PICASSO – Part I

Workshop:

High level design for the participation in MARI & PICASSO platforms

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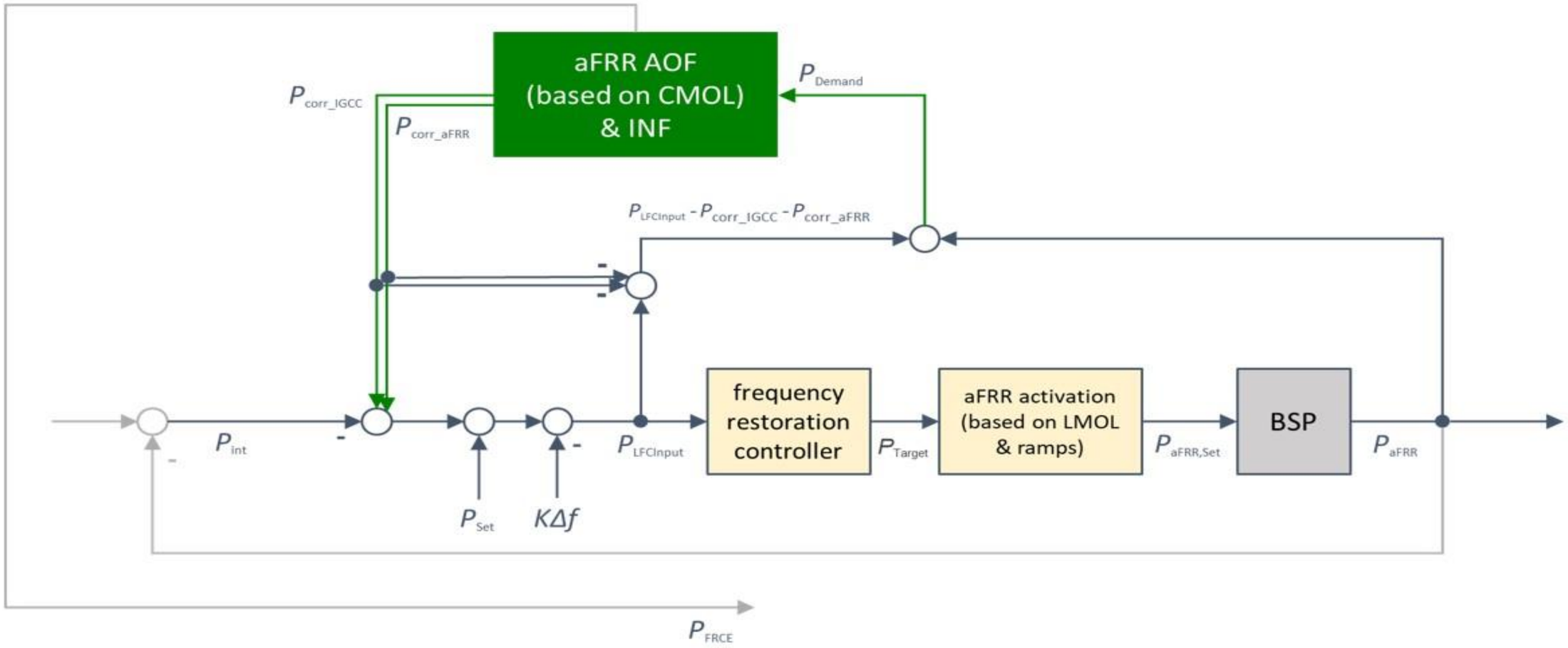
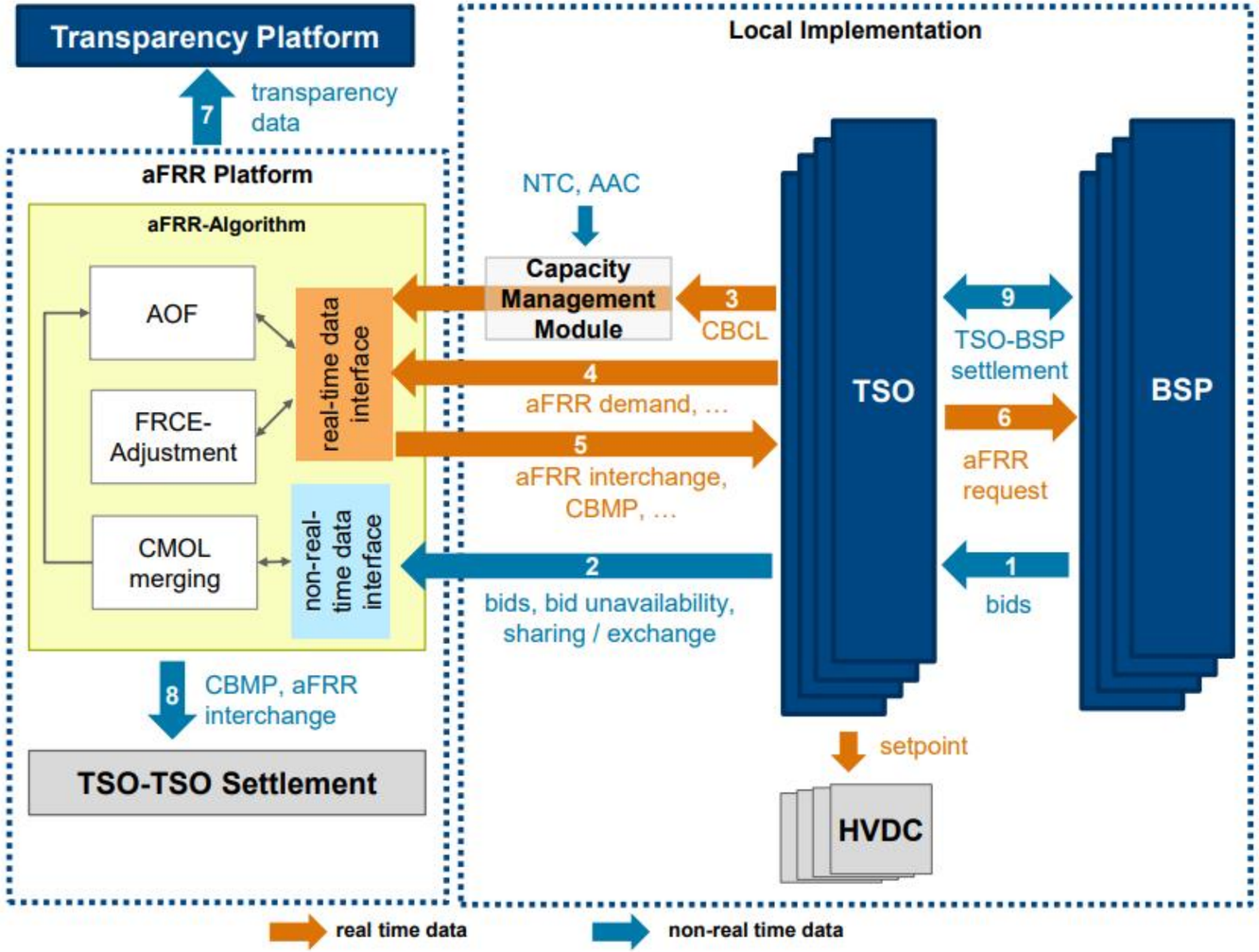
AGC operation under PICASSO



PICASSO General Process



AOF	Activation Optimisation Function	NTC	Net Transfer Capacity
FRCE	Frequency Restoration Control Error	AAC	Already Allocated Capacities
CMOL	Common Merit Order List	CBCL	Cross-Border Capacity Limits
CBMP	Cross-Border Marginal Price	HVDC	High Voltage Direct Current

1. TSO receives bids from BSPs in their LFC area
2. TSO forwards standard aFRR balancing bids to platform
3. TSOs communicate Cross-Border Capacity Limits to Platform
4. TSOs communicate aFRR demands to platform
5. Communication of clearing results to TSO
6. Communication of aFRR request from each LFC to BSP
7. Data Publication
8. TSO-TSO settlement process and invoicing
9. TSO-BSP settlement process and invoicing

PICASSO Activation Optimization Function

Activation Optimization Function basic priorities

1st Control FRCE to zero	Maximise satisfaction of the aFRR demand of individual LFC areas
2nd Netting of aFRR demand	Minimise the total amount of aFRR activation avoiding counteracting aFRR activation
3rd Minimise cost of activation	Activate the most economic efficient bids
4th Minimise exchanges on borders	Minimise the amount of frequency restoration power exchange on each border between LFC areas

Activation Optimization Function Inputs - Outputs

Basic inputs in the AOF

- every LFC control cycle
  - the aFRR demand of every participating area
- every 15 minutes
  - the positive merit order list (LMOL)
  - and negative merit order list (LMOL)
  - balancing border capacity limits

Basic outputs of the AOF

- Power correction value
- Selected aFRR bids
- Volume of satisfied demand
- Volume of unsatisfied demand
- Total aFRR-power interchange
- Price for the activated bids

Current Product & PICASSO Product Comparison

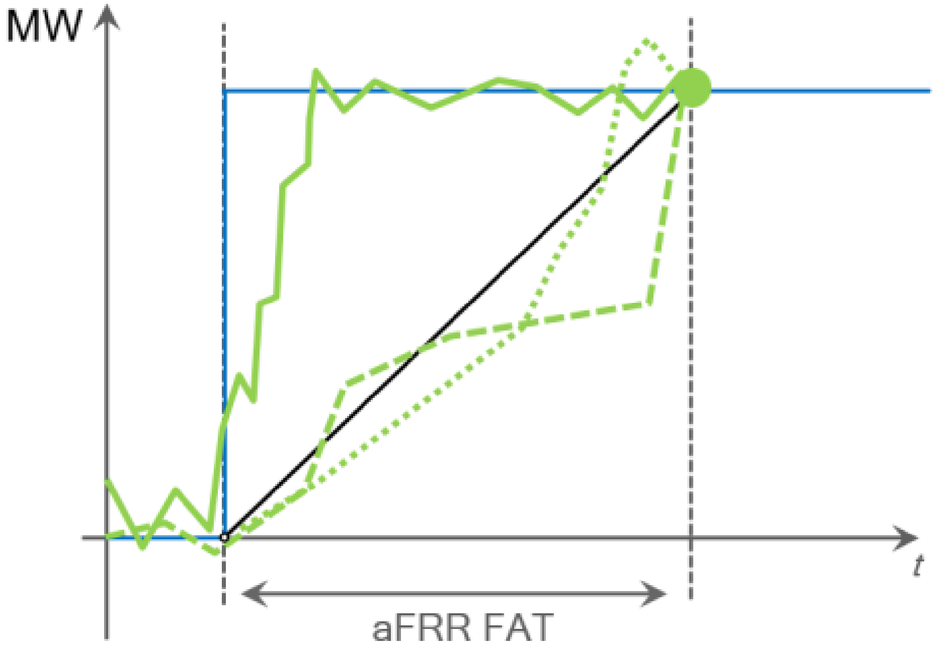
Bid Characteristics	Description	Current Local Product	Standard aFRR product
Full Activation Time	The time period between the activation request by TSO and the corresponding full activation of the standard product.	7.5 minutes	5 minutes
Minimum bid size	The minimum bid size of the energy bid volume offered.	1 MW	1 MW
Maximum bid size	The maximum bid size of the energy bid volume offered.	limited by BSE max capacity	limited by BSE max capacity, up to 9,999 MW
Granularity	The possible increment of bids above the minimum bid size.	0.1 MW	1 MW
Price resolution	The minimum resolution for the price of the standard balancing energy product bid.	0.01 EUR/MWh	0.01 EUR/MWh
Validity Period	The time when the balancing energy bid offered by the BSP can be activated	15 min-60min	15 minutes
Direction	Positive or negative		
Volume	MW		
Divisibility	aFRR balancing energy bids are fully divisible.		

Full Activation Time

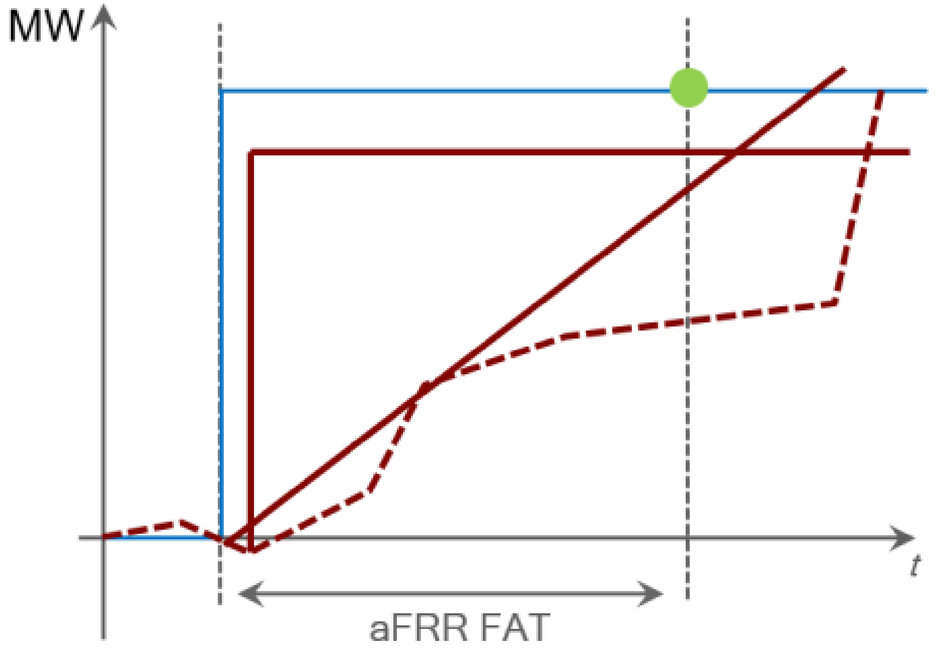
To get prequalified, a BSP must be able to activate the volume to be prequalified within the given FAT.

In case of activation, a bid of a BSP must reach a given setpoint within the FAT.

Compliant



Not compliant



Full Activation Time

The duration of activation of balancing products has a direct impact on the resulting frequency restoration control error (FRCE).

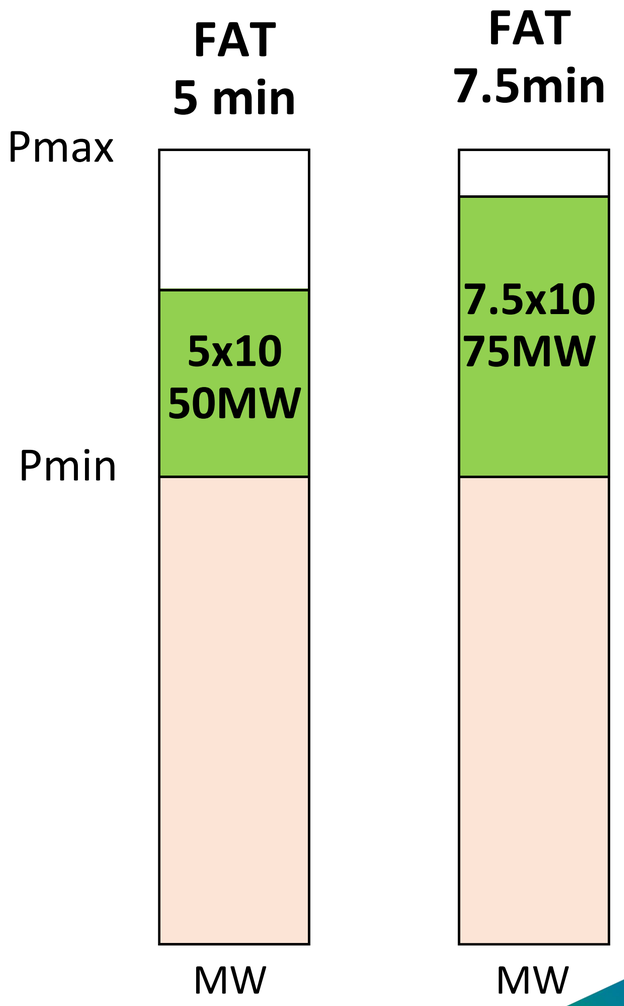
The FAT has to be short enough to guarantee the FRCE target parameters required by SOGL.

The FAT has to be long enough to ensure the availability of the required capacities and facilitate a liquid aFRR market.

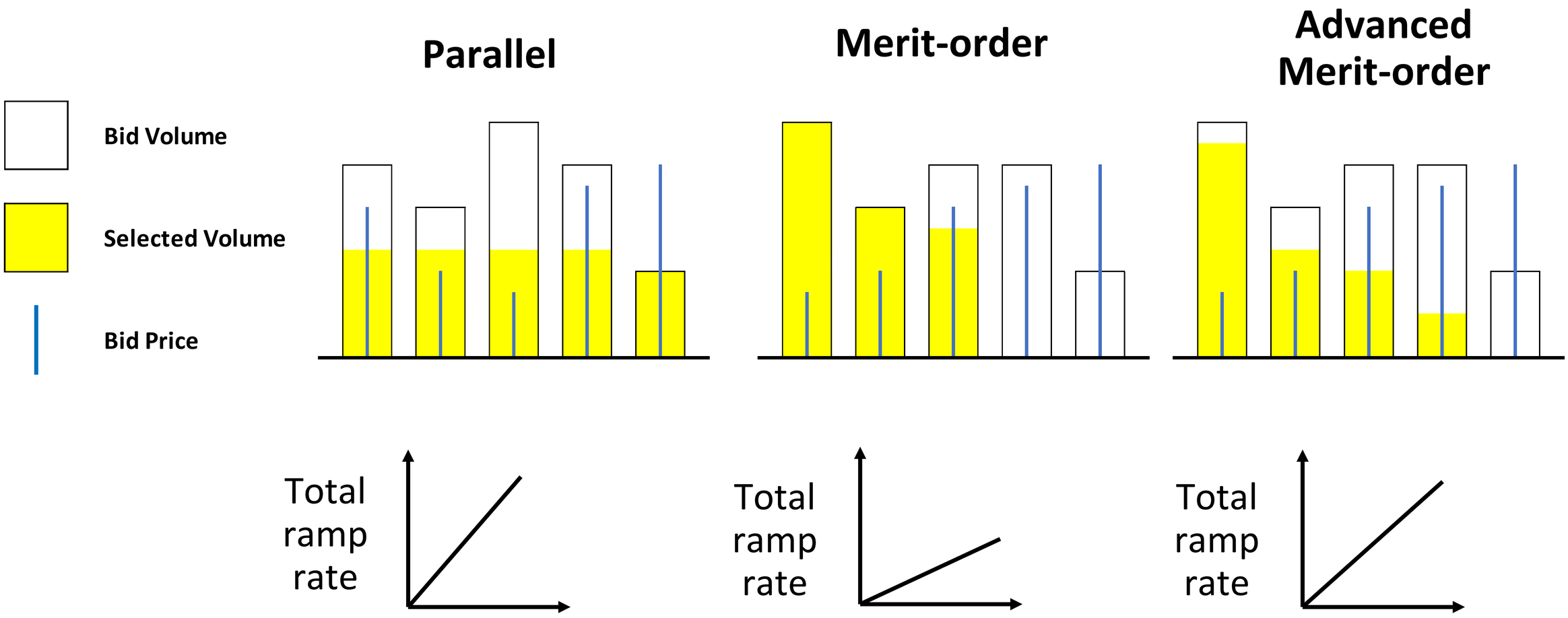
A decrease in FAT will reduce the aFRR capacity offered by thermal units linearly with the FAT decrease.

A FAT change usually has no impact on offered aFRR capacity for non-thermal units (RES, Demand Response, Hydro)

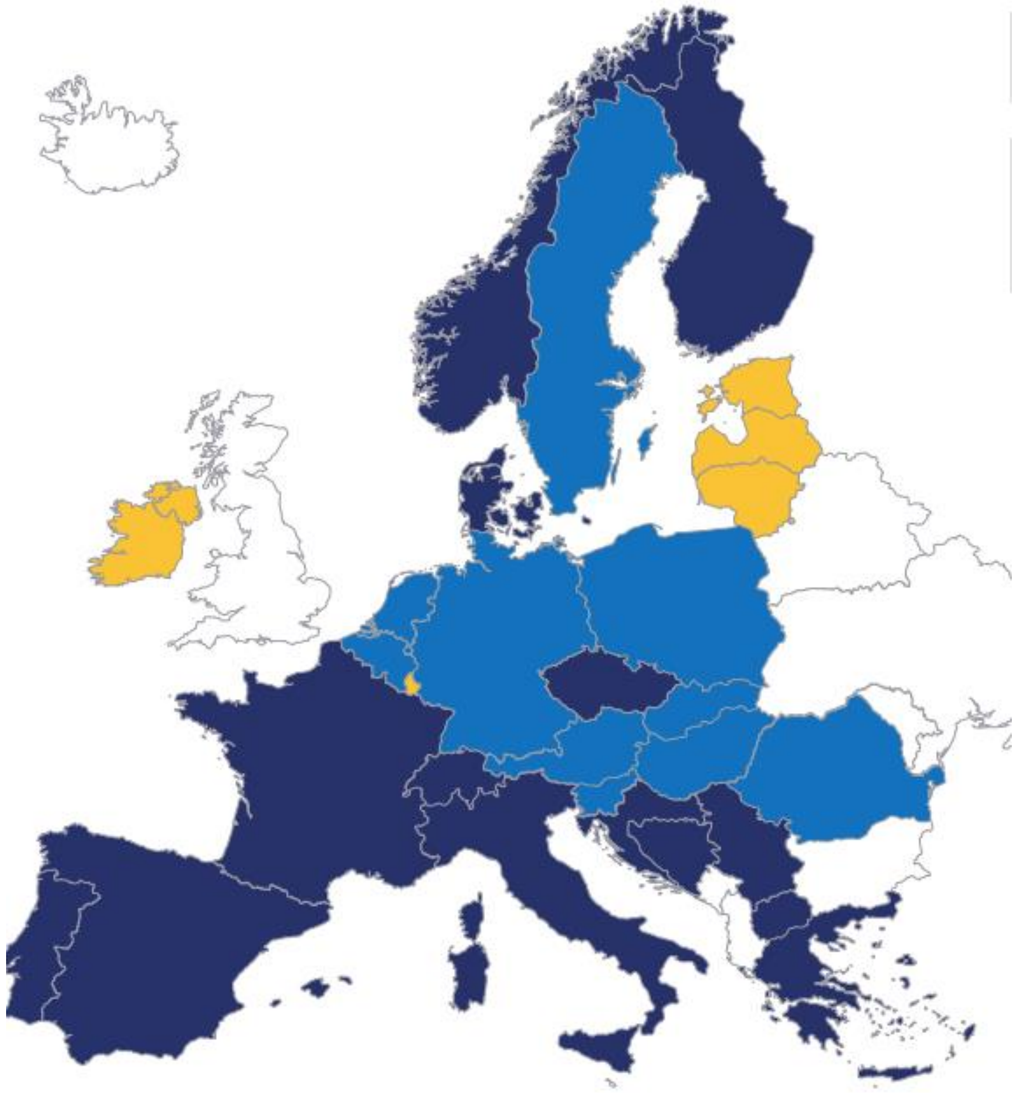
Available upward aFRR Capacity of a Thermal Unit with a ramp rate of 10 MW/min



Mode of activation (parallel, merit-order, advanced)



Mode of activation in Europe (year 2021)



Key:

- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

Non-contracted aFRR balancing energy bids

Currently, aFRR Balancing Energy is provided only by the BSEs that have been awarded aFRR Balancing Capacity in the ISP. Following participation in PICASSO, provision of aFRR by non-contracted BSEs is also being considered

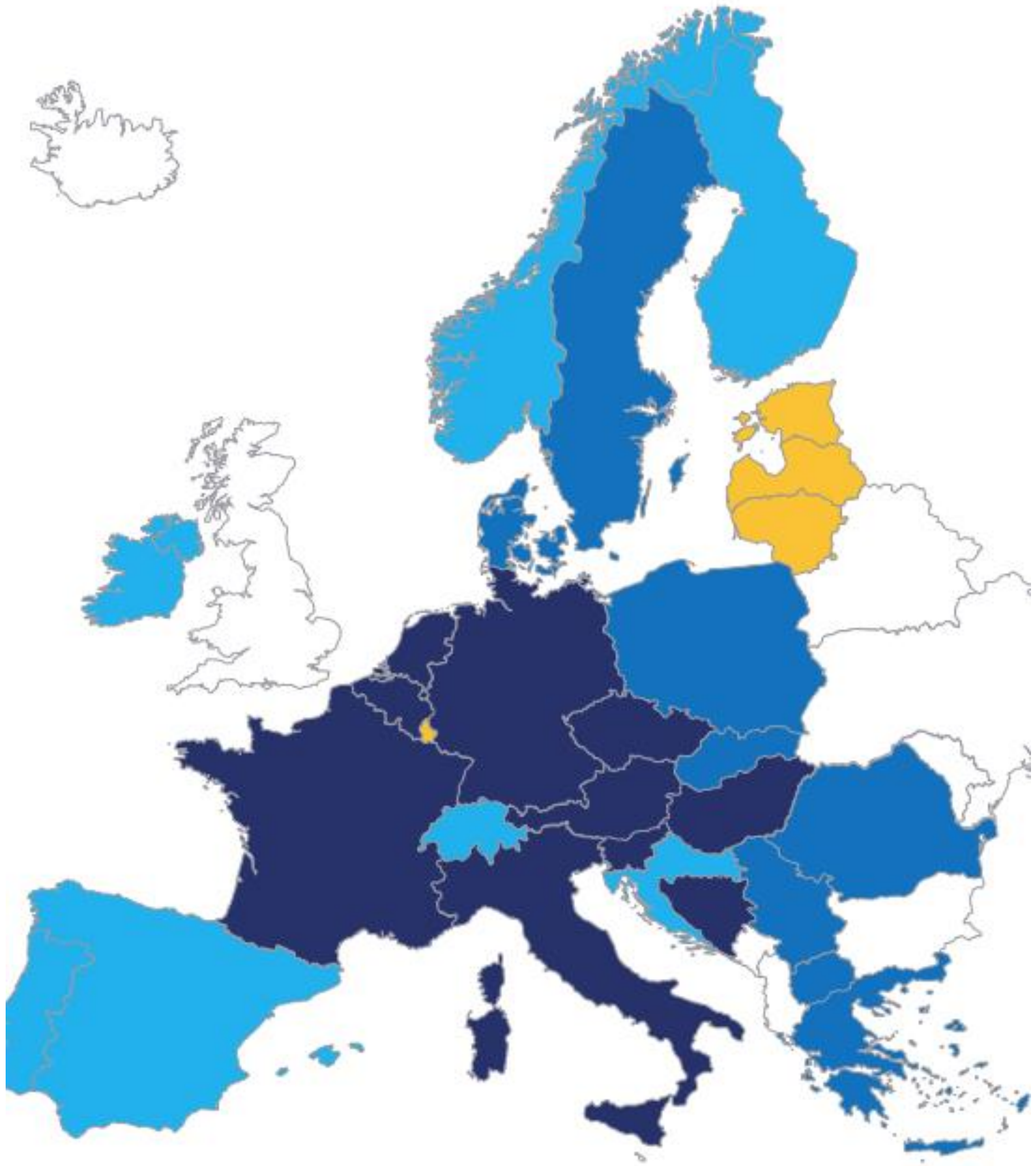
Main Principles:

- All prequalified for aFRR provision BSEs may submit non-contracted aFRR balancing energy bids for voluntary aFRR provision.
- Submission of non-contracted aFRR Balancing Energy bids is allowed for BSEs that have already been awarded aFRR Balancing Capacity for the remainder of their available aFRR capacity.
- Activation of non-contracted aFRR bids will be remunerated for the provision of aFRR Balancing Energy with the same rules as contracted aFRR bids.
- Non-contracted balancing energy bids will not be remunerated for Balancing Capacity.

Indicative procedure:

- The selection among contracted and non-contracted aFRR balancing energy bids will be performed on an hourly basis.
- BSEs willing to provide non-contracted aFRR for each hour shall submit aFRR balancing energy bids to IPTO ahead of time.
- For each hour, IPTO will select the most economic bids corresponding at least to the aFRR Balancing Capacity need for the hour. These bids will be available for activation in real time for the specific hour.

Non-contracted bids for aFRR in Europe (year 2021)



Key:

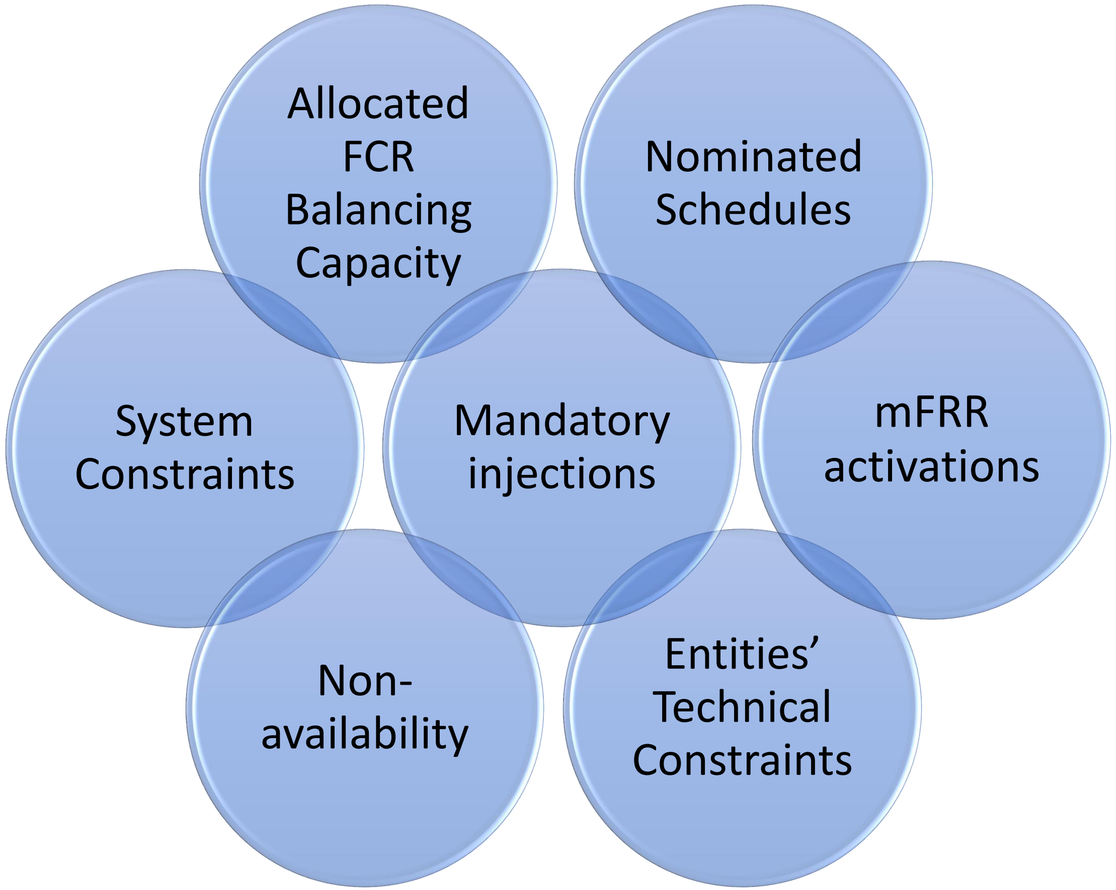
- Missing data
- N/A
- Yes
- No
- No, there is no aFRR balancing energy market

Balancing energy bids conversion rules

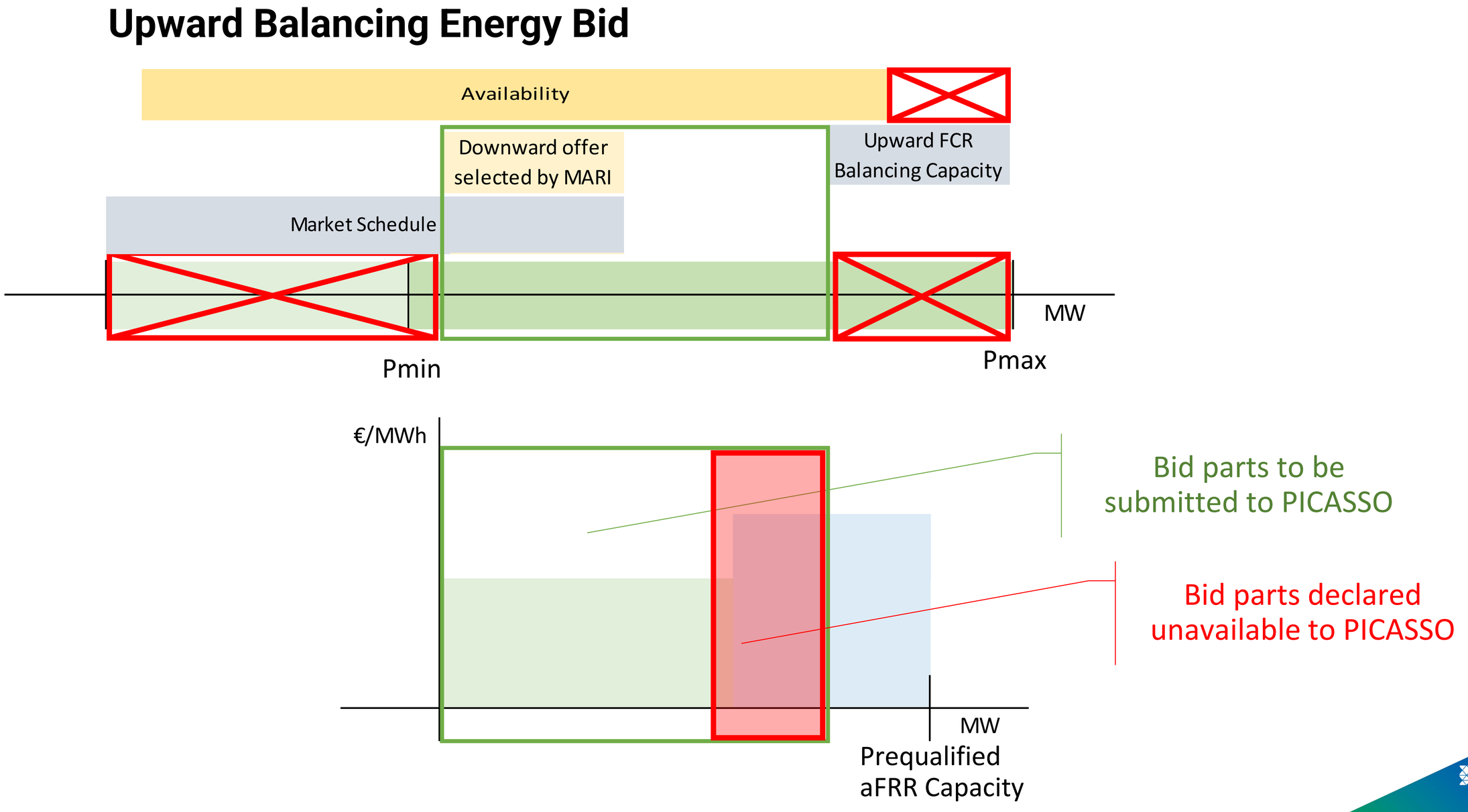
The conversion process considers bids that can be activated within a quarter-hour from the following entities:

- ✓ Entities that are online but not in startup or shut-down phase or transitioning phase.
- ✓ Entities that are not in commissioning or testing operation.
- ✓ Entities that have been selected for aFRR provision (including non-contracted bids).

The conversion process will consider bids that can be activated within a quarter-hour taking into account the following:



Bid conversion example (entity - upward bid)



aFRR demands

Quantity	The Imbalance Quantity estimated by the TSO. Positive for upward demand or negative for downward demand
Location	Bidding zone

TSO aFRR demands are inelastic since a TSO shall always activate aFRR to regulate its own FRCE to zero

The aFRR demands from a TSO can only be for balancing purposes