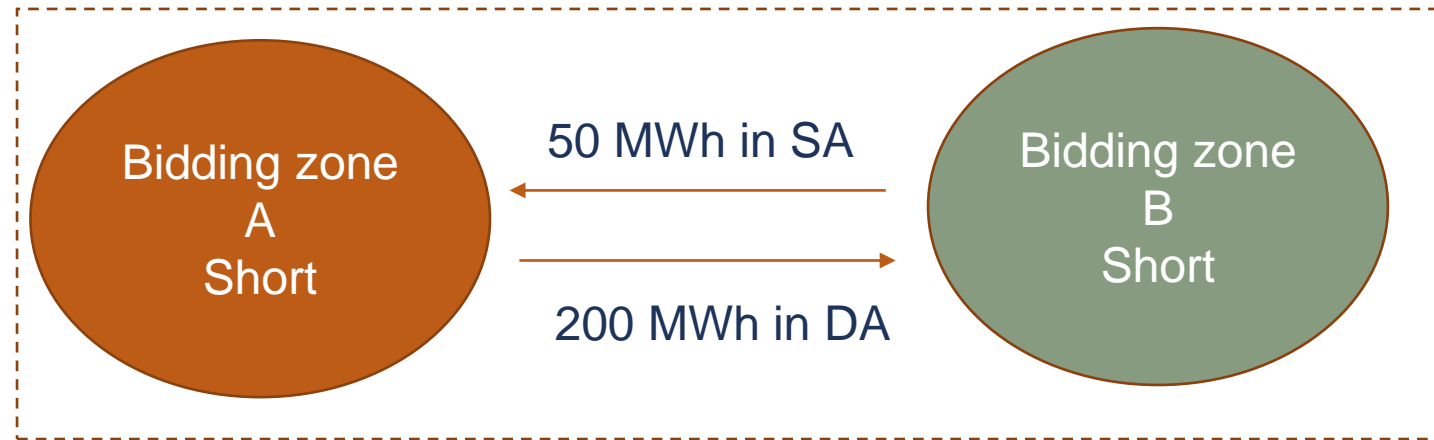
- When we are only connected to MARI, we expect quite some cases of "no balancing energy activation", which means that the demand of a bidding zone is fully netted
- When we are both connected to MARI and Picasso, we expect it to be more likely that we will have both a demand and a balancing energy price in both activation directions during an ISP because of aFRR
- This means **it is fair to expect situations which require VoAA to be quite limited** in the "end model" with both MARI and Picasso
- There are several design options, but a pragmatic and simple approach may be desirable and also acceptable due to limited application

Examples

Example) Marginal of FRR prices for which you have a satisfied demand

Area A	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+200	+150
DA up	0	+200
aFRR run 1	0	0
aFRR run 2	0	0

Area B	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+100	+150
DA up	+200	0
aFRR run 1	+10	+10
aFRR run 2	+10	+10



A and B uncongested both in SA and DA

- SA price 40 EUR/MWh
- DA price 60 EUR/MWh
- aFRR price run 1: 80 EUR/MWh
- aFRR price run 2: 100 EUR/MWh

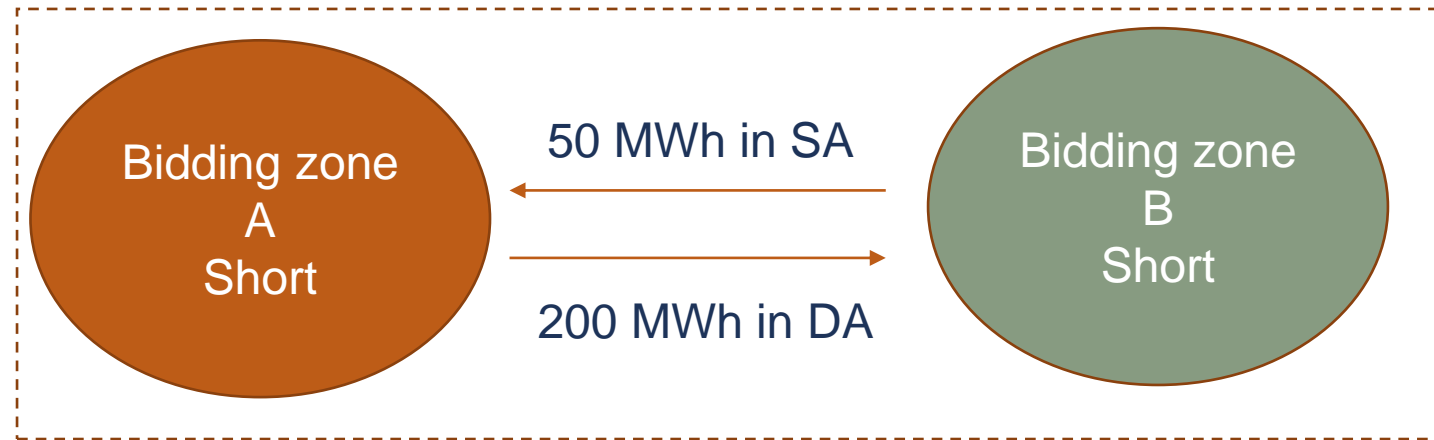
Imbalance price, Max price approach

- Area A = 100 EUR/MWh with zero demand or 40 EUR/MWh without zero demand
- Area B = 100 EUR/MWh

Example) Volume Weighted Average of FRR prices for which you have a satisfied demand

Area A	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+200	+150
DA up	0	+200
aFRR run 1	0	0
aFRR run 2	0	0

Area B	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+100	+150
DA up	+200	0
aFRR run 1	+10	+10
aFRR run 2	+10	+10



A and B uncongested both in SA and DA

- SA price 40 EUR/MWh
- DA price 60 EUR/MWh
- aFRR price run 1: 80 EUR/MWh
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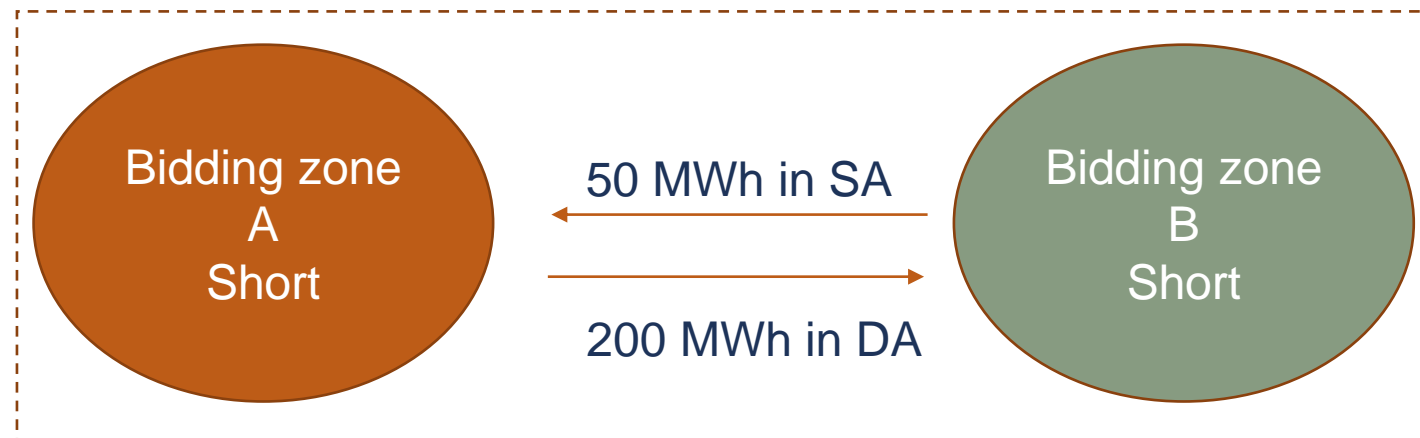
Imbalance price, Volume Weighted Average approach

- Area A = 40 EUR/MWh
- Area B = 55,63 EUR/MWh

Example) Combined approach: Highest of VWA of aFRR and marginal of mFRR prices

Area A	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+200	+150
DA up	0	+200
aFRR run 1	0	0
aFRR run 2	0	0

Area B	Satisfied demand (MWh)	Activated with BSPs (MWh)
SA	+100	+150
DA up	+200	0
aFRR run 1	+10	+10
aFRR run 2	+10	+10



A and B uncongested both in SA and DA

- SA price 40 EUR/MWh
- DA price 60 EUR/MWh
- aFRR price run 1: 80 EUR/MWh
- aFRR price run 2: 100 EUR/MWh

Imbalance price, Combined approach

- Area A = 60 EUR/MWh with zero demand for DA up or 40 EUR/MWh without zero demand
- Area B = 90 EUR/MWh as the VWA from aFRR prices is the highest FRR price

Summary and key insights so far

Key insights so far

- Balancing energy activation prices and the imbalance price will be decoupled compared to current situation, and give changed incentives, which may be difficult to fully foresee the impact of (depends on actual prices)
- The financial incentive to deliver balancing energy for the BSP through the cost of an imbalance may be weakened, and other measures necessary
- Expectation of much more variation in the imbalance price between all bidding zones, both in and between the Nordic countries – especially when we are connected to both MARI and Picasso
- It may be hard to justify to use the Max price approach directly, due to how aFRR prices will be set
- Cases where we will need to apply the Value of Avoided Activation (VoAA) are likely limited – when we are connected to both MARI and Picasso

Decisions to be made

- Select the method for imbalance price calculation
 - Max price approach
 - Combined approach
 - Volume weighted average approach
- Local or uncongested area pricing and whether or not to take into account balancing energy prices for which you have a demand equal to zero
- How to set VoAA

Next steps

- We are working on setting up the work plan for H1-2023 in more detail, and will provide information on the NBM webpage in January
- This also includes the process for informal feedback from stakeholders on the alternative design choices