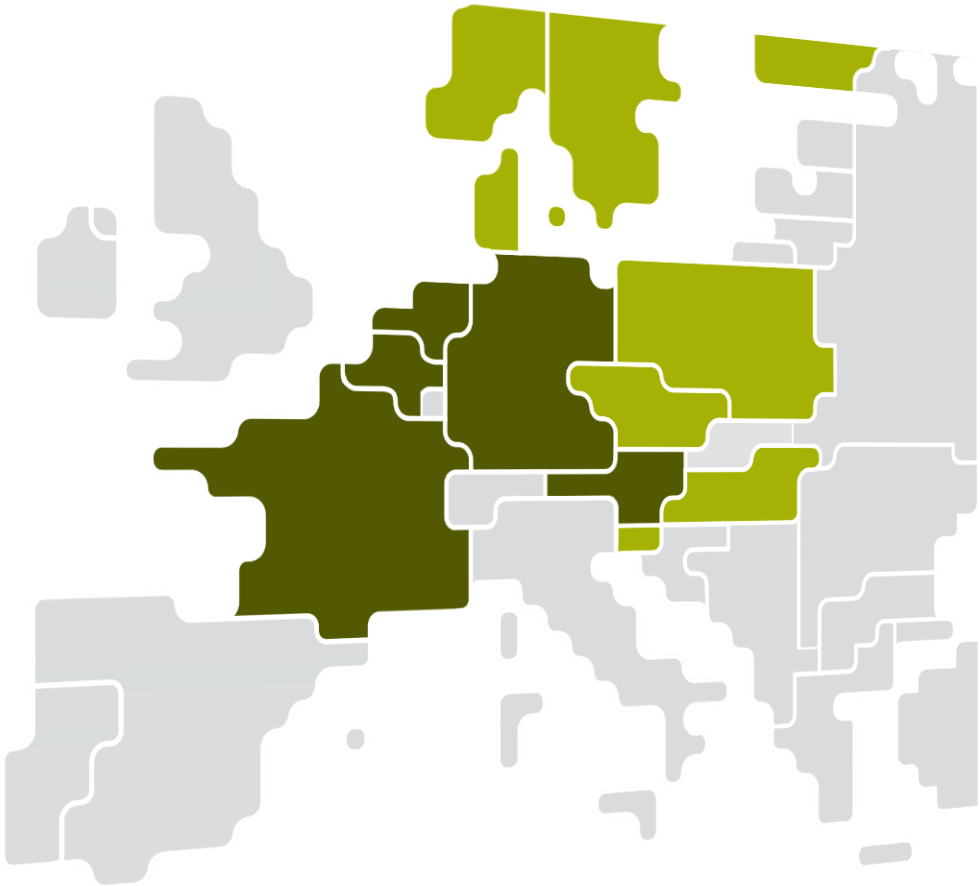
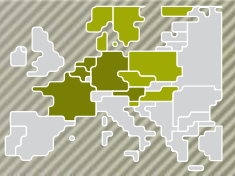
Le projet PICASSO

13 Novembre 2017, La Défense

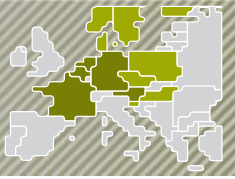


SOMMAIRE



- Qu’est ce que le projet Picasso ?
- Quels sont les changements à venir?
- Quels sont les éléments de réflexions en cours ?
- Avez vous des questions?

SOMMAIRE



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Project description :

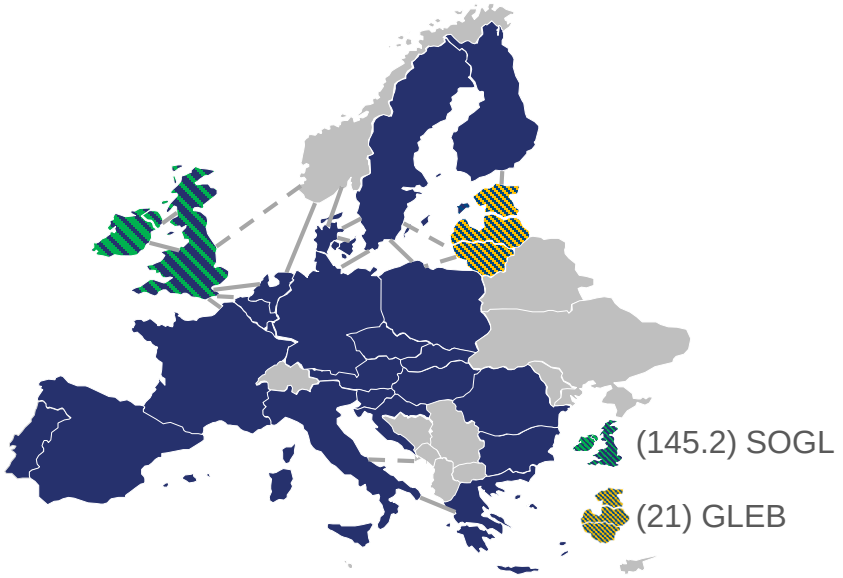
Platform for the International Coordination of the Automatic frequency restoration process and Stable System Operation

- The TSOs of **Austria**, **Belgium**, **France**, **Germany** and the **Netherlands** agreed to initiate a project on the design, implementation and operation of an aFRR Platform.
- These TSOs intend to apply as reference project for aFRR within ENTSO-E.

PICASSO

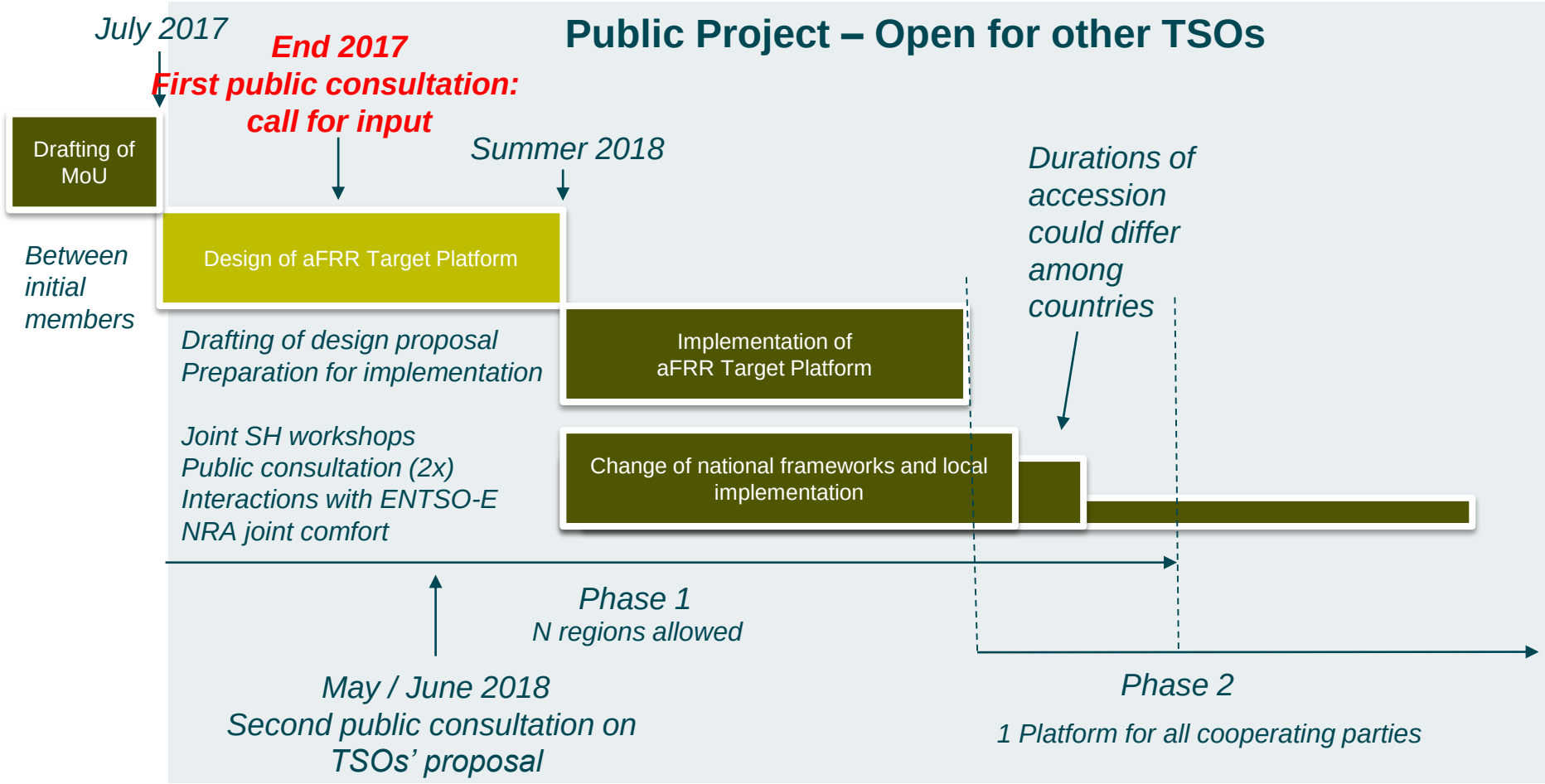


EU mandatory aFRR target



Non EU TSOs may also participate

Intended timeline



PICASSO as a project

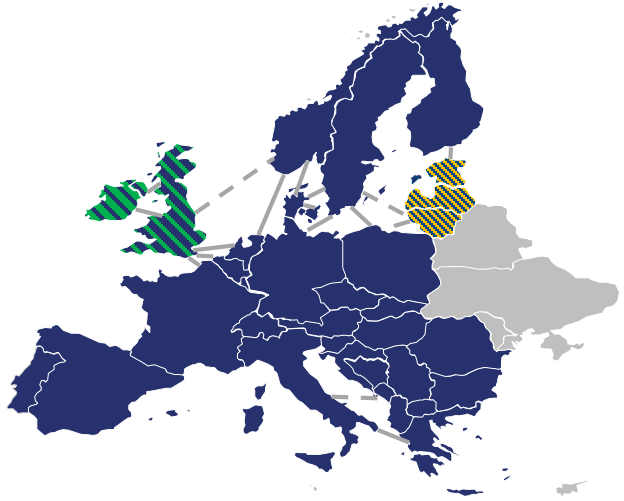
Possible Phase 1 “Intermediate versions”

Potential intermediate version of the platform may facilitate design & operation of target platform

Intermediate versions should not slow down the target platform. They may not be as advanced/compliant as the target platform. TSOs would be able to gather valuable feedback with such intermediate version. TSOs are considering the implementation of intermediate version.

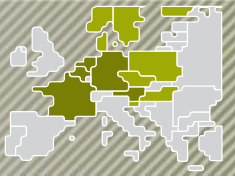


Intermediate platform:
Potential extension of AT-DE to BE and FR in 2020?

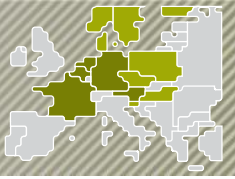


Target platform ?

SOMMAIRE



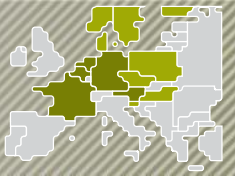
- Qu’est ce que le projet Picasso ?
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- Ce qui va changer :
  - PICASSO concerne le produit standard de Réserve Secondaire : aFRR;
  - Passage de l'activation nationale au prorata sur l'ensemble des groupes fournissant de la réserve secondaire avec un signal de niveau N généralisé à une activation selon préséance économique (ou Merit order) sur les groupes les moins chères avec l'émission d'un signal de niveau Ni individualisé;
  - Formulation par les responsables de réserves d'offres pour l'activation de la réserve secondaire (volume, prix);
  - Partage des offres sur une plateforme Européenne, pour l'activation régionalement de l'aFRR;
  - Passage à un paiement de l'énergie au Prix Marginal Cross Border;
  - Harmonisation Européenne de certains éléments de définitions du produit d'aFRR standard pour la constitution d'un marché commun (Full Activation Time, bid resolution, BEGCT, validity period = delivery period)

- Ce qui ne devrait pas changer :
  - Pas de changement du processus de programmation
  - Pas de changement dans la contractualisation et la prescription de la réserve secondaire
  - Participation à IGCC maintenue

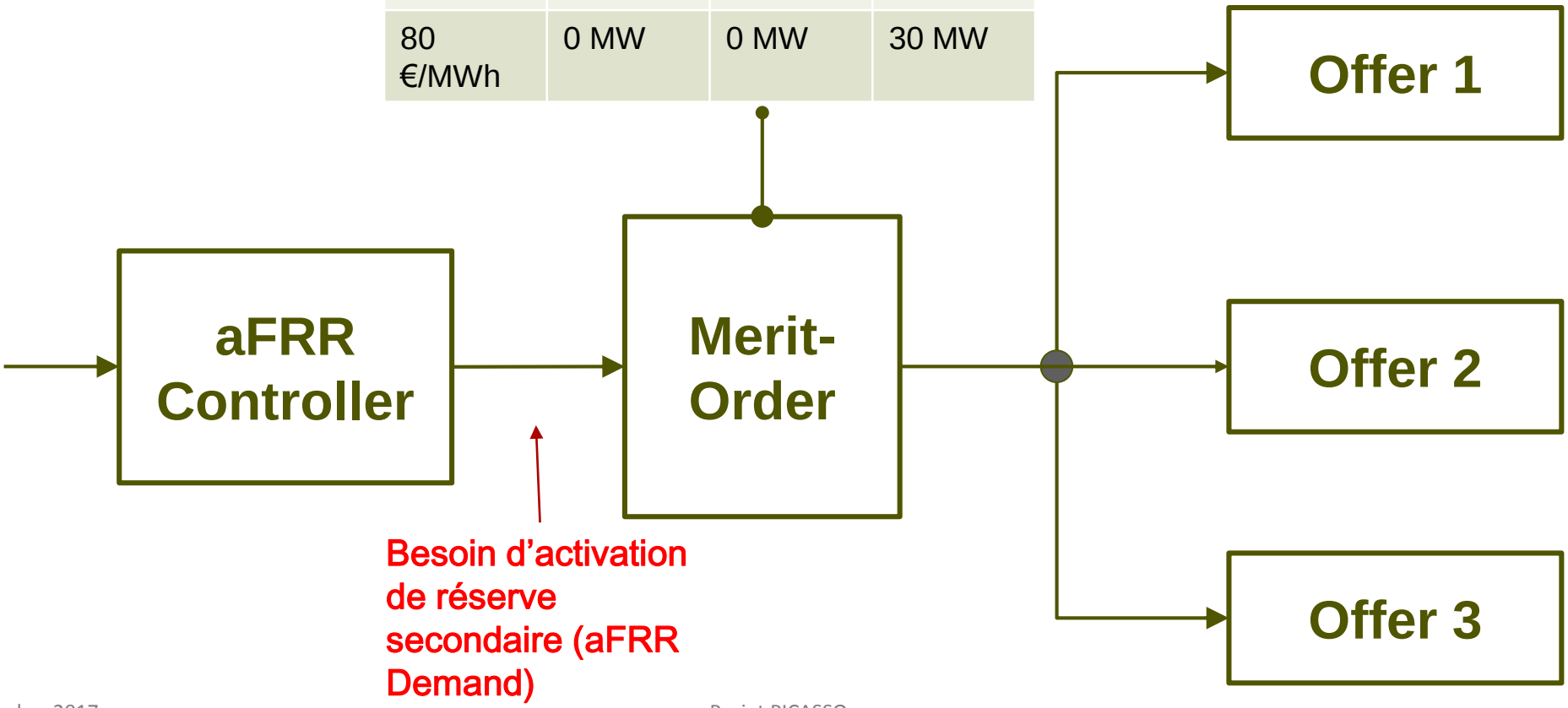
SOMMAIRE

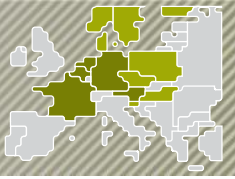


- Qu’est ce que le projet Picasso ?
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Pro-rata to Merit Order

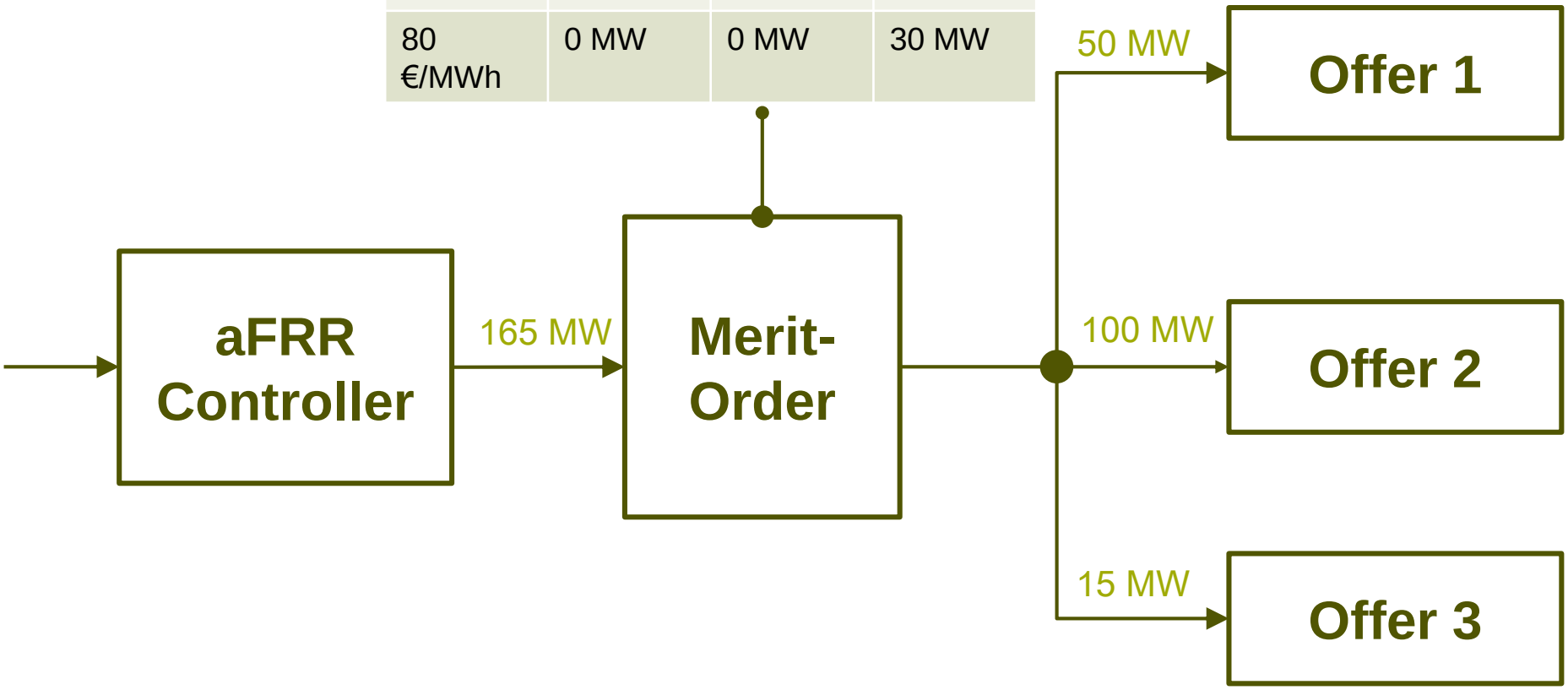
Price	Offer 1	Offer 2	Offer 3
30 €/MWh	50 MW	0 MW	0 MW
40 €/MWh	0 MW	100 MW	0 MW
80 €/MWh	0 MW	0 MW	30 MW





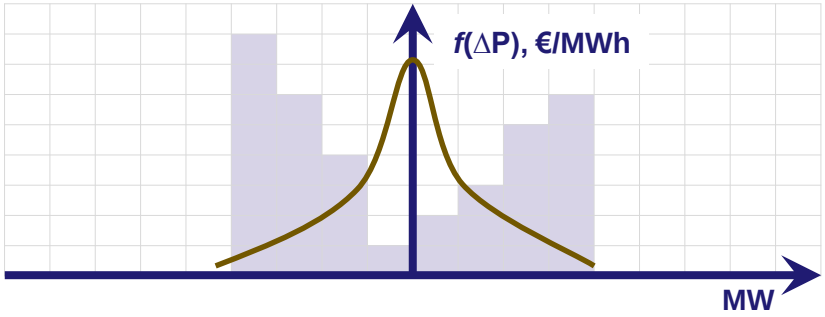
Pro-rata to Merit Order

Price	Offer 1	Offer 2	Offer 3
30 €/MWh	50 MW	0 MW	0 MW
40 €/MWh	0 MW	100 MW	0 MW
80 €/MWh	0 MW	0 MW	30 MW

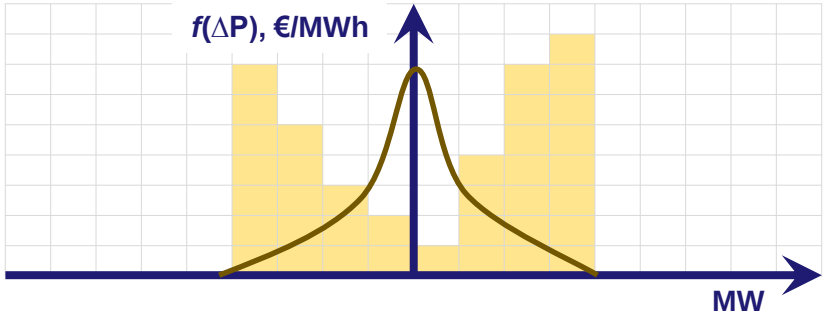


CMOL – Basic Principle

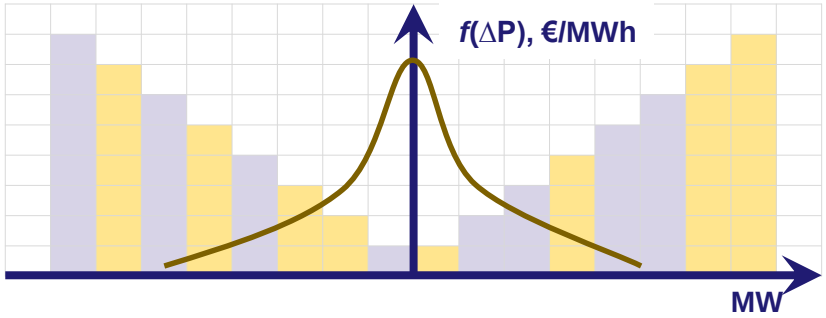
Area A – Supply / Demand



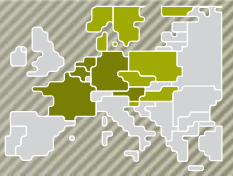
Area B – Supply / Demand



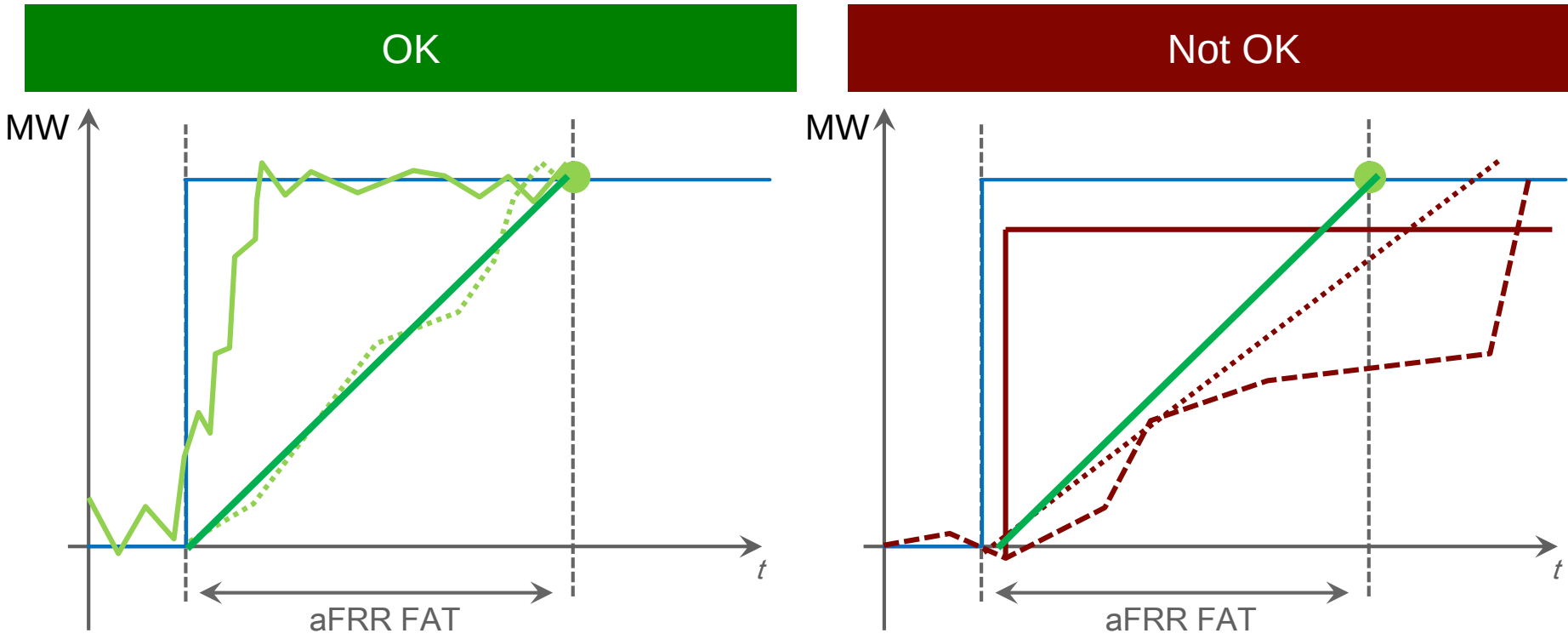
Area A+B - Supply / Demand



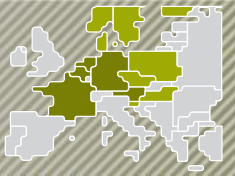
CMOL = Common Merit-Order List



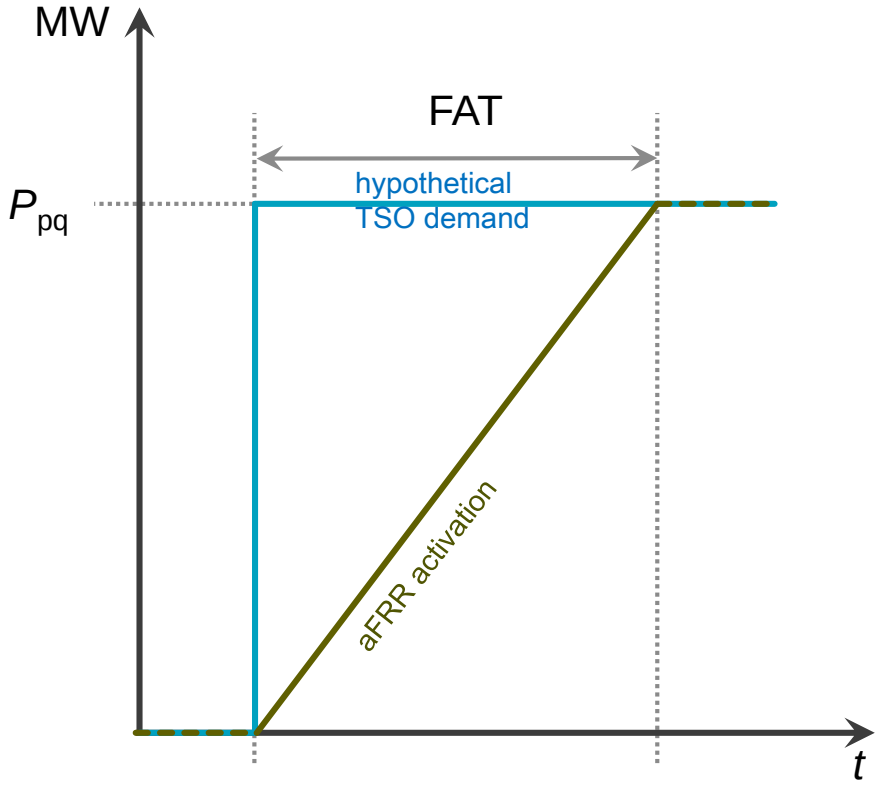
Full Activation Time (FAT)	**Minimum “speed” of BSPs**
Bid resolution (time)	**For how long is a bid valid?**
Bid granularity (volume)	**What is the minimum bid size / increment?**



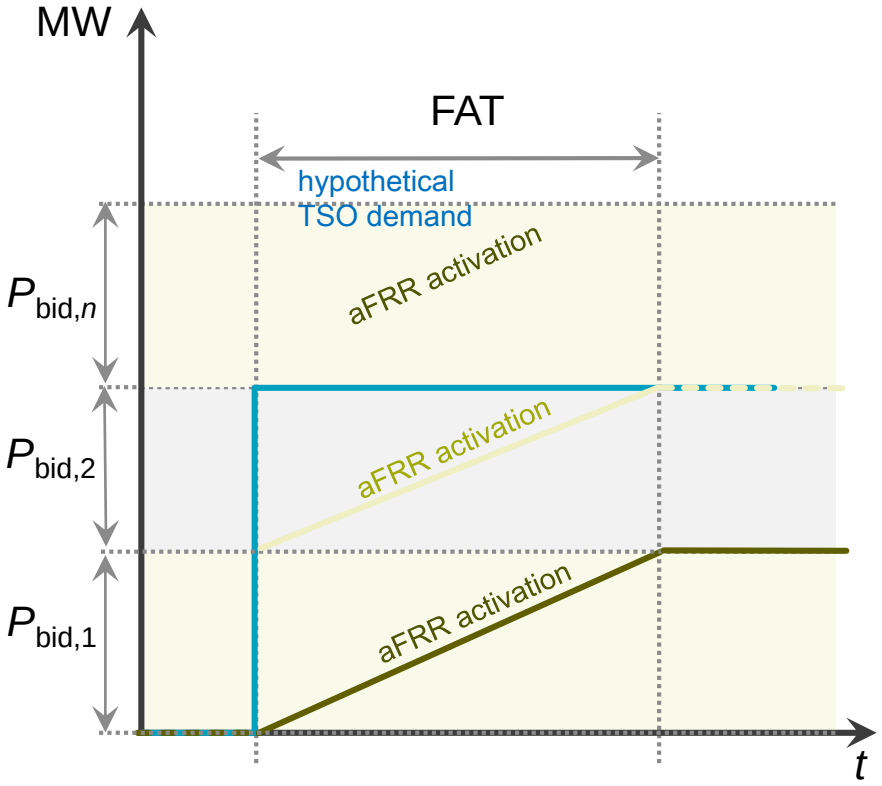
As a principle – activation slower than FAT is not allowed



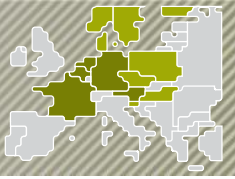
Prequalification



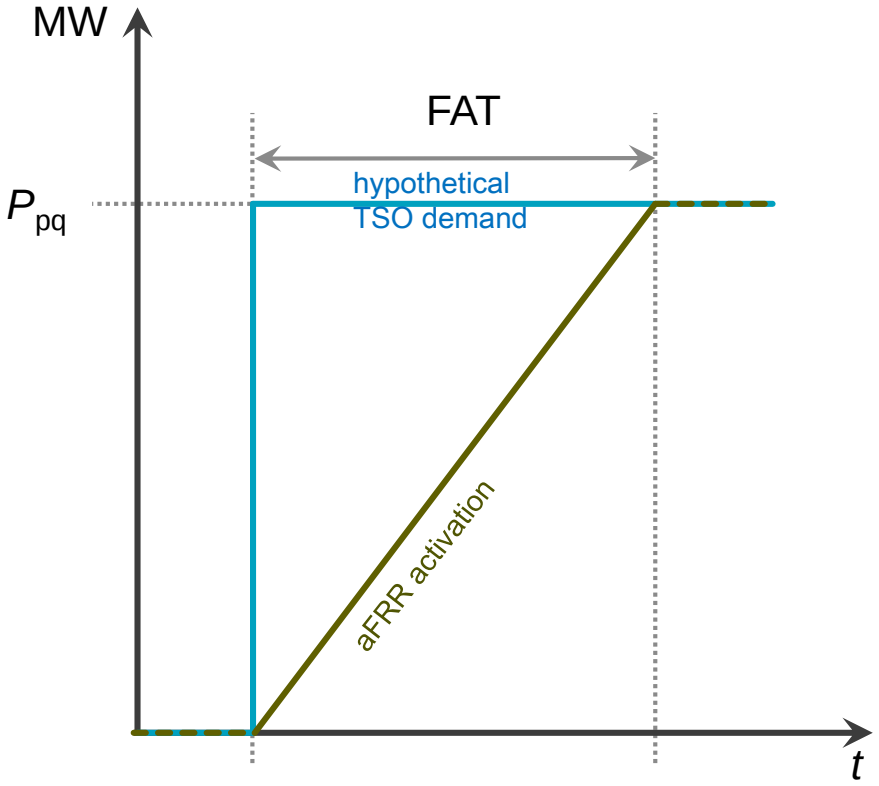
Bid Activation / Balancing



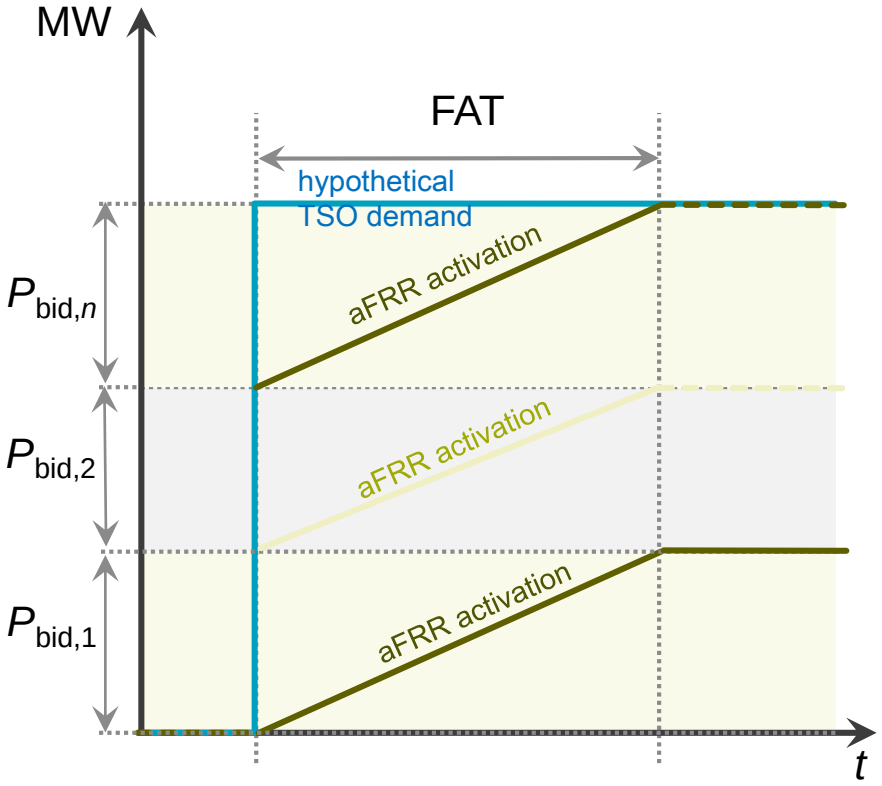
FAT = X minutes, while in the prequalification phase FAT refers to the activation of the whole volume which is to be prequalified, for the CMOL the FAT refers to the time to activate a bid



Prequalification



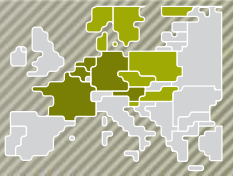
Bid Activation / Balancing



FAT = X minutes, while in the prequalification phase FAT refers to the activation of the whole volume which is to be prequalified, for the CMOL the FAT refers to the time to activate a bid

Standard product: Full Activation Time (FAT) – Maximum FAT

Markus



- A technical and economic assessment methodology for the determination of the maximum FAT for Phase 2 is currently being developed, focusing on values of 5.0 and 7.5 minutes
  - In case technical and economic assessments lead to divergent conclusions, mitigation measures will be studied

- The assessment methodology and a common proposal for a maximum FAT will be carried to discussions on ENTSO-E level

- Note : Current French value for the aFRR FAT is 6min40s.

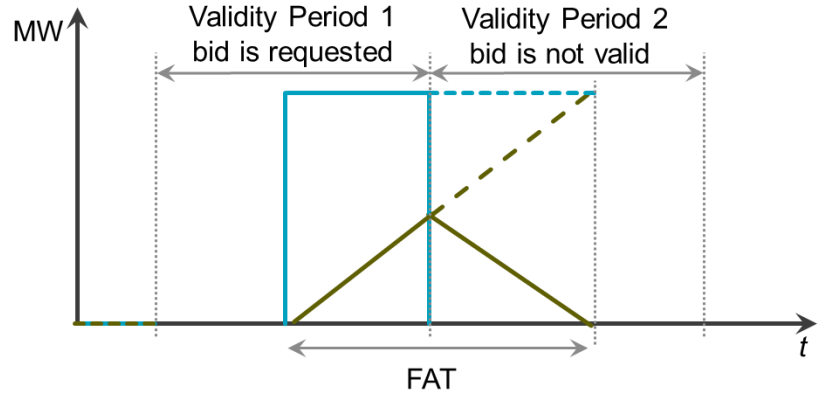
Validity Period

- As a starting point, a validity period (= delivery period) of 15 minutes is assumed, in line with expected validity period for mFRR

Impact on frequency and ACE

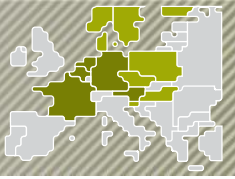
- A short validity period could however lead to frequent changes of the CMO and therefore
  - to frequent deactivation of bids which were valid in the last validity period and activation of bids which are valid in the current validity period
  - Impact on frequency / ACE has to be evaluated
- In case impact on frequency / ACE is not acceptable, TSOs will consider a multiple of 15 minutes.

Example



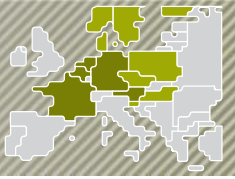
4. Harmonizing aFRR markets

Standard product: Bid granularity (volume)



Current	Germany	Austria	Belgium	France	Netherlands
Minimum bid size	5 MW	5 MW	1 MW	1 MW	4 MW
Granularity	1 MW	1 MW	0.1 MW	1 MW	1 MW
Divisibility	Yes	Yes	Yes	Yes	Yes

- **Minimum & maximum bid size [MW]**
  - Means the min/max size of the offered bid volumes from the BSPs
  - Affects the number of bids on the MOL (IT technical impact) & minimum pool size required (market entry)
  - If bid are divisible, the maximum bid size is to be considered mostly as an IT limitation
- **Granularity [MW]:**
  - Possible increment of offers above the minimum bid size
- **Divisibility:**
  - Means whether a minimum bid volume constraint during activation applies yes/no
  - By nature of the aFRR process, **energy bids have to be divisible** to be activated continuously

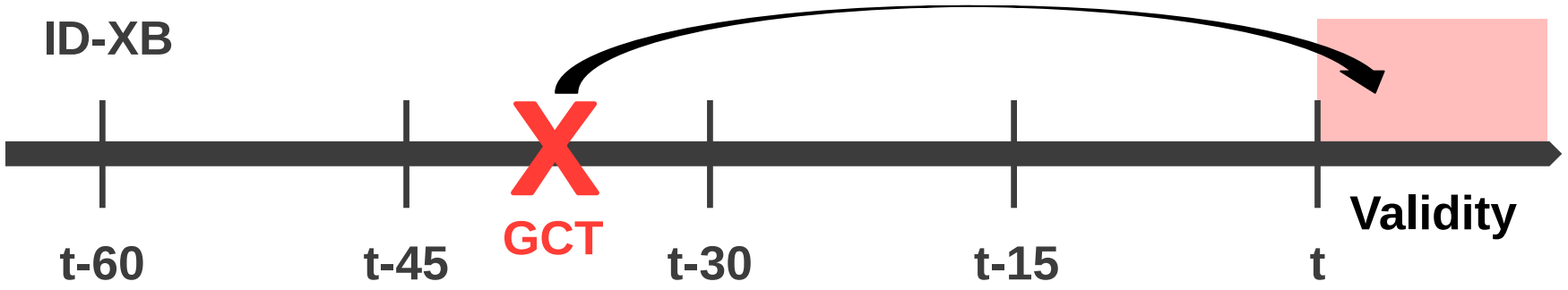


- Different terminologies for the bids that are not linked to a contract for balancing capacity:
  - Voluntary bids = non-contracted bids = free bids

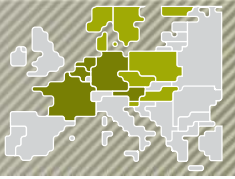
- Pre-contracted bids and voluntary bids for standard aFRR balancing energy products are obligatory in the target model pursuant to Article 16 (5) GLEB

- Total volume may be limited to dimensioning amount pursuant to Article 29(10) GLEB

	Germany	Austria	Czech Republic	Belgium	France	Netherlands	Finland
Current BEGCT	Week-1 (on Wed 11:00 for following week)	Week-1 (on Wed 11:00 for following week)	D-1 (9:00)/15 mins	D-1 (at 3PM for the next day D)	60 mins	60 mins (being changed to 30)	-none-

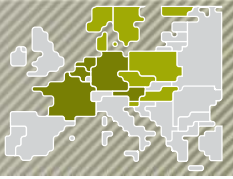


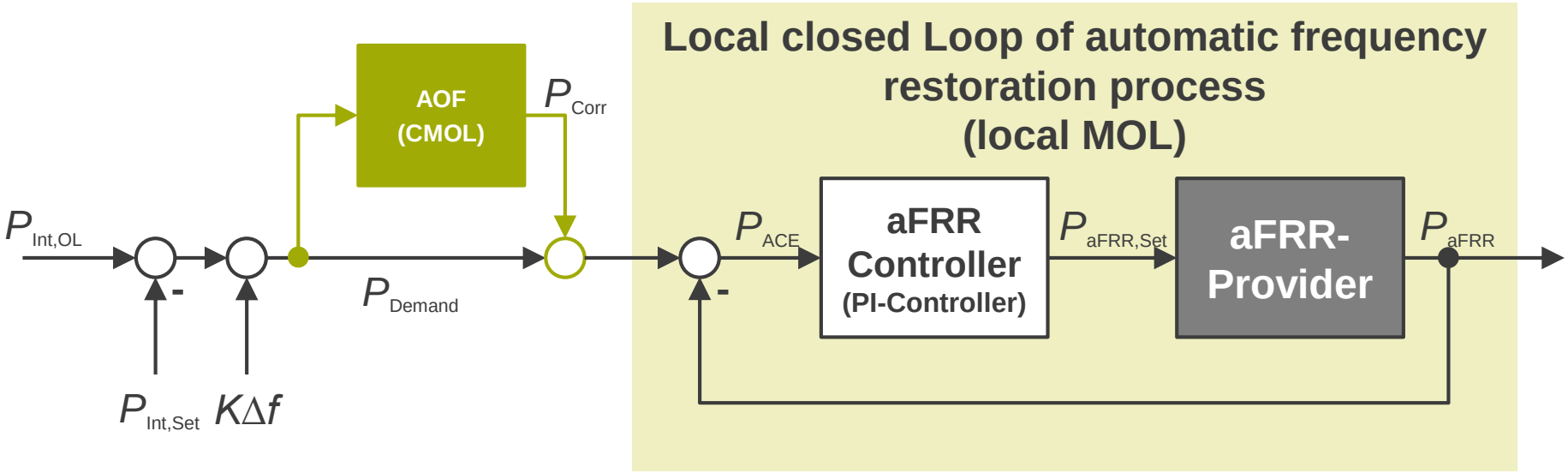
- GLEB requirements for BEGCT:
  - be as close as possible to real time;
  - not be before the intraday cross-zonal gate closure time;
  - ensure sufficient time for the necessary balancing processes.
- BEGCT needs further discussion in ENTSO-E to ensure consistency of the timing of the different processes (RR, mFRR, aFRR, Intraday)



Restore Frequency / Control ACE to zero	**The amount of aFRR to be activated according to the AOF should cover the aFRR Demand of each LFC Area (full access to the CMOL)**	**1**
Implicit Netting	**Implicit aFRR netting of requests based on prices: The amount of activated aFRR should be minimized**	**2**
Activate Cheapest Bids	**Minimize the cost of aFRR activation (including the netting of most expensive bids)**	**3**
Responsibility / Operational Security	**Minimize Cross-Border Exchanges (if the rest is equal)**	**4**

- **Capacity calculation**
  - Currently PICASSO TSOs intend to use only cross-zonal capacity remaining after intraday for exchange of balancing energy: i.e. no specific capacity calculation for the aFRR process
- **IGCC**
  - There is a strong link between aFRR Target Platform and Imbalance Netting Platform to be taken into account (almost simultaneous processes).

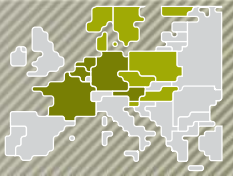




Control Demand Concept and ACE Adjustment

- Coordinates the imbalances at the input of the control loop
- Stability proven theoretically and in real operation in Germany, IGCC and the aFRR cooperation between Austria and Germany
- The concept will be extended by an ACE adjustment mechanism assigning the ACE resulting from aFRR activation dynamics to the importing TSO

Do the stakeholders share the principles proposed by the TSOs?



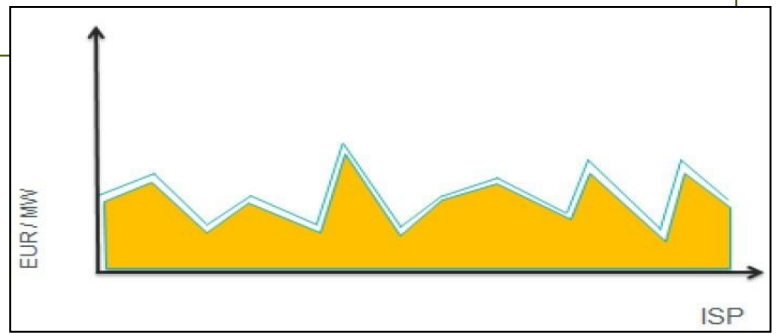
PICASSO TSOs propose following approach:

Pricing	TSO-TSO Settlement
Cross-Border Marginal Pricing	**Proportional cost sharing**
– All BSPs within a non-congested area receive the same marginal price – Marginal price is the price of the most expensive bid activated in a non-congested area. – With congestion the marginal price is the price of the highest activated bid per uncongested area. – Consistent with other market timeframes and mFRR proposal – Most accurately reflects the value of energy in uncongested area	– **Actual costs** for each partner is calculated based local activation for the cooperation – **Target costs** for each partner is calculated based on the respective demand – **Difference** between actual and target costs are compensated between the partners Congestion rent may be generated.

In principle two extreme options are possible for the balancing energy pricing period:

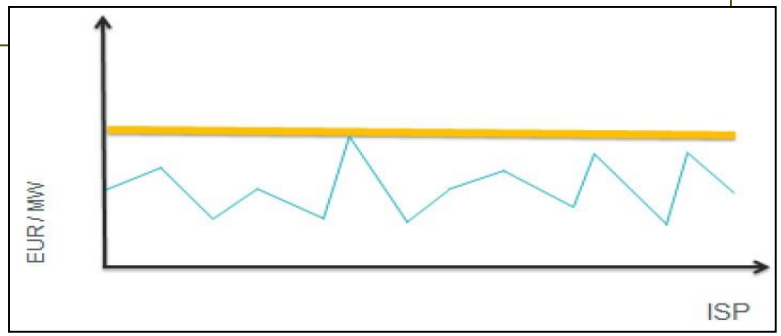
„Control-cycle BEPP“

- The BSP settlement is settled on a control-cycle basis (each 4 seconds)
- The BRP settlement is done on a volume weighted average



„15-min BEPP“

- The BSP settlement is done on an ISP basis (each 15 minutes)
- The BRP settlement results from the market clearing price of the BSP settlement



Note:

- Intermediate options are also possible for BEPP. They lead to different combinations of pros and cons of the extreme options.
- Volume weighted average has been used in assessment of the options. Other variants for BRP settlement are possible.

Questions ?

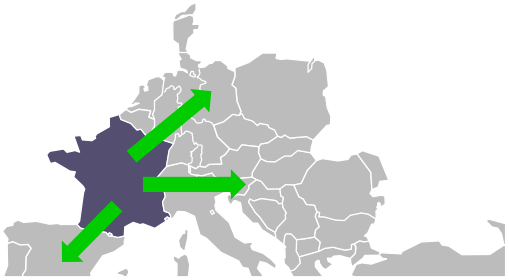
ANNEXES

Frequency Containment automatic / manual Frequency Reserves



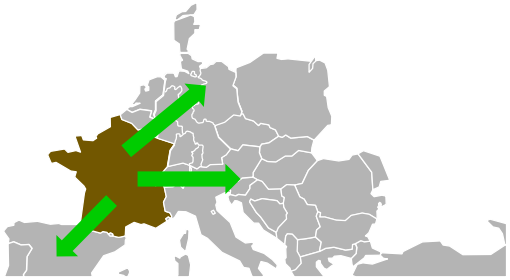
Stabilization

Restoration Reserves

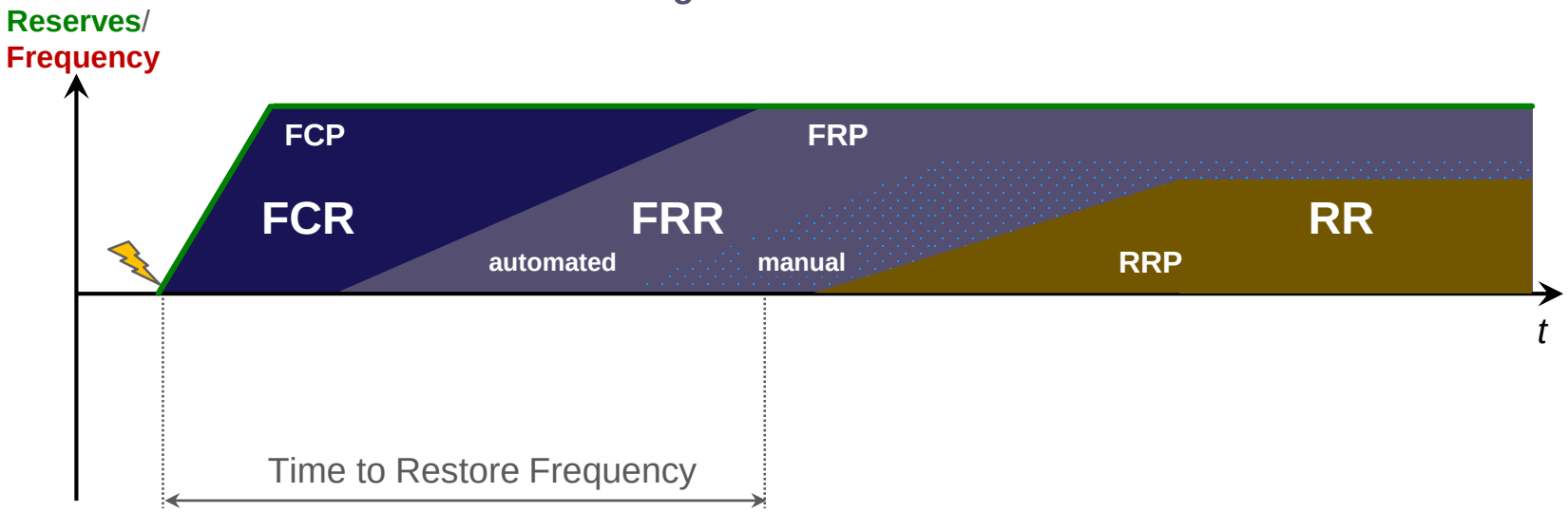


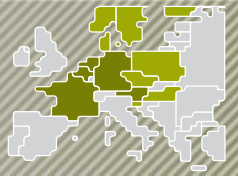
Regulate FRCE to zero

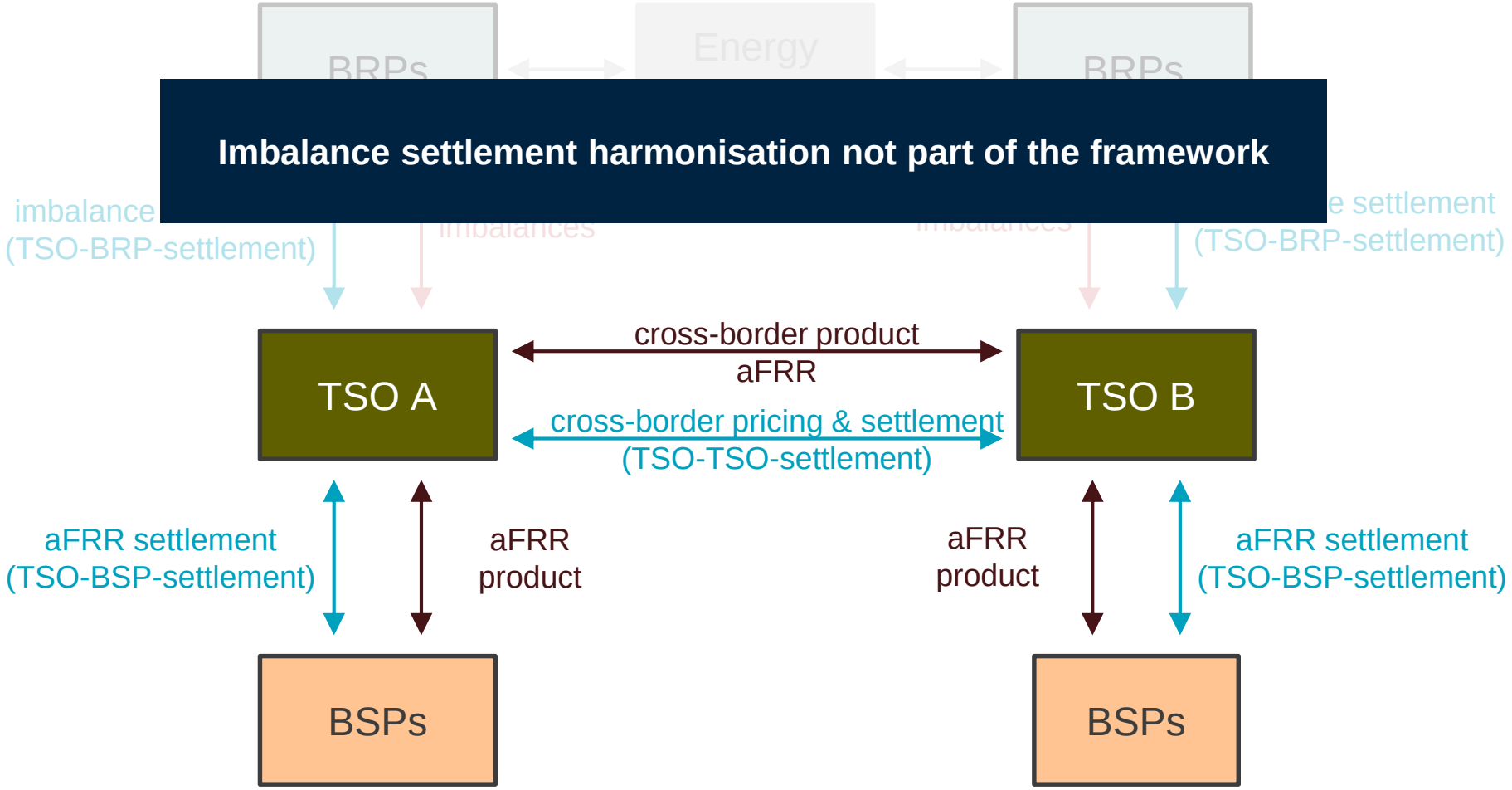
Replacement Reserves (optional)



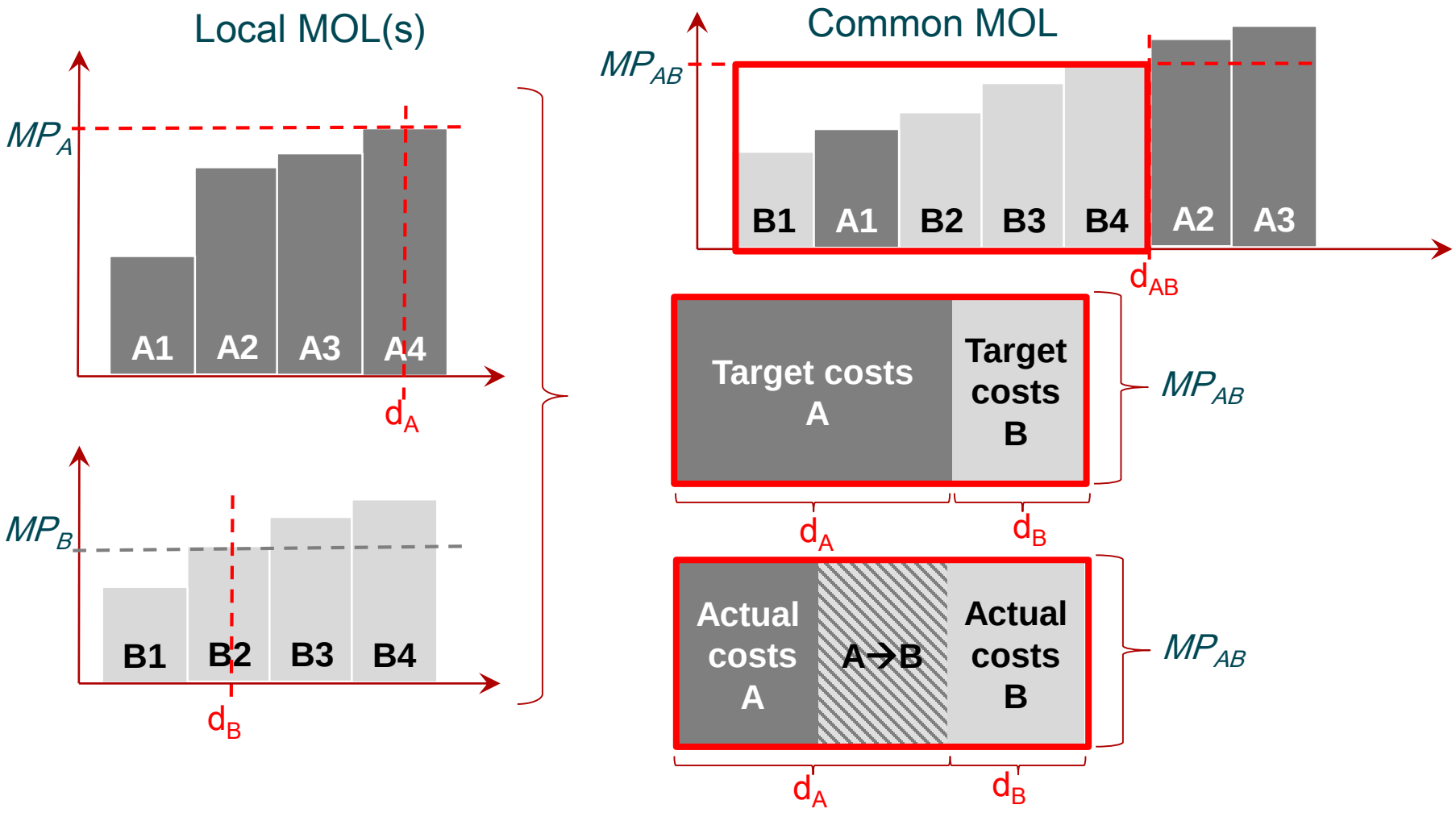
Release Used FRR



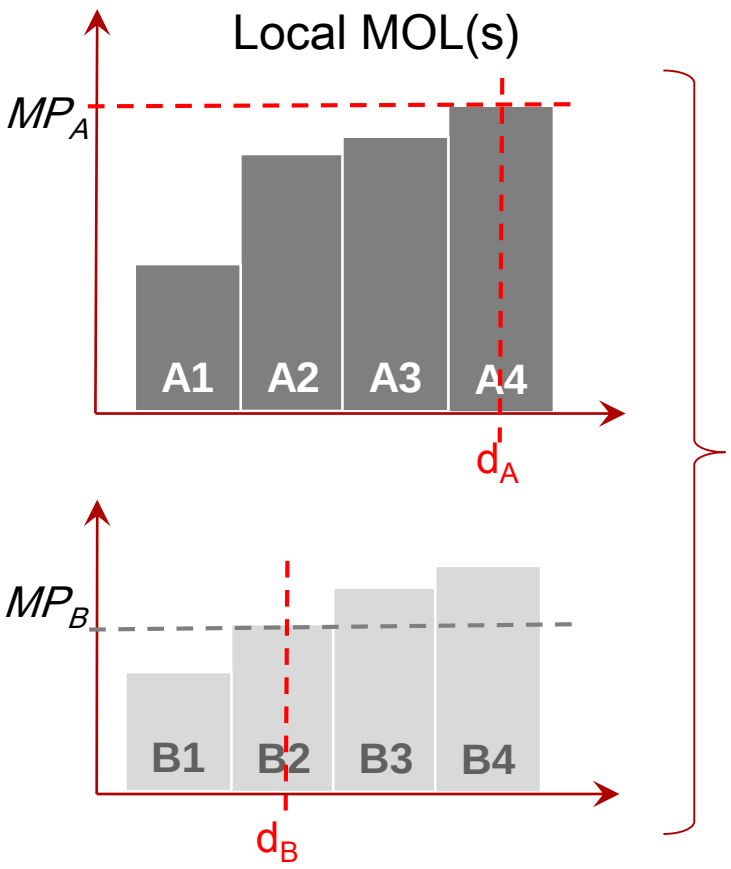


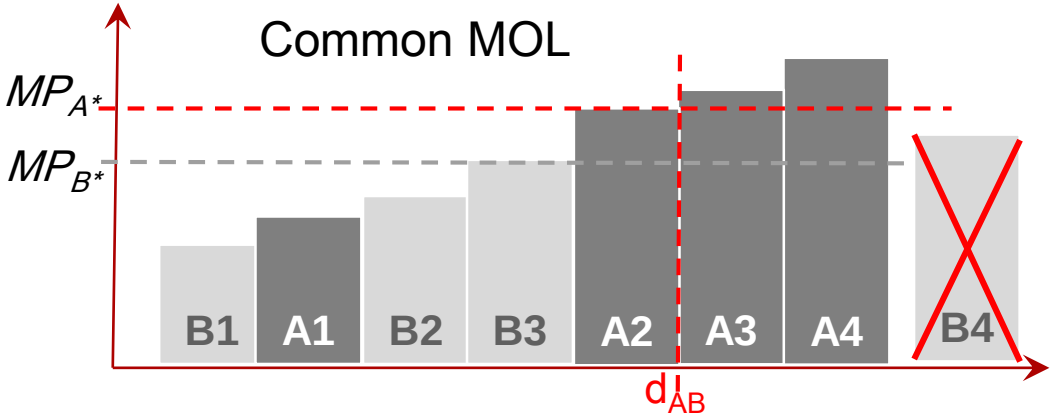

BRPs
Energy
BRPs
Imbalance settlement harmonisation not part of the framework
imbalance
(TSO-BRP-settlement)
Imbalances
Imbalances
e settlement
(TSO-BRP-settlement)
TSO A
cross-border product
aFRR
cross-border pricing & settlement
(TSO-TSO-settlement)
TSO B
aFRR settlement
(TSO-BSP-settlement)
aFRR
product
aFRR
product
aFRR settlement
(TSO-BSP-settlement)
BSPs
BSPs

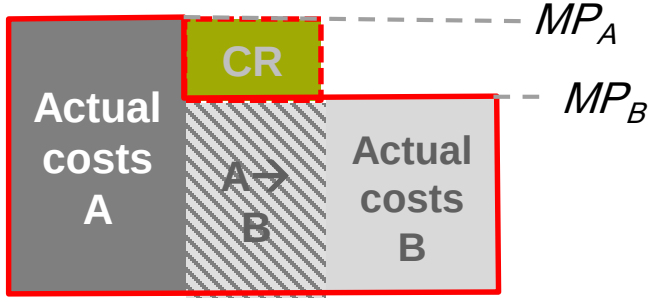
In uncongested case all activated BSPs receive the same marginal price (MP).



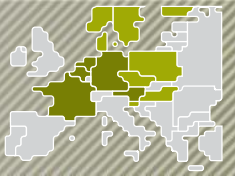
With congestions a mechanism for defining the uncongested areas needs to be developed.







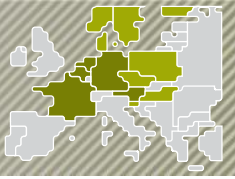
Distribution of the congestion rent still need to be defined



Chosen approach pricing & settlement approach:

- is compliant with GLEB,
- incentivizes BSP to bid marginal cost
- creates congestion rent in case of congestion
- ensures that all countries benefit from platform
- is consistent with other timeframes (DAMC, RR, mFRR)

Any stakeholder remark?



4. Harmonizing aFRR markets

Balancing Energy Pricing Period (BEPP): Introduction

Situation

- TSOs are responsible for maintaining the frequency and ACE within given parameters.
- Market participants carry financial responsibility for their energy imbalances.
- Within an ISP the energy and power fluctuations are strongly linked. aFRR is activated continuously and follows power fluctuations within a delivery period (henceforth ISP).

Complication

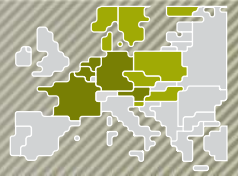
In some cases, fluctuating power demand can cause activation peaks and resulting price peaks that may not reflect the energy scarcity in the system when it is settled on the basis of a full ISP:

- affecting the TSO-BSP settlement price
- affecting the TSO-BRP settlement price

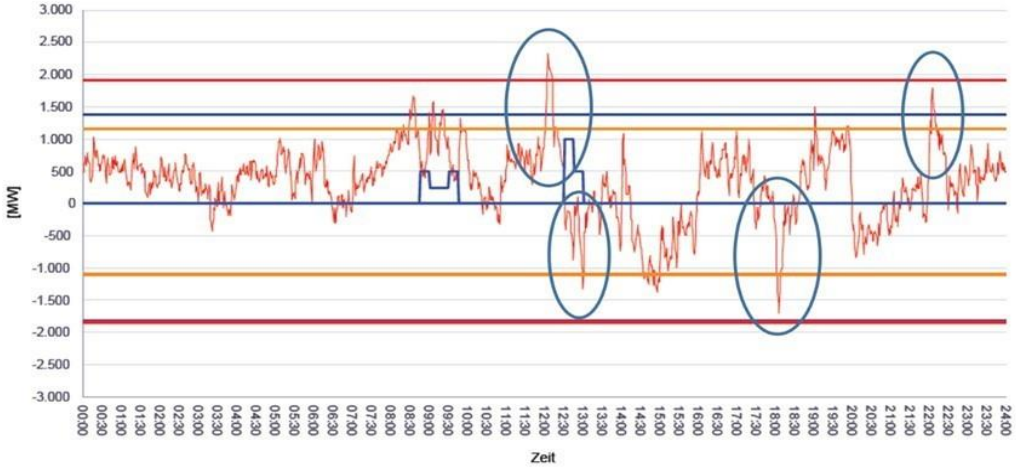
Discussed actions

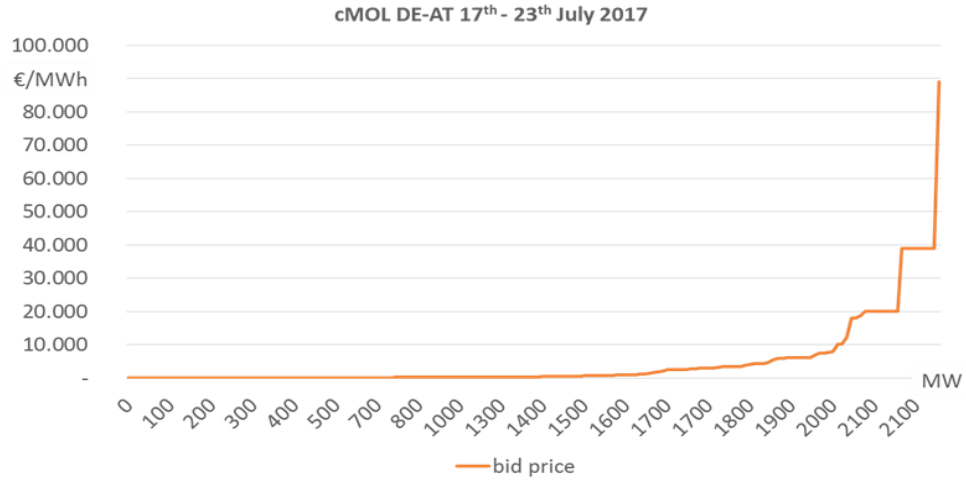
Pricing and settlement of balancing energy on the basis of a shorter than the ISP pricing period is being discussed within PICASSO

- ➔ **Balancing Energy Pricing Period**: Period over which the marginal price is determined
- ➔ The redistribution effects and the impacts on the costs and incentives for the different participants are discussed
- ➔ The topic is analyzed from a market design perspective. Technical (IT) feasibility has not been investigated so far and might be a limiting factor.



aFRR demand (thin orange line) of Germany at 2nd of August 2017 and typical MOL

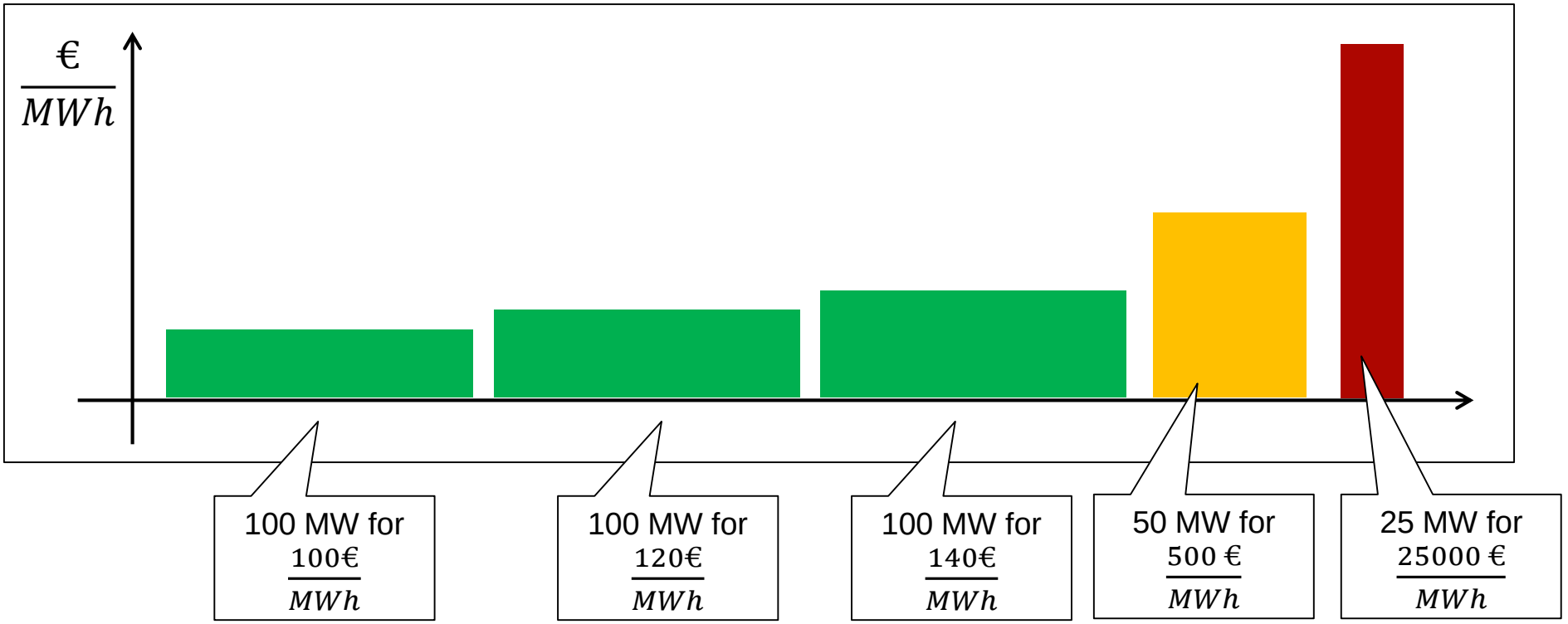




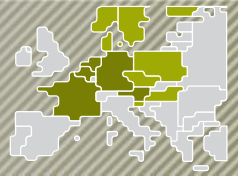
- Imbalance spikes due to differences of scheduling and physical reality lead to activation peaks
- Due to fast ramping loads (e.g. steel mills) and generation units (e.g. pump storage)
- Occur several times daily, short duration, low energy, but high power demand

- High prices at end of MOL (e.g. Demand Side Management)
- High prices result from low activation probability
- Due to the low activation probability those bids do not significantly increase overall cost in the current German scheme.

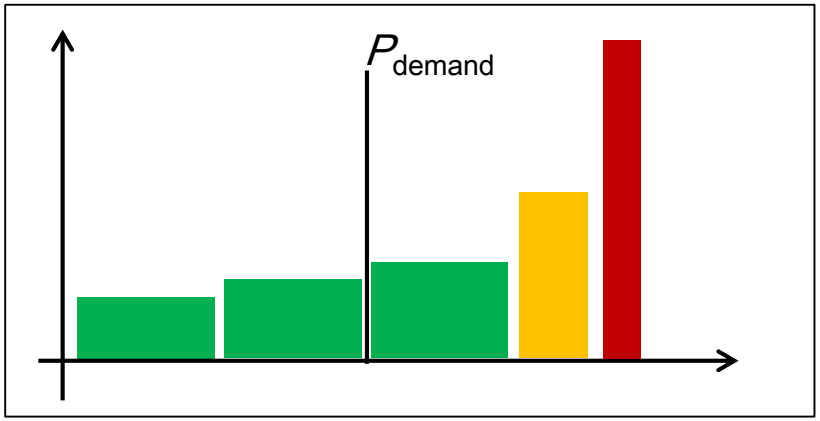
The analysis will be performed with the following artificial merit order:



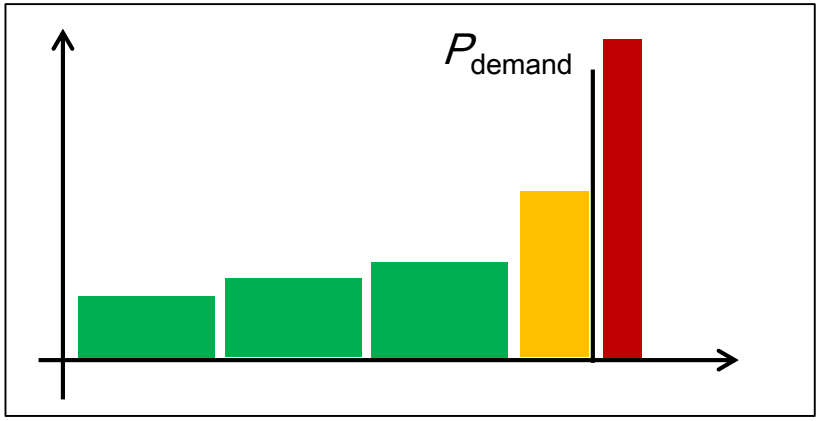
Central question: How do the two options differ in terms of BSP and BRP settlement?



Minute 1-14



Minute 15

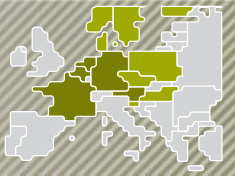


Control-cycle BEPP:

- $Payment_{TSO \rightarrow BSP} = \left(200\ MW \cdot \frac{120€}{MWh}\right) \cdot \frac{14}{60} + 350\ MW \cdot \frac{500€}{MWh} \cdot \frac{1}{60} = 8516€\ \left(or\ \frac{162€}{MWh}\right)$
- $SettlementPrice_{BRP} = \frac{8516€}{200MW \cdot 14\ min + 350MW \cdot 1\ min} = \frac{162\ €}{MWh}\ (or\ 8516€\ in\ total)$

15-min BEPP:

- $Payment_{TSO \rightarrow BSP} = \left(200\ MW \cdot \frac{500€}{MWh}\right) \cdot \frac{14}{60} + 350\ MW \cdot \frac{500€}{MWh} \cdot \frac{1}{60} = 26\ 250€\left(or\ \frac{500€}{MWh}\right)$
- $SettlementPrice_{BRP} = \frac{500€}{MWh}$



- The period of application of marginal pricing for aFRR is a pure market design & redistributive question.
- The aFRR activations are unchanged.
- Main effects resulting from the two options:

	Control cycle BEPP	15-min BEPP
BSP income	Lower	Higher
BRP cost of imbalances	Lower	Higher
Congestion rent	Lower	Higher
Occurrence of price convergence	Higher	Lower

- TSOs understand that BSPs want to maximize their income and BRPs want to minimize their costs. TSOs expect different feedback & insights.

Stakeholder views regarding BEPP?

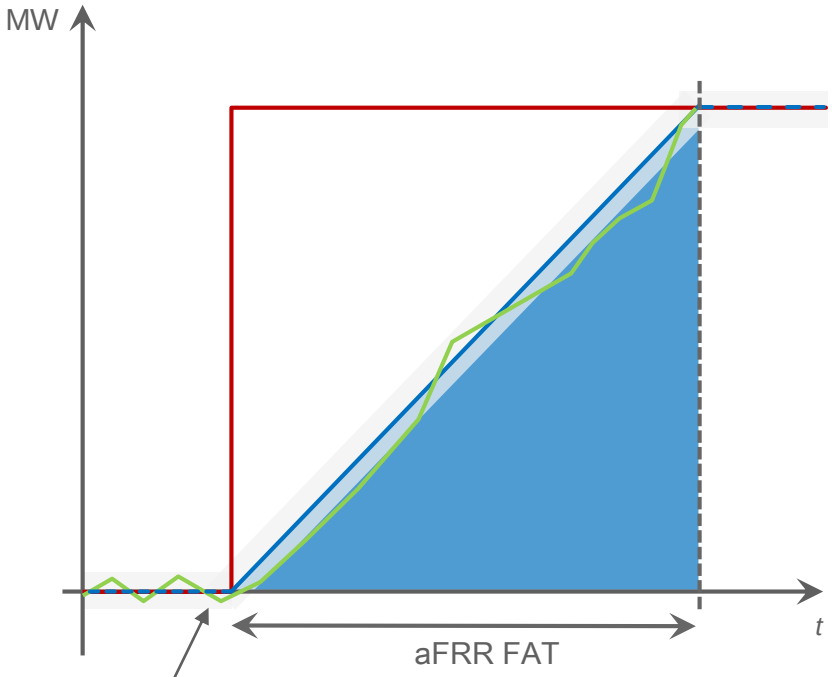
4. Harmonizing aFRR markets

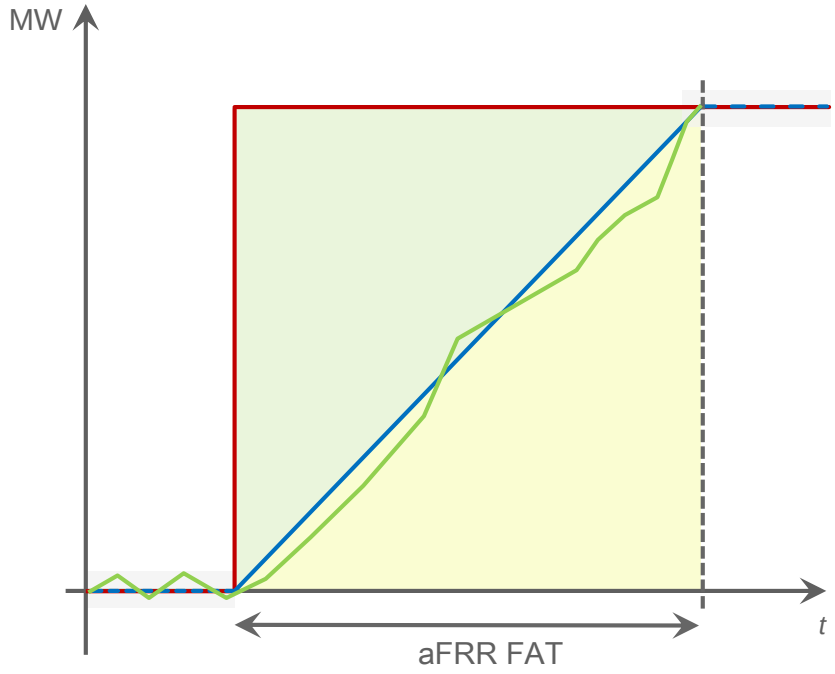
Other harmonization topics: Ramping approach

BSP settlement of the **requested** energy volume defined by the controller output (that's why the name)

BRP incentive to deliver energy, where applicable

BSPincentive not to deliver less then requested





Penalties for being outside the tolerance band

disturbance

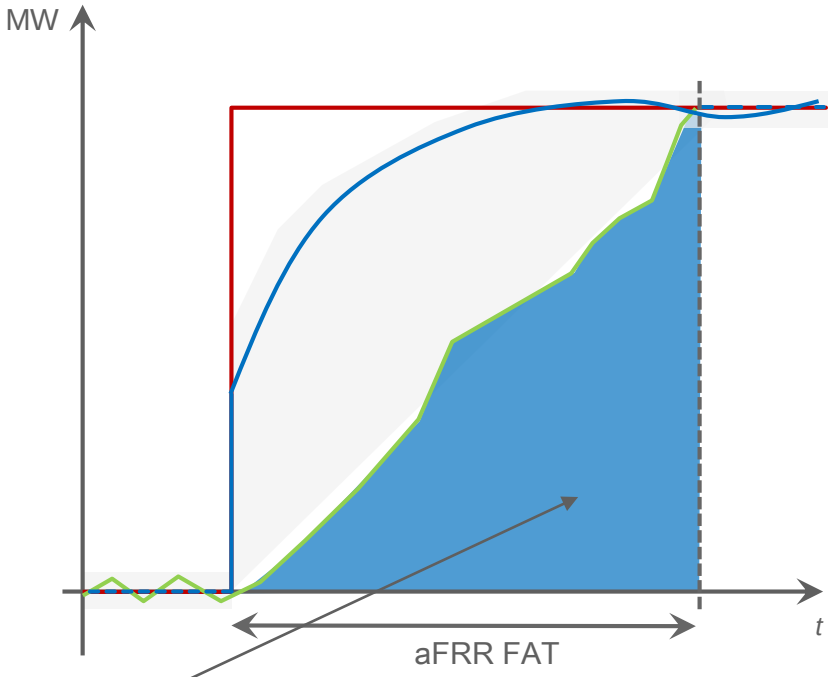
aFRR (BSP reaction)

tolerance band for „compliance"

4. Harmonizing aFRR markets

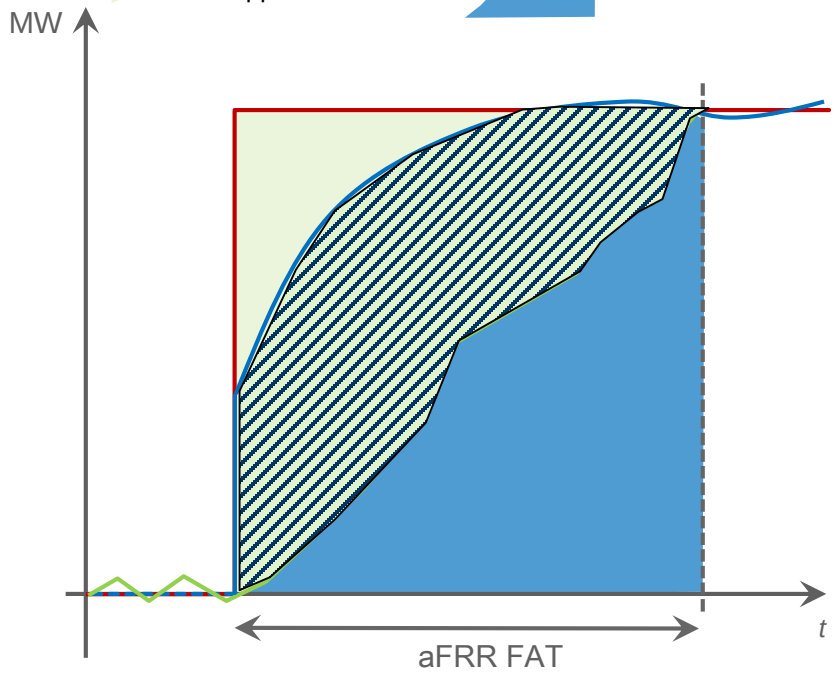
Other harmonization topics: FAT-approach

BSP settlement of the energy volume based on the delivered aFRR, since the BSP cannot follow the set-point very closely – bigger tolerance band based on FAT



BRP incentive to deliver energy, where applicable

BSP incentive to deliver since no payment otherwise



Penalties for not fulfillling the dynamic requirements

disturbance

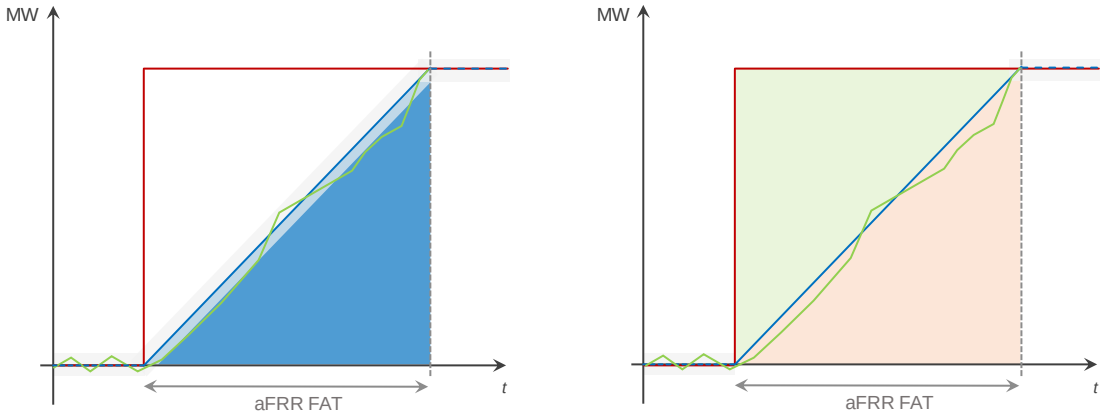
aFRR (BSP reaction)

tolerance band for „compliance“

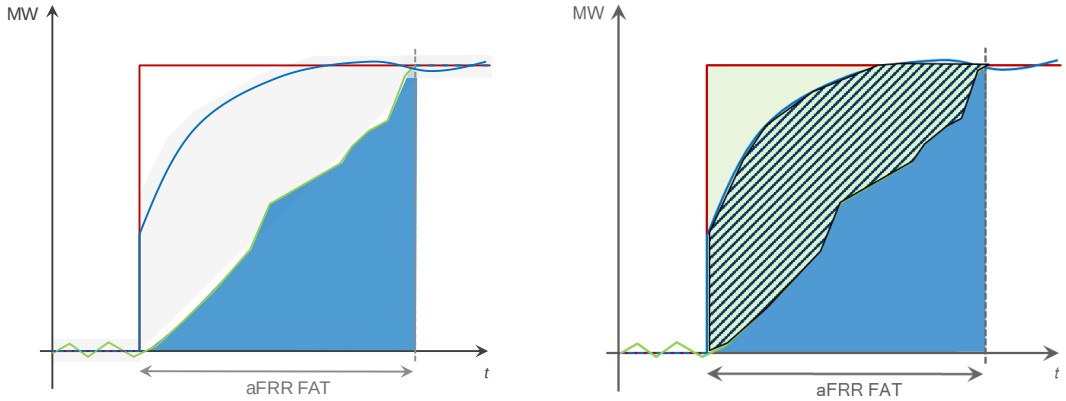
Incentive to deliver faster

4. Harmonizing aFRR markets

Other harmonization topics: Comparison - Ramping approach vs. FAT-approach



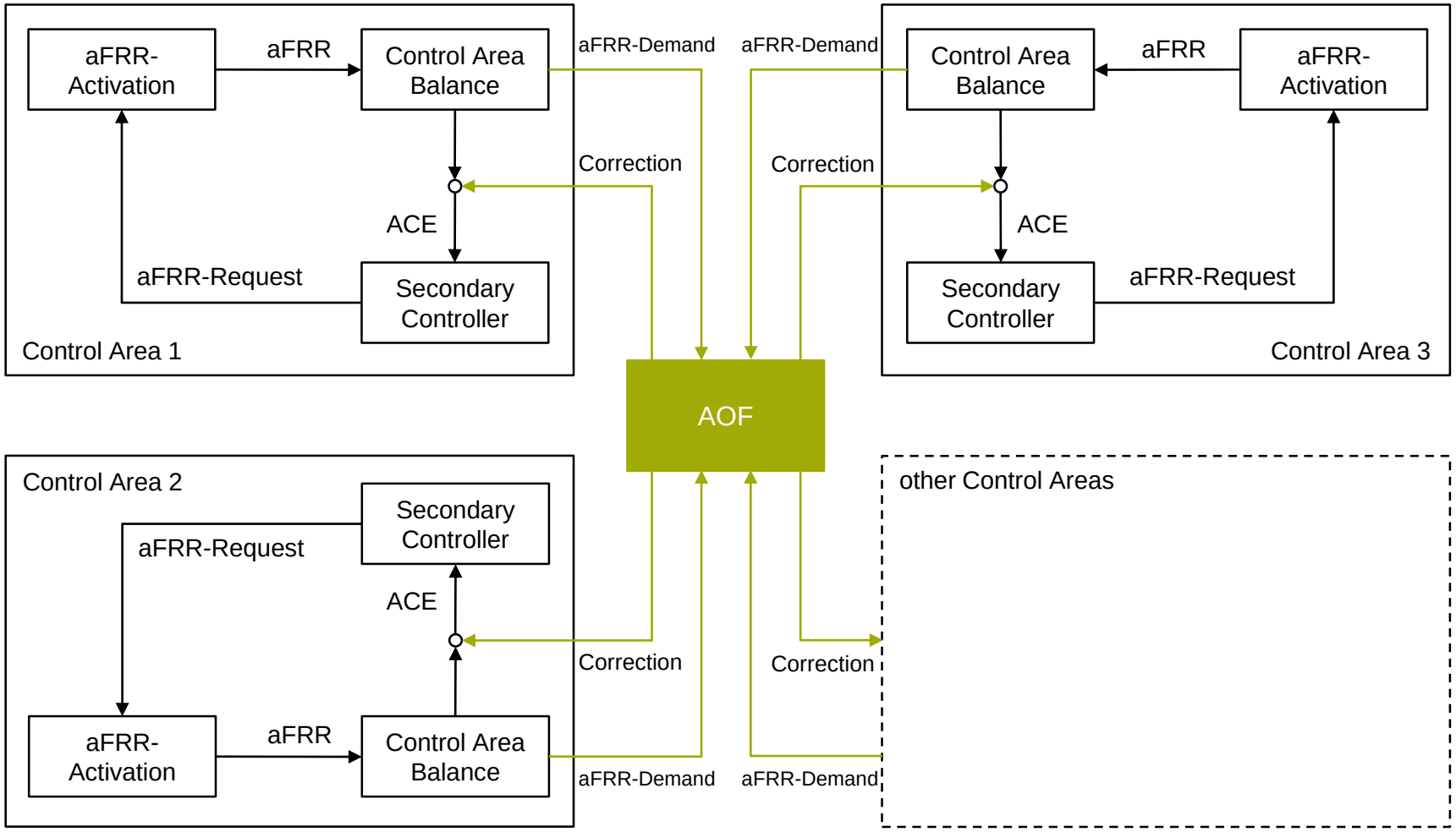
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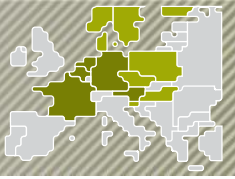


Ramp rate which must be closely followed and known in advance before activation (e.g. CCGT)

Variable ramp rate (faster than FAT) nominated by BSPs may be considered

Ramp rate is only known for prequalification, a ramp cannot be followed closely without preparation (e.g. coal mill delay) or only with additional costs (e.g. discrete pumps)


aFRR-Activation
aFRR
Control Area Balance
aFRR-Demand
aFRR-Demand
Control Area Balance
aFRR
aFRR-Activation
Correction
Correction
ACE
ACE
aFRR-Request
Secondary Controller
aFRR-Request
Secondary Controller
Control Area 1
Control Area 3
AOF
Control Area 2
Secondary Controller
aFRR-Request
ACE
other Control Areas
Correction
Correction
aFRR-Activation
aFRR
Control Area Balance
aFRR-Demand
aFRR-Demand



- **Capacity calculation**
  - Currently PICASSO TSOs intend to use only cross-zonal capacity remaining after intraday for exchange of balancing energy: i.e. no specific capacity calculation for the aFRR process
- **Capacity allocation**
  - Cross-zonal capacities can only be used by one balancing process at the same time. Chronological order (XB ID > RR > mFRR > aFRR/IN) vs. prioritization between the platforms is subject of discussion among NRAs and on ENTSO-E level
  - The aFRR Target Platform should perform netting of TSO aFRR demands and optimize the activation of aFRR using cross-zonal capacities given to the aFRR Target Platform. There is a strong link between aFRR Target Platform and Imbalance Netting Platform to be taken into account (almost simultaneous processes).
- **Congestion management**
  - This topic is very similar to MARI and is not presented in detail here

Stakeholder views regarding calculation, allocation, and congestion management?