Historical Background

Workshop:

High level design for the participation in MARI & PICASSO platforms

2/2/2023

Konstantinos Petsinis

Head of Branch

Market Design & Monitoring

Need for European balancing platforms

Local Balancing Markets

> Balancing mechanisms are not only technical, but have significant commercial implications

> The balancing mechanisms differ significantly from one TSO to another

> Significant balancing price differences in Europe

> Insufficient use of cross-border transmission capacity

Drivers for integration of Balancing Markets

> Driver 1: Improve balancing prices and consistency with other timeframes

> Driver 2: Optimal usage of cross-border transmission capacity

> Driver 3: Increase competition

A fully functioning and interconnected internal energy market is crucial for:

> Maintaining security of energy supply

> Increasing competitiveness

> Reducing prices

Steps taken towards European harmonization

In order to allow an exchange of balancing services and adequate liquidity in the balancing market, it is necessary to achieve a minimum level of harmonization within Europe

- Standard Products for Balancing Energy provision

- Common settlement rules applicable to all intended exchanges

- Methodology for pricing balancing energy and cross-zonal capacity used for the exchange of balancing energy or operating the imbalance netting process

- Methodology for the harmonization of the main features of imbalance settlement

- Methodology for classifying the activation purposes of balancing energy bids

- Harmonised methodologies for the allocation of cross-zonal transmission capacity for balancing purposes

- Common settlement rules for all unintended exchanges of energy

- Common settlement rules for intended exchanges of energy as a result of the frequency containment process and ramping period

MARI – Part I

Workshop:

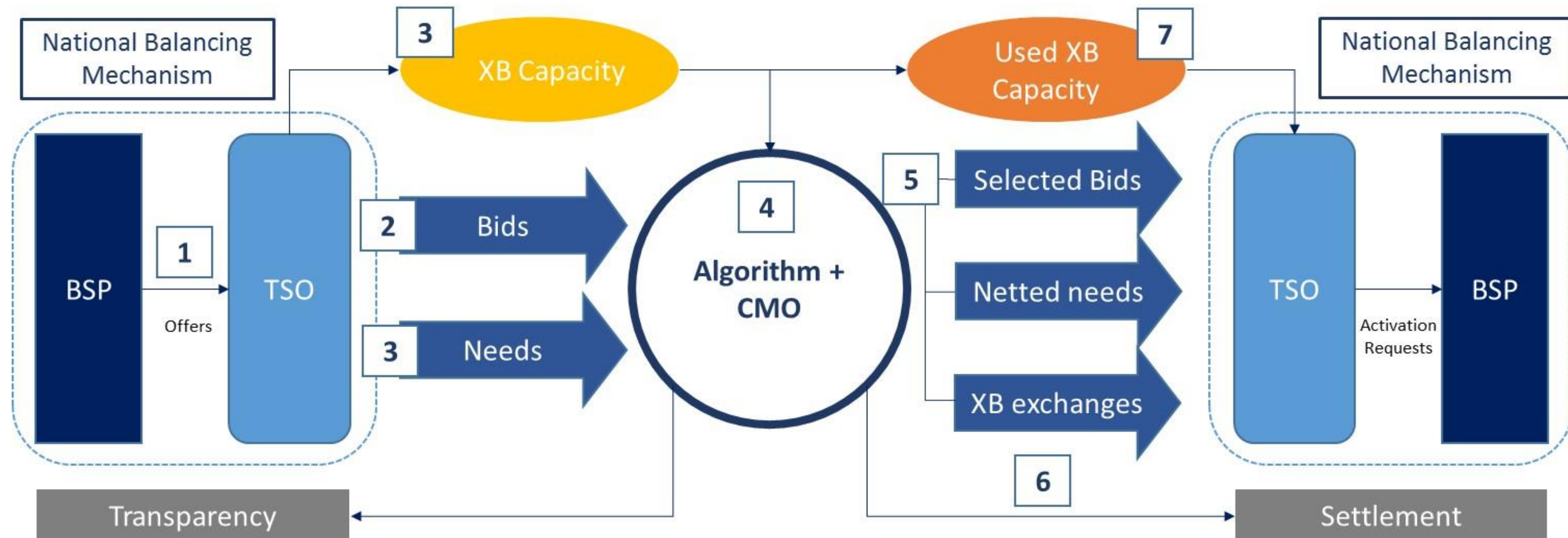*High level design for the participation in MARI & PICASSO platforms*

Konstantinos Petsinis
Head of Branch
Market Design & Monitoring

2/2/2023

MARI General Process

1. TSOs receive offers from BSPs in local market
2. Forward of mFRR bids to MARI platform
3. TSOs communicate their balancing needs and the available XB transmission capacities (ATC)
4. Optimization (balancing needs against BSPs' offers)

5. Communication of the accepted offers, satisfied needs and prices to the TSOs
6. Calculation of the commercial flows between market balancing areas and settle the expenditure and revenues between TSOs
7. Communication of the resulting XB schedules and remaining ATC

MARI Activation Optimization Function (AOF)

AOF Priorities

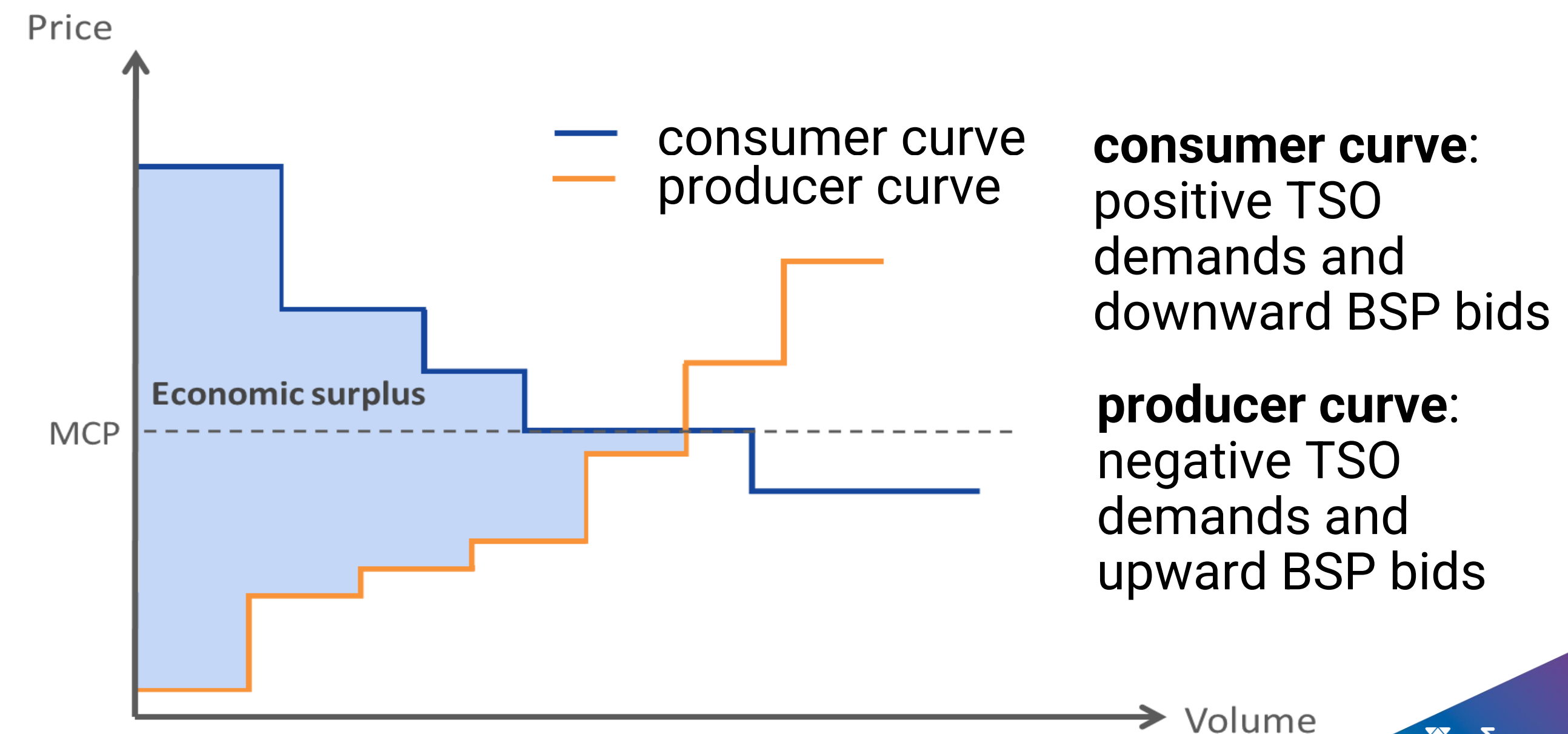|	
1st **Economic Surplus**	The first priority is to maximise the economic surplus for a given set of standard mFRR balancing energy bids and mFRR balancing energy demands
2nd **Minimize border exchanges**	The second priority is to minimise the amount of mFRR power exchange on each mFRR balancing border

AOF Outputs
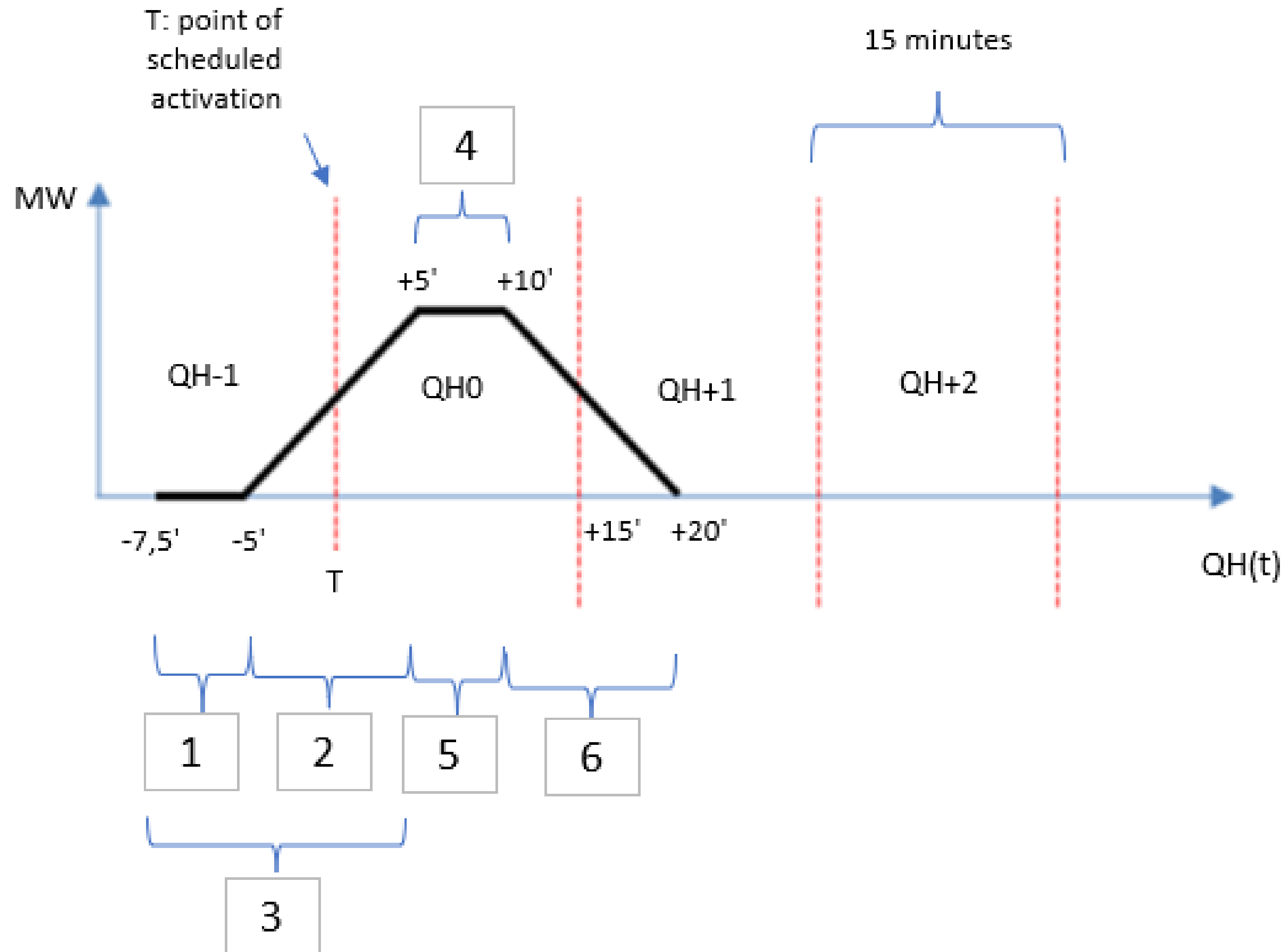
- Cross-border marginal prices (CBMPs)
- Satisfied demands
- Selected bids (and volume)
- Net position of each scheduling area
- Cross-border flows in the interconnectors
- Remaining cross-border capacity

consumer curve: positive TSO demands and downward BSP bids

producer curve: negative TSO demands and upward BSP bids

Scheduled Activation: TSO-TSO exchange profile

[1]: preparation period = 2,5'
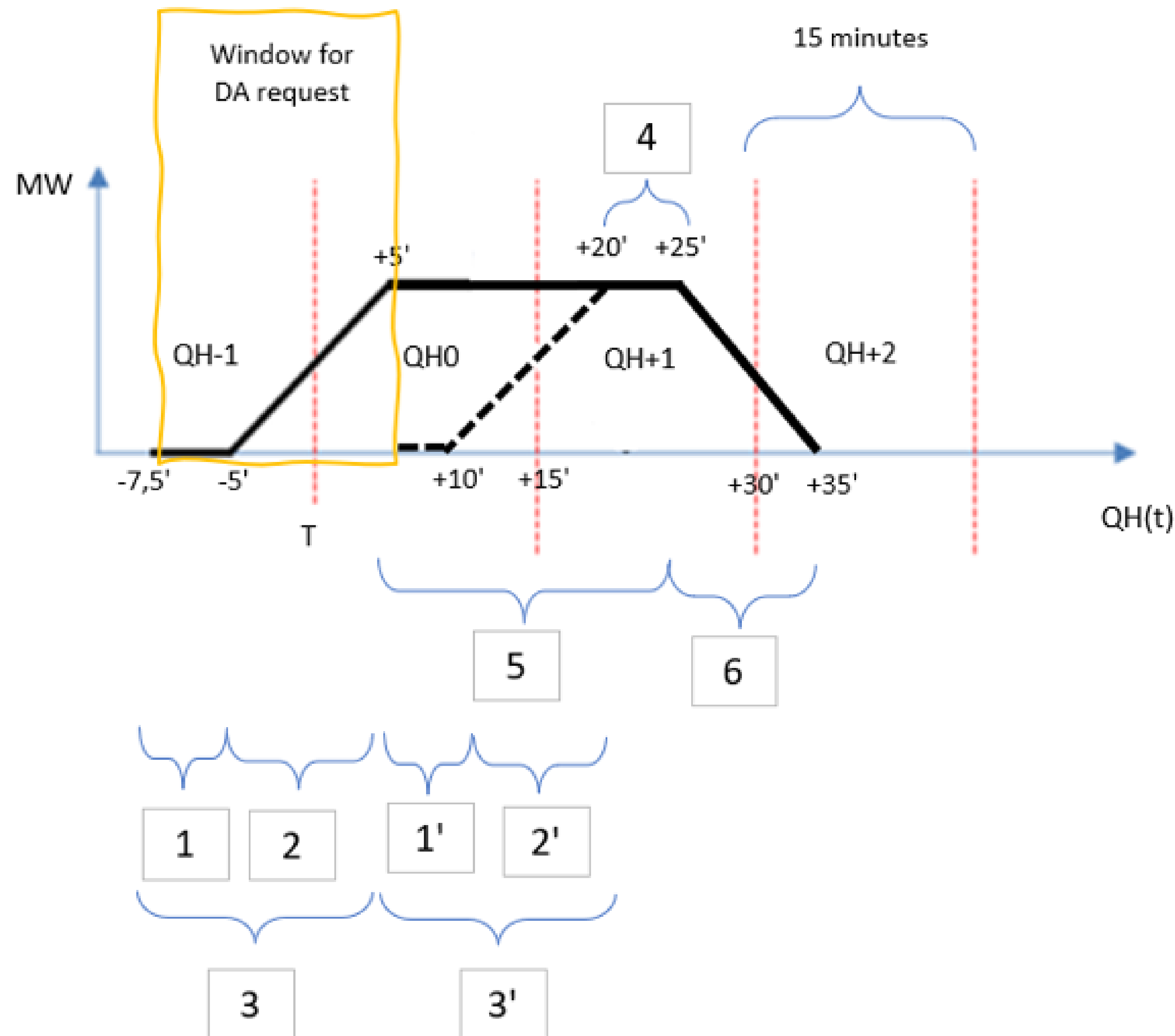
[2]: ramping period = 10'

[3]: full activation time = 12,5' = [1]+[2]

[4]: delivery period = 5'

[5]: maximum delivery period = [4]

[6]: deactivation period = 10'

Direct Activation: TSO-TSO exchange profile

[1] preparation period + [2] ramping period for first possible DA request for QH0 = [3] full activation time = 2,5' +10' = 12,5'

[1'] preparation period + [2'] ramping period for latt possible DA request for QH0 = [3'] full activation time .....

[4]: minimum deliver period = 5'

[5]: maximum delivery period = 20'

[6]: deactivation period = 10'

Current Product & MARI Product Comparison

|	local mFRR product as of today	mFRR standard product
Activation type	Scheduled or Direct	Scheduled or Direct
Full Activation Time	7,5 min	12,5 min
Minimum quantity	1 MW	1 MW
Bid granularity	0,1 MW	1 MW
Maximum quantity	n/a	9.999 MW
Minimum duration of delivery period	7,5 min	5 min
Price resolution	0,01 €/MWh	0,01 €/MWh
Bid divisibility	Fully divisible for generating units. Both divisible and invisible bids are allowed for demand response.	Divisible bids with an activation granularity of 1 MW. Indivisible bids based on national terms and conditions.
Linking between bids and complex bids	Multipart bids	Technical and conditional linking between bids submitted in consecutive quarter hours. Complex bids.

MARI & current mFRR product
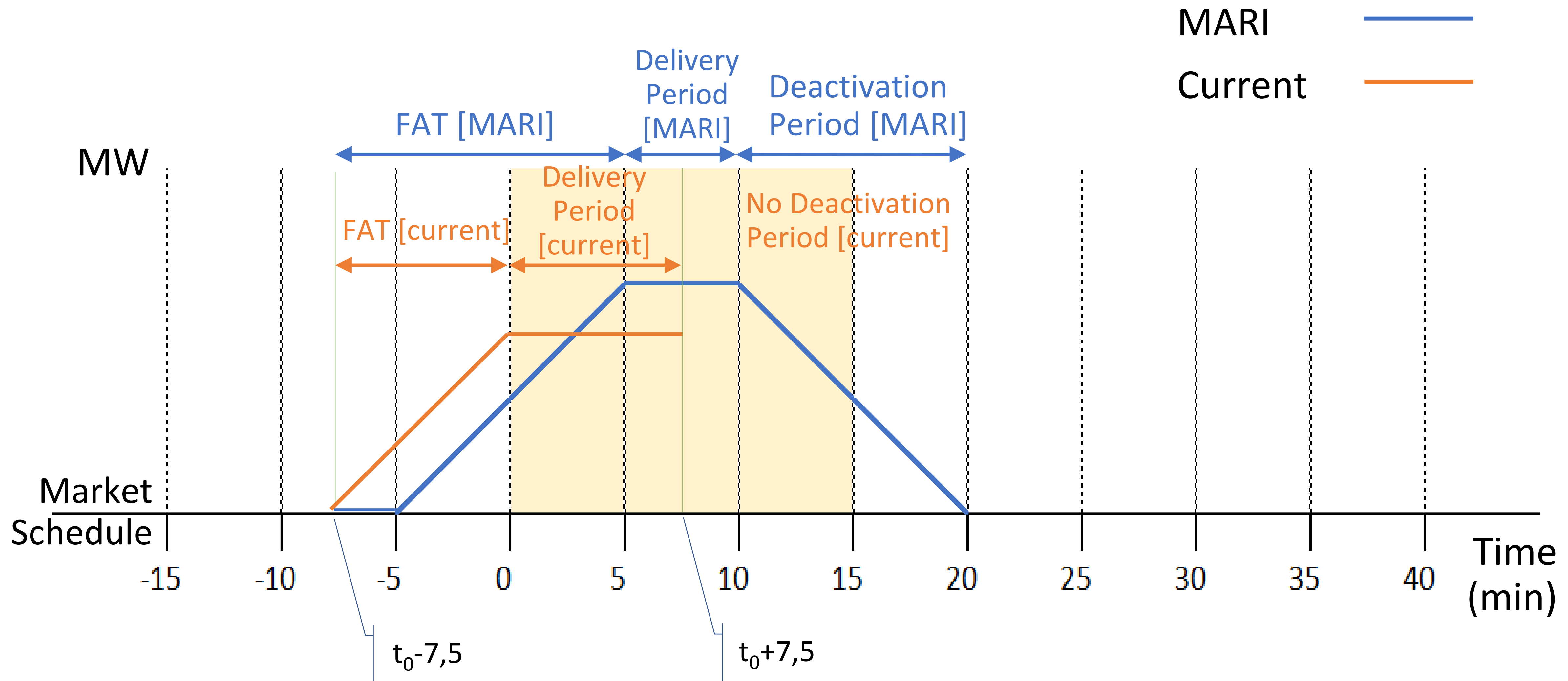
Sequential MARI instructions (same direction)
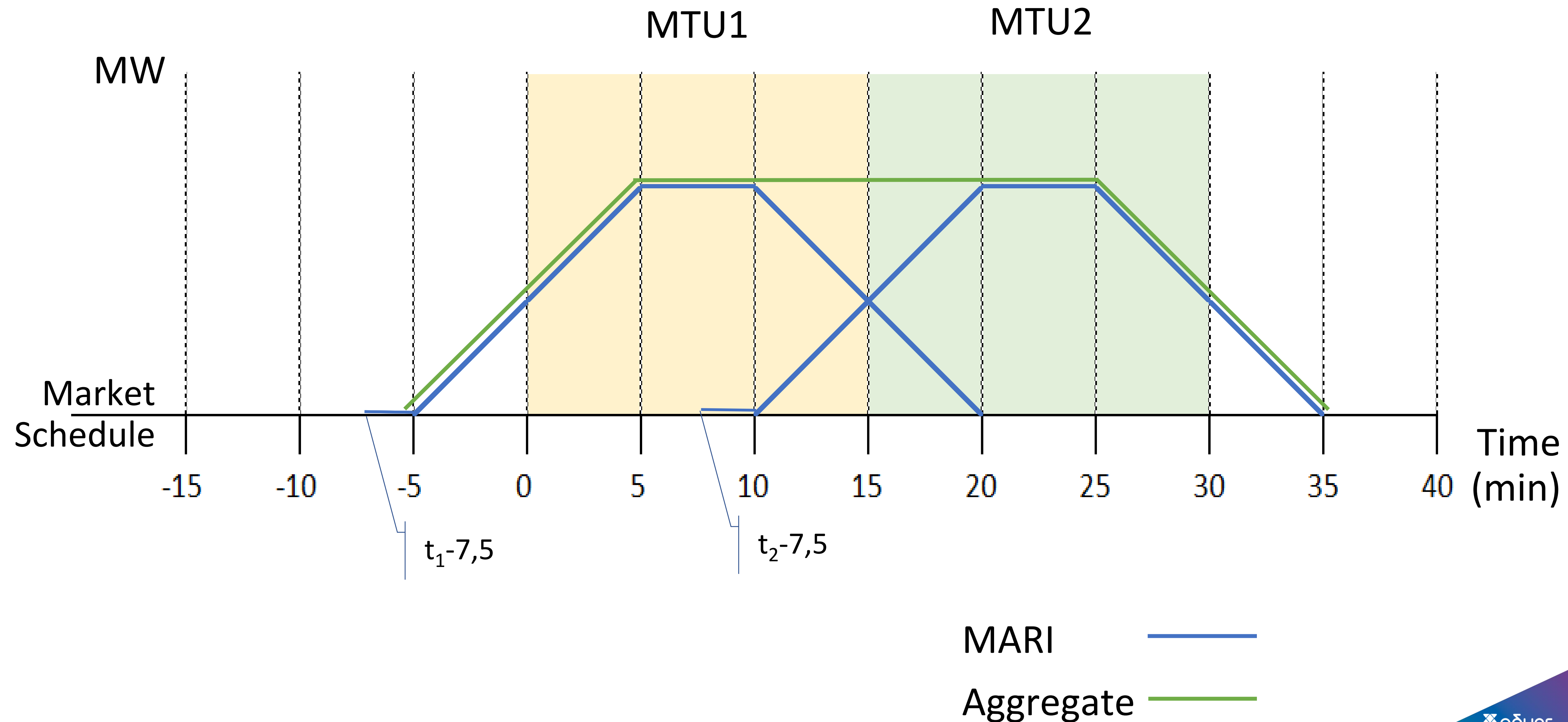
Sequential MARI instructions (opposite directions)
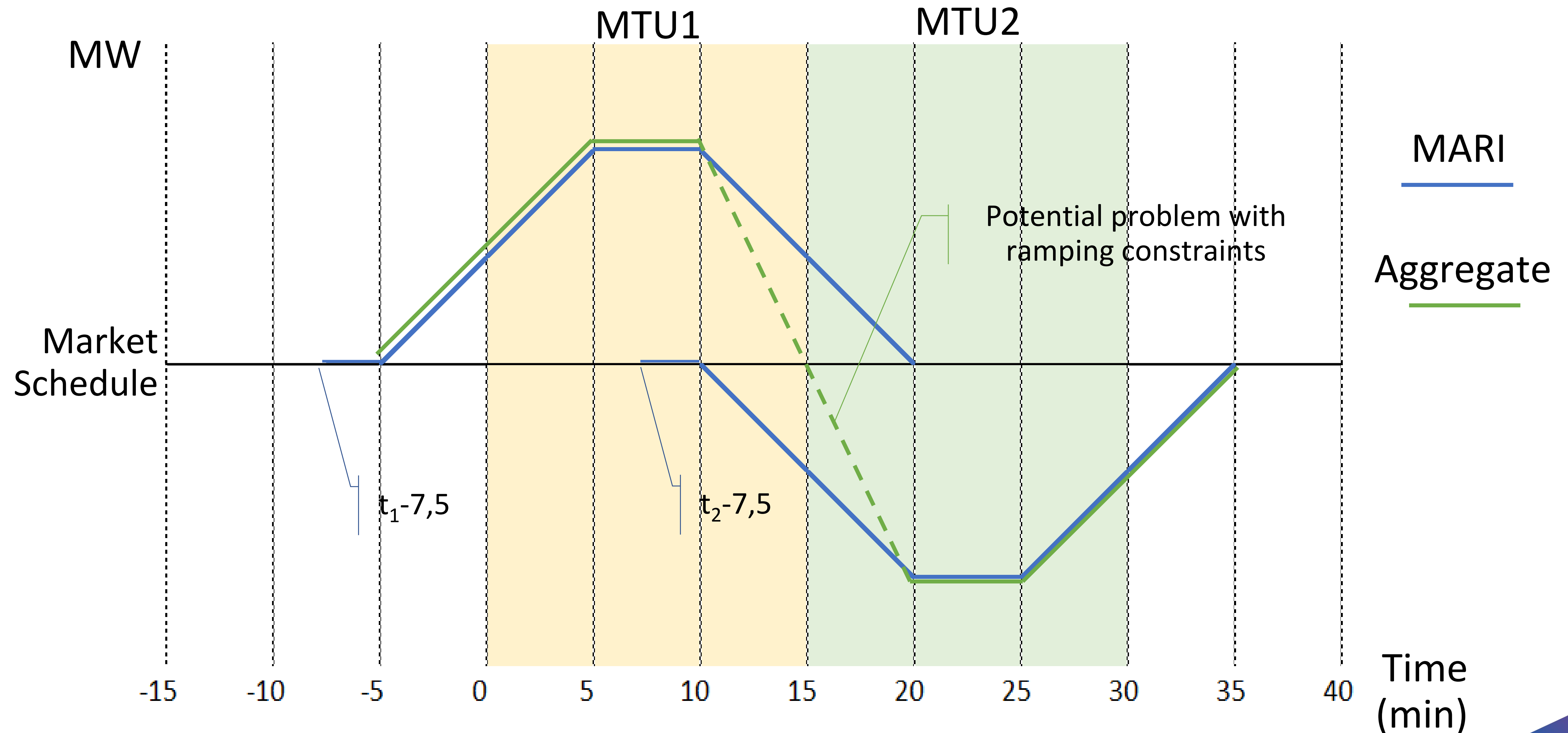
Bid Activation Types

Every bid will be assigned an activation type by IPTO:

|	
'Schedu-led only'	a bid which can be activated at the point of scheduled activation only
'Direct'	a bid that can be activated at the point of scheduled activation and anytime during the 15 minutes after the point of scheduled activation
'Direct only'	a bid that is eligible for direct activation only, i.e., anytime during the 15 minutes after the point of scheduled activation.
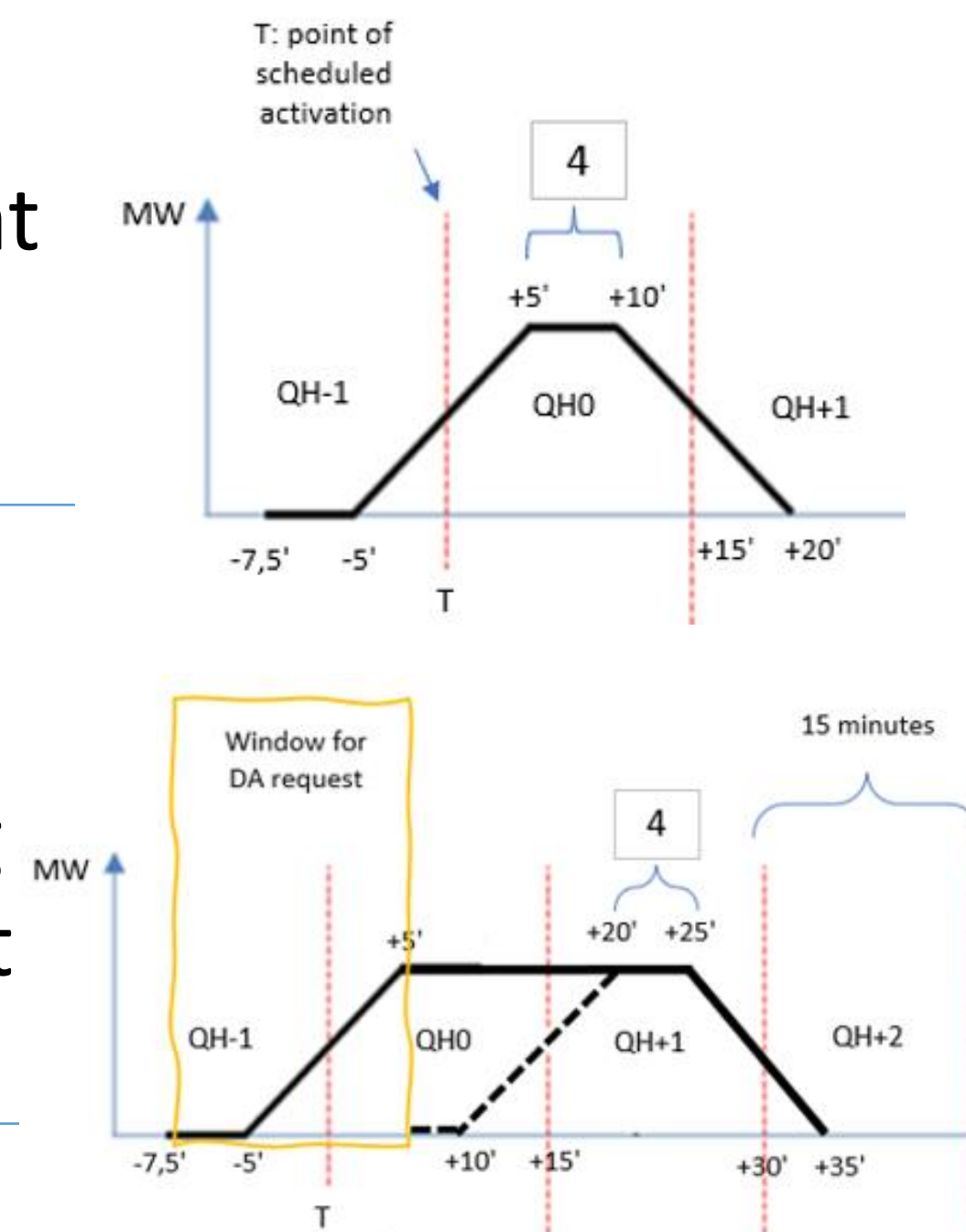
Guaranteed Volume

When unforeseen incidents or unexpected demands occur in real time, TSOs might need to have access to a certain volume of "direct activatable bids"
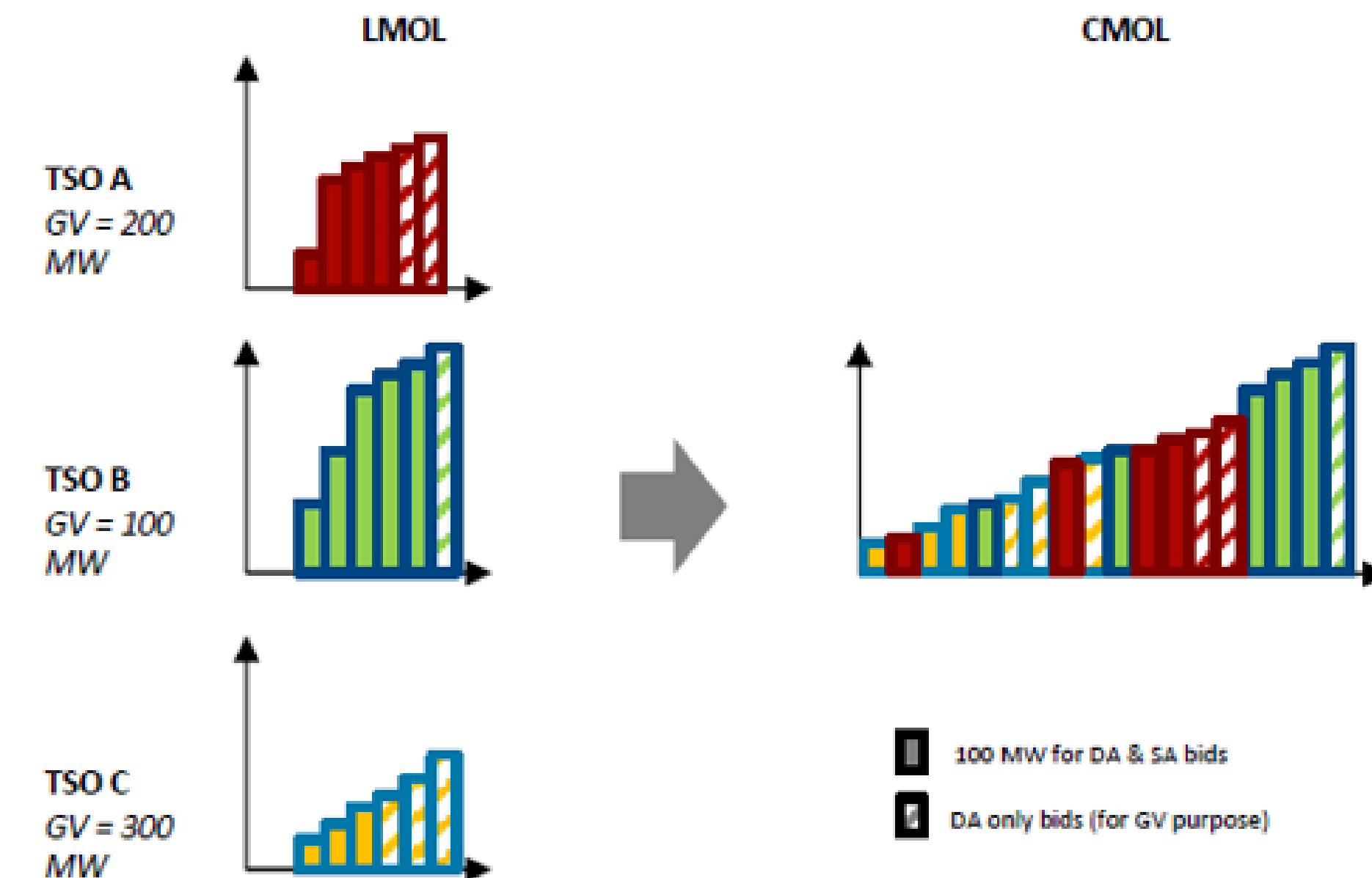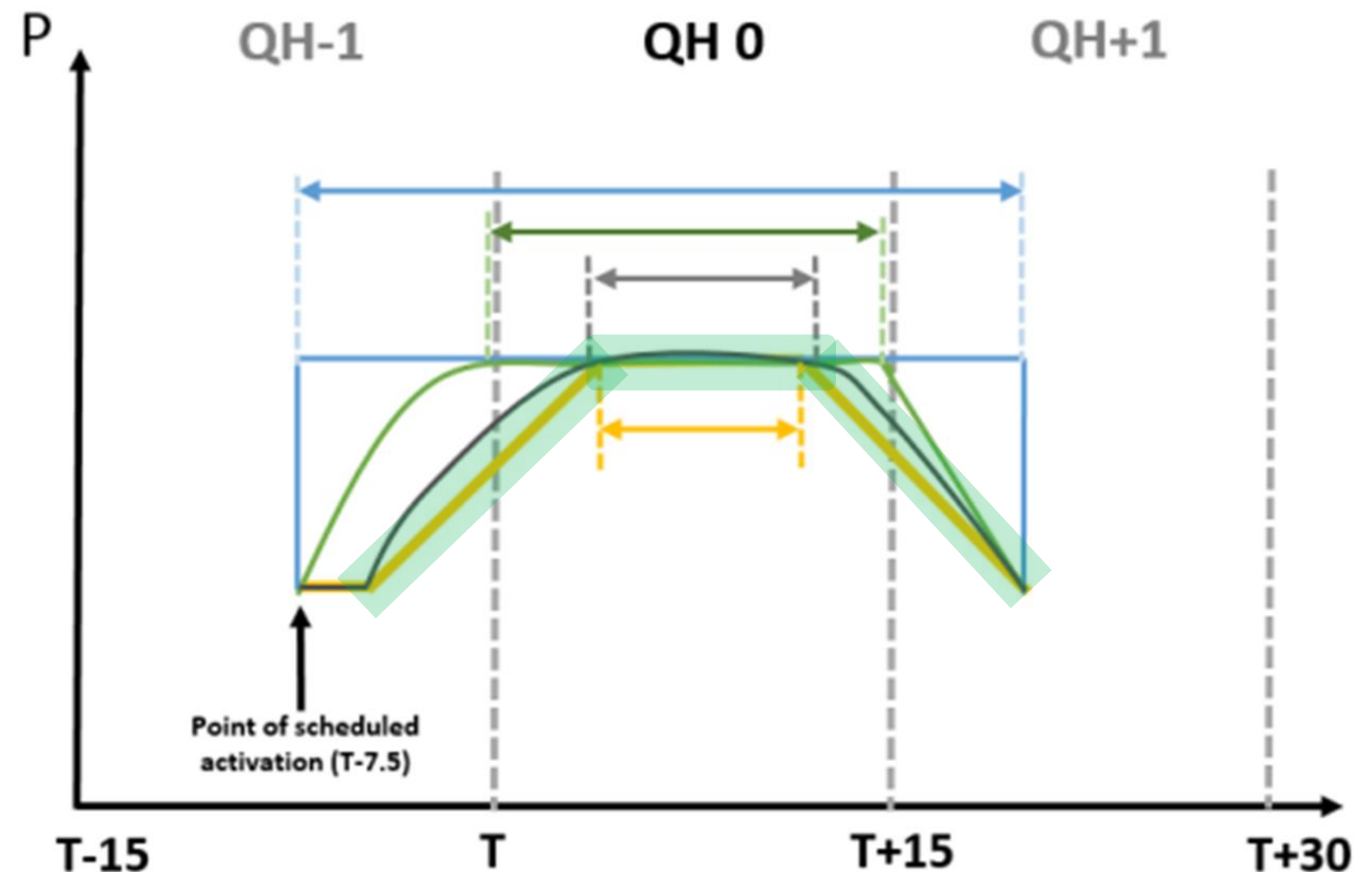
Local mFRR product characteristics

Each TSO in accordance with their terms and conditions defines the following:

- preparation period
- ramping period
- deactivation period
- maximum duration of delivery period

IPTO may set a tolerance band around the TSO-TSO exchanged shape and perform random checks
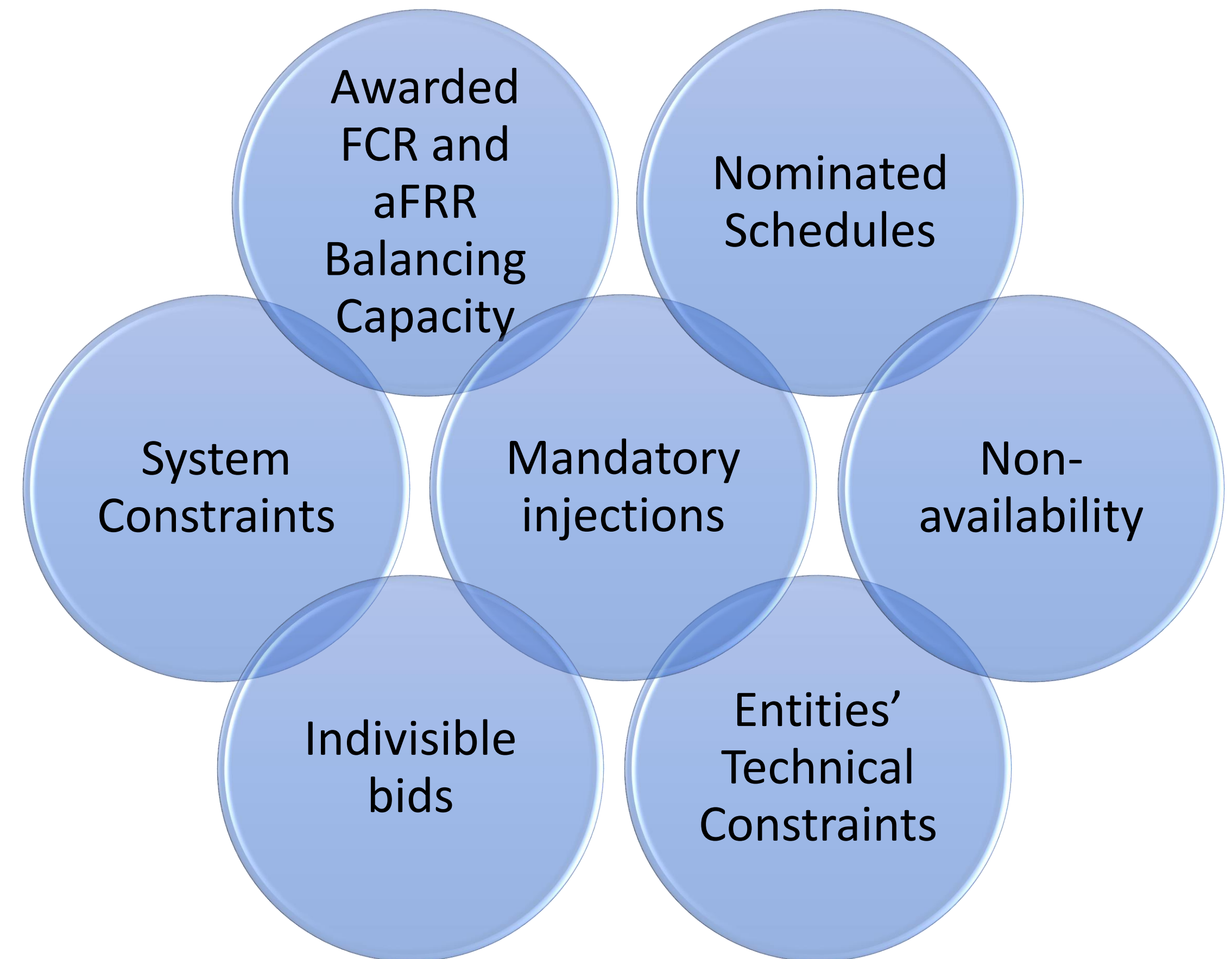

--- TSO-TSO exchanged shape

--- Potential BSP-TSO exchanged shape 1

--- Potential BSP-TSO exchanged shape 2

--- Potential BSP-TSO exchanged shape 3

Balancing energy bids conversion rules

The conversion process considers bids that can be activated within a quarter-hour from the following entities:
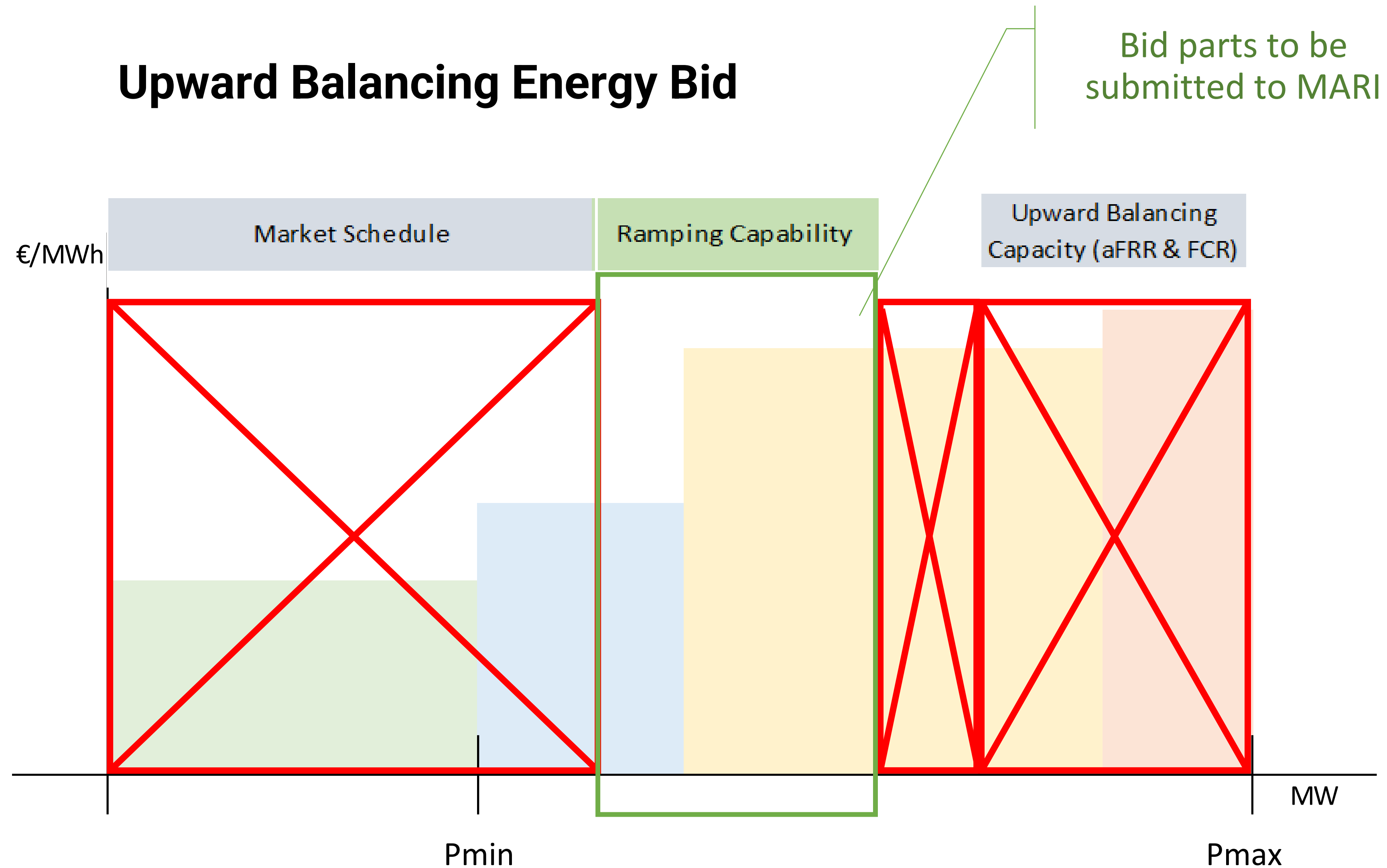
- ✓ Entities that are online but not in startup or shut-down phase or transitioning phase.
- ✓ Entities that are not in commissioning or testing operation.
- ✓ Entities that are offline but have been awarded non-spinning mFRR capacity.

The conversion process will consider bids that can be activated within a quarter-hour from entities taking into account:
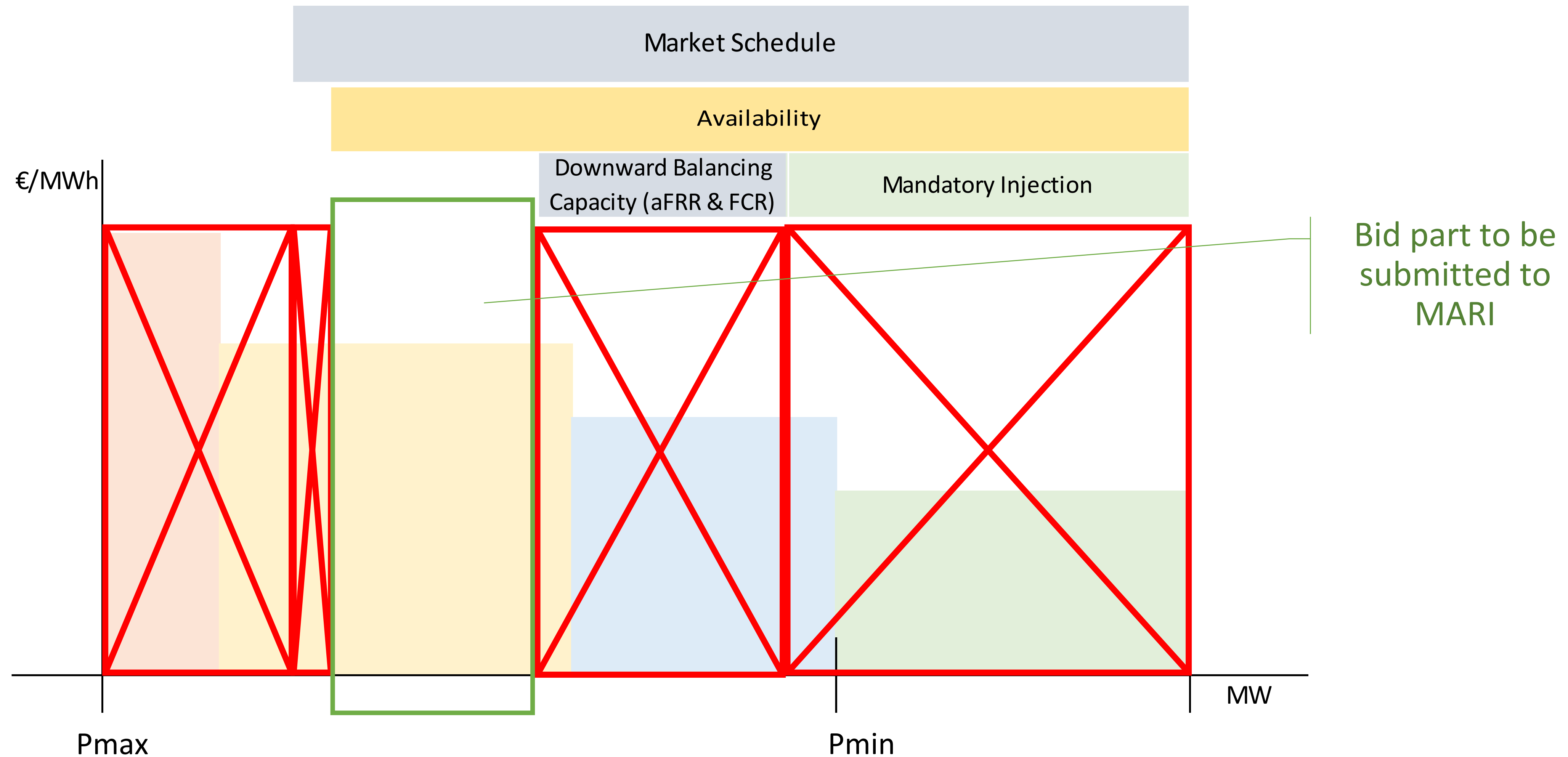
- Awarded FCR and aFRR Balancing Capacity
- Nominated Schedules
- System Constraints
- Mandatory injections
- Non-availability
- Indivisible bids
- Entities' Technical Constraints

αδμηε

Bid conversion example (entity - upward bid)

Bid conversion example (entity – downward bid)

Bids conversion example (system constraint)
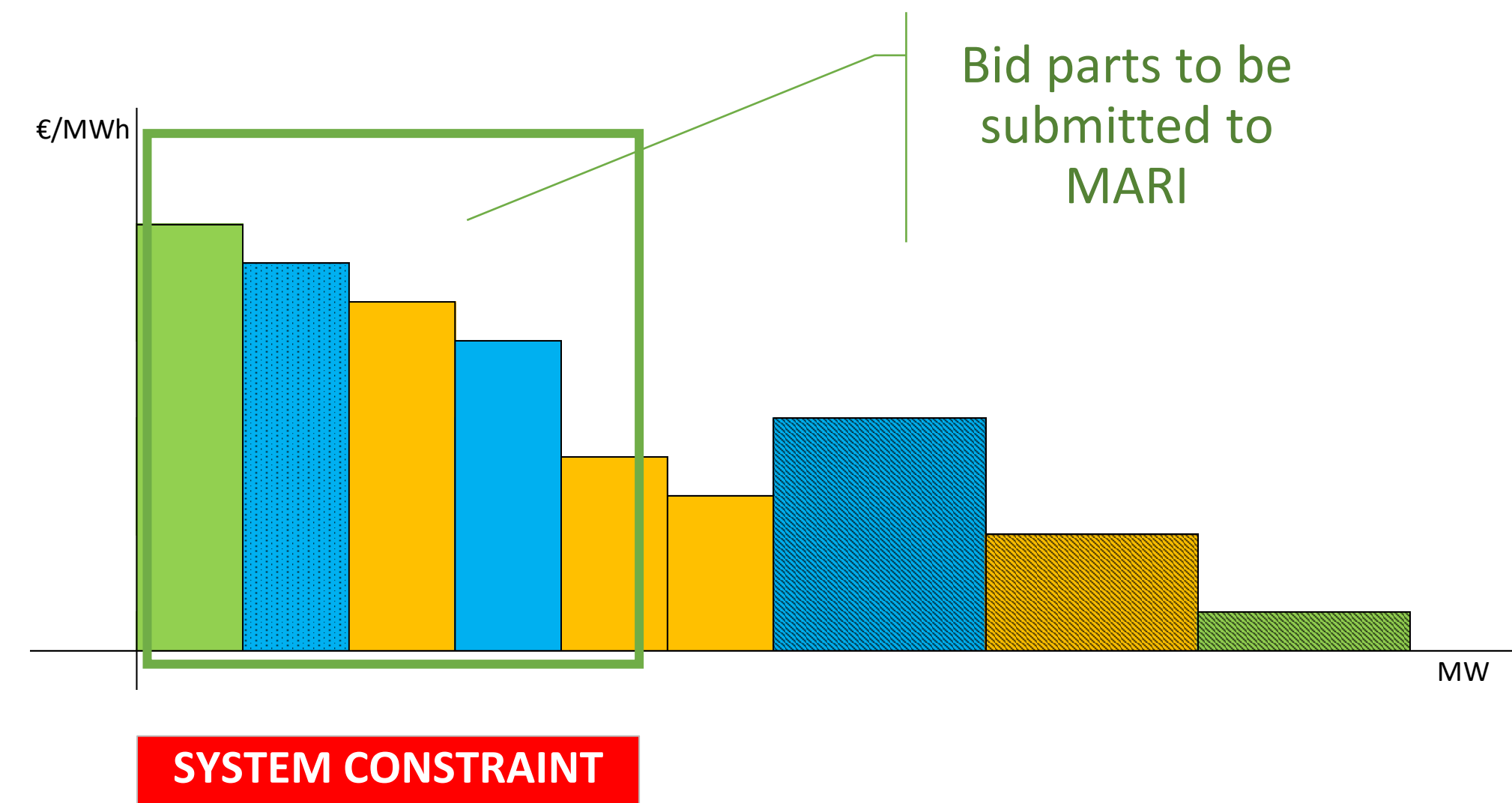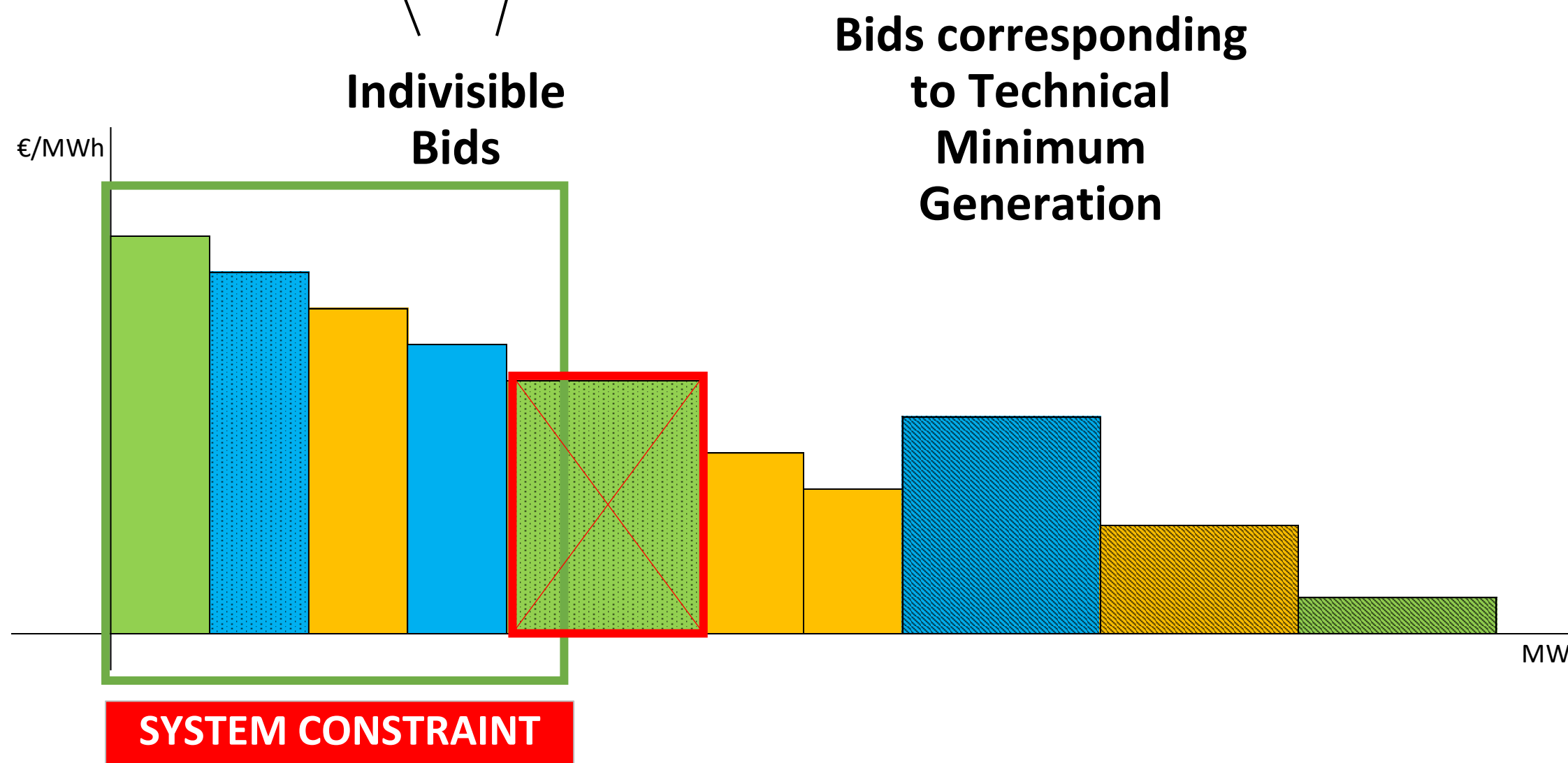
mFRR demands

TSO mFRR demands have the following characteristics:

| Quantity | The Imbalance Quantity estimated by the TSO. Positive for upward demand or negative for downward demand |

| Price | The maximum (minimum) price acceptable for upward (downward) activations |

| Location | Bidding zone |

| Purpose | 'Balancing' or 'System Constraint'. |

| Activation Type | 'Scheduled' or 'Direct' |

Estimation of the mFRR demands for scheduled activation:

| Zonal Imbalances | Estimation of zonal load, RES injections, cross-border and other imbalances |

| aFRR desaturation | Free up the already used aFRR balancing capacity |

Estimation of the mFRR demands for direct activation:

| Incidents | Incidents and unforeseen imbalances within the quarter hour |

| Unsatisfied demand | Volumes of mFRR demand not fully satisfied by the MARI platform |

αδμηε

Cross Zonal Capacity

MARI AOF uses a model based on Available Transfer Capacities (ATC)

The scheduling areas connected through interconnectors can exchange mFRR balancing energy with respect to the ATC limits of the interconnector.
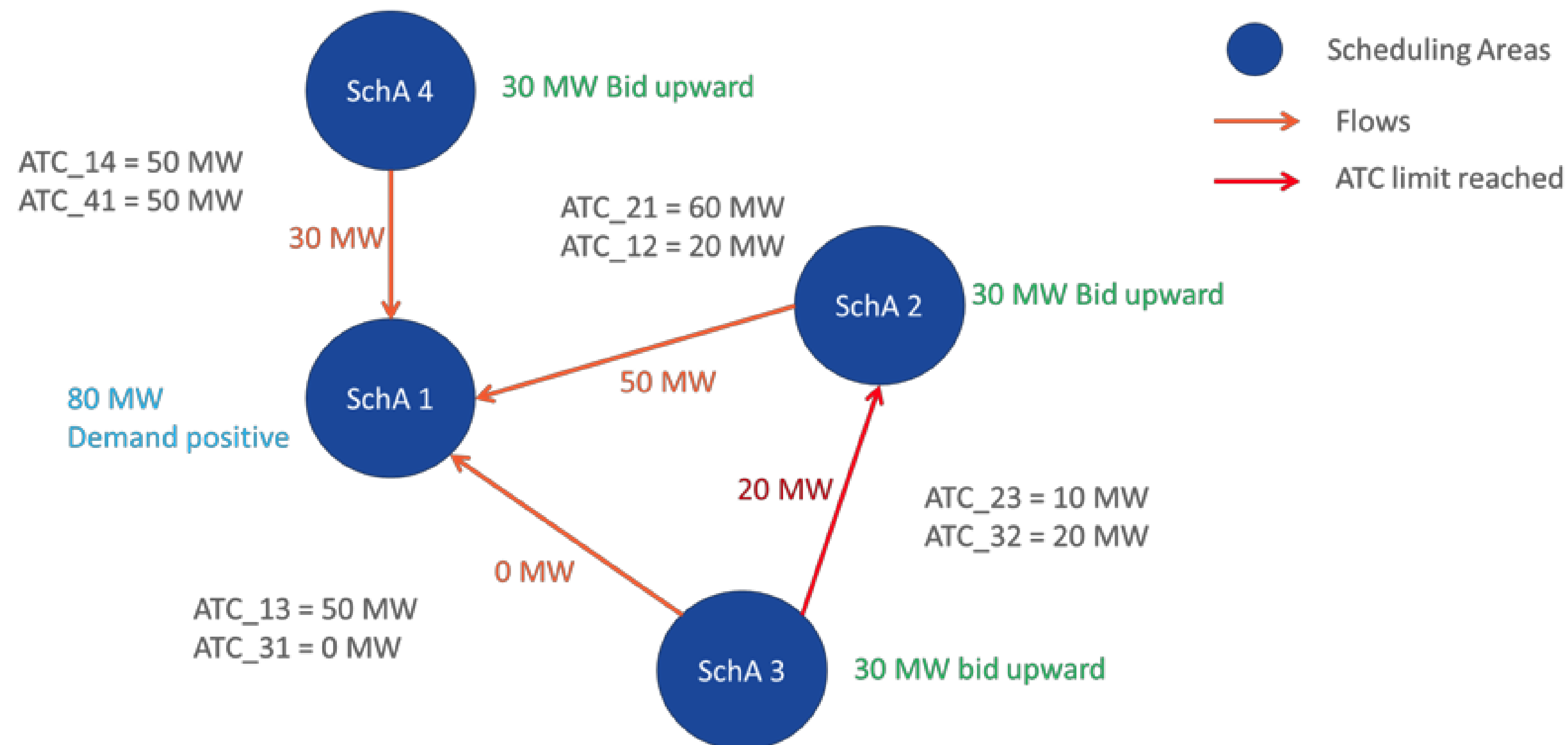
Interconnectors are bidirectional and have one ATC limit per direction.

Figure 7: Example of a feasible flow solution