PICASSO

KPI REPORT

2023

Content

1. Terms, acronyms and definitions

Acronym	Complete Name	Description
aFRR	automated Frequency Restoration Reserve	Automatic FRR means FRR that can be activated by an automatic control device
aFRR IF	aFRR Implementation Framework	A framework developed by TSOs in Europe for the implementation of a European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation, in accordance with Article 21 of Commission Regulation (EU) 2017/2195, which establishes a guideline on electricity balancing (EBGL).
AOF	Activation Optimisation Function	Function that ensures the activation of the merit order from CMOL through an optimization cycle with a fixed interval of less than 10 seconds, using the requests and constraints received from each participating TSO in real-time. The optimization function must adhere to the following high-level principles in a single optimization step leading to a global optimum: Control FRCE to zero, Demand aFRR Compensation, Minimize Activation Cost, Operational Safety.
API	Automatic Programming Interface	An intermediary that enables different software applications to interact and share data, functionalities, or services without having access to each other's internal workings.
BE	Balancing Energy	The energy activated by TSOs to maintain the balance between injections and withdrawals in real time.
BEB	Balancing Energy Bid	The proposal made by a market participant to provide or absorb balancing energy as needed by the TSO.
BSP	Balancing Service Provider	Balancing Service Provider (BSP) in the European Union Internal Electrictiy Market is a market participant providing balancing services to its Connecting TSO, or in case of the TSO-BSP Model, to its Contracting TSO. Each TSO is responsible for procuring balancing services from BSPs in order to ensure operational security.
BZ	Bidding Zone	The largest geographical area within which market participants are able to exchange energy without capacity allocation.
CBMP	Cross Border Marginal Price	Represents the price of the highest price bid of a standard product which has been selected to cover the energy need for balancing purposes between borders. The AOF computes the balancing energy price per LFC area. In case there is no congestions between adjacent areas, the price will be the same in these areas. In case there is a congestion – there will be a price split (principally like the day-ahead market)
CMOL	Common Merit Order List	The complete set of bids that is used in the optimizer of the platform. The list of orders returned by the algorithm in merit order - cheapest first.
CZC	Cross Zonal Capacity	The capability of the interconnected system to accommodate energy transfer between bidding zones.
EBGL	Electricity Balancing Guideline	Regulatory framework and set of guidelines designed to ensure the efficient and reliable operation of electricity grids within the European Union. Key aspects of the Electricity Balancing Guideline include market integration, cross-border cooperation, transparency and non-discrimination, security of supply, market design, flexibility and integration of renewable energy.
FRCE	Frequency Restoration Control Error	The instantaneous difference between the actual and the reference value for the power interchange of a control area, taking into account the effect of the frequency bias for that control area according to the network power frequency characteristic of that control area, and of the overall frequency deviation. The calculation of FRCE serves the purpose of attributing responsibility to TSOs for any discrepancies in their respective systems. The ultimate objective of FRCE is to achieve a balance where FRCE equals zero, but aFRR often comes with a certain time delay, as per the FAT. Thus a certain level of FRCE is inevitable and is often seen as more or less a corrected ACE. Looking ahead, there is a prospective evolution where ACE would transform into FRCE, and subsequently, the FRCE would undergo further adjustment. There are ongoing efforts to refine the accuracy of these metrics.

IF	Implementation Framework	The major regulatory document describing the aFFR platform and market. The implementation of the balancing platforms are required by the EBG, which doesn't describe how they should work. It requests all TSOs to make a proposal how to design the platform. It was conformed by regulatory bodies. There is one framework per platform.
LFC	Load-Frequency Control or Load-Frequency Controller	Automatic control device designed to reduce the FRCE to zero. Physically this is a process computer that is usually implemented in the TSOs control centre systems (SCADA/EMS). The LF Controller processes FRCE measurements every 4-10s and provides - in the same time cycle – automated instructions to aFRR providers that are connected by telecommunication connections. This is a control scheme created to maintain balance between generation and demand, to restore the frequency to its set point value in the synchronous area and, depending on the control structure in the synchronous area, to maintain the exchange power to its reference value. It performs the following functions: - be responsible for the frequency limitation process ; - maintain power exchange at the programmed value; - cooperate to restore the frequency to its set value after a disturbance; - be responsible for accounting for involuntary power deviations within its territory.
MTU	Market Time Unit	The period for which the market price is established or the shortest possible common time period for the two bidding zones, if their market time units are different. This period is set to 15min for PICASSO.
TSO	Transmission System Operator	Entities operating independently from the other electricity market players that are responsible for the bulk transmission of electric power on the main high voltage electric networks. TSOs provide grid access to the electricity market players (i.e. generating companies, traders, suppliers, distributors and directly connected customers) according to non-discriminatory and transparent rules. In order to ensure the security of supply, they also guarantee the safe operation and maintenance of the system. In many countries, TSOs are in charge of the development of the grid infrastructure too.
VWAP	Volume weighted average price	Average price of bids weighted by the respective bid volumes

2. Introduction

The Commission Regulation (EU) 2017/2195 of 23 November 2017 (from here on referred to as the EB Regulation) lays down the guidelines for creating an integrated balancing market and thus, among other, obliges all Transmission System Operators (hereinafter “TSOs”) to establish the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (hereafter “aFRR platform”). Consequently, in line with Article 21(4) all TSOs had to develop the Implementation Framework setting the rules for the implementation of aFRR platform.

According to Article 13(1) of the Implementation Framework for a European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (hereafter referred to as the “aFRRIF”), all member TSOs of PICASSO project shall monitor, evaluate, and report the implementation and operation aspects of the aFRR-Platform at least on a yearly basis. This document presents the operational results for the first operational year of aFRR platform including the methodology for the calculation and/ or evaluation individual key performance indicators in line with the provisions of Article 13(1) aFRRIF.

3. The scope of the KPI Report

This report covers the operational period from July 2022 to 30 June 2023 which is the first operational year of the aFRR balancing platform. Although, the Picasso Balancing Platform has been operational already since 01.06.2022 the amount of exchanged aFRR balancing energy was very limited in June 2022 since only one TSO participated in the operation in most of this month. Thus, this period was not taken into account for the evaluation.

The following key performance indicators (hereinafter "KPI") are included in the report in line with the provisions aFRRIF:

a) *the implementation progress and roadmap in accordance with Article 5;*
b) *the amount of aFRR balancing energy requested by each participating TSO in relation to the total volume of balancing energy pursuant to Article 29(12) of the EB Regulation;*
c) *the frequency and volume of deviations between the activation of bids by each participating TSO and the selection of bids by the AOF as referred to in paragraph 3(b) and (c), pursuant to Article 29(5) of the EB Regulation;*
d) *the impact on the economic surplus of minimising the volume of selected standard aFRR balancing energy product bids for balancing energy pursuant to Article 11(2)(b);*
e) *aggregated information and detailed statistics on the bids which were declared as unavailable by TSOs in accordance with Article 9;*
f) *the efficiency of the pricing method for aFRR pursuant to Article 30 of the EB Regulation;*
g) *the availability of cross-zonal capacity for the aFRR exchange on the platform;*
h) *the results of the survey conducted in accordance with Article 16(2)(a)."*

4. Key performance Indicators of the operation of aFRR balancing platform

4.1. aFRR IF 13(1)(a): The implementation progress and roadmap in accordance with Article 5

According to Article 5(5) of aFRRIF, the accession roadmap should be published, and in particular, any information on national derogations shall be updated when new information becomes available. The accession roadmap shows the implementation progress of each TSO and gives stakeholders current information on the development. This information is provided based on National Implementation Roadmaps and reported twice per year at ENTSO-E website.

After all TSOs have connected to the aFRR-Platform, the roadmap under this paragraph is not mandatory for the Report or depending on the decision of Steering Committee of PICASSO project regarding to Article 5(5) of aFRRIF.

The latest published version of accession roadmap for PICASSO can be found here: https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/Network%20codes%20documents/Implementation/picasso/PICASSO_8th_Accession_roadmap_ext.pdf

4.2. *aFRR IF 13(1)(b): The amount of aFRR balancing energy requested by each participating TSO in relation to the total volume of balancing energy pursuant to Article 29(12) of the EB Regulation*

According to Article 29(12) of EB Regulation: "*Each requesting TSO may request the activation of balancing energy bids from the common merit order lists up to the total volume of balancing energy. The total volume of balancing energy that can be activated by the requesting TSO from balancing energy bids from the common merit order lists is calculated as a sum of volumes of:*

(a) balancing energy bids submitted by the requesting TSO not resulting from sharing of reserves or exchange of balancing capacity;
(b) balancing energy bids submitted by other TSOs as a result of balancing capacity procured on behalf of the requesting TSO;
(c) *balancing energy bids resulting from the sharing of reserves under the condition that the other TSOs participating in the sharing of reserves have not already requested the activation of those shared volumes.*"

For the demonstration of the results for this KPI, the total available volume is represented as a sum of volumes of balancing energy bids pursuant to Article 29(12) of the EB Regulation, including bids that have been procured by other TSOs on behalf of the respective TSO.TSO. As aFRR is commonly dimensioned and procured within Germany, the average volume requested and submitted by each of the German TSOs is combined into one number.

As this KPI focuses on the average volume that is available as part of the common merit order list (CMOL), the amounts may deviate from locally procured volumes.

To make requested and available volumes comparable, all values are shown as average power in MW.

Table 1: Yearly amount of average aFRR requested power requested by each participating TSO in MW

	Average requested power (MW)		Average volume of balancing energy that can be activated by the requesting TSO from balancing energy bids as a sum of volumes* of BEBs**	
	Positive	**Negative**	**Positive**	**Negative**
APG	49	-50	197	-197
ČEPS	43	-50	165	-210
DE	200	-202	2069	-2058

*To make requested and available volumes comparable, all values are shown as average power in MW. Average volume of balancing energy is for the Table 1 and 2 and in the Figures 1, 2 and 3 considered as aFRR Band.

**BEB = balancing energy bids

Table 2: Monthly amount of average aFRR requested power requested by APG, CEPS and DE in MW

APG	Direction	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Average
Average requested power (MW)	Positive	42	44	48	54	53	59	46	55	54	36	44	50	49
	Negative	48	50	61	57	49	43	59	40	49	52	44	55	50
Average volume of balancing energy that can be activated by the requesting TSO from balancing energy bids as a sum of volumes of BEBs**	Positive	201	201	201	201	200	200	183	174	200	200	200	200	197
	Negative	201	201	201	201	202	201	179	169	201	200	201	200	197

ČEPS	Direction	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Average
Average requested power (MW)	Positive	50	41	42	49	38	37	39	53	39	37	42	47	43
	Negative	45	57	59	53	44	46	51	31	50	57	50	59	50
Average volume of balancing energy that	Positive	184	178	192	189	157	154	163	153	149	151	157	158	165

can be activated by the requesting TSO from balancing energy bids as a sum of volumes of BEBs**	Negative	255	250	233	230	196	186	175	170	176	198	206	250	210

DE	Direction	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Average
Average requested power (MW)	Positive	190	172	256	256	187	219	223	214	180	169	166	170	200
	Negative	205	215	191	206	234	188	180	161	205	233	187	220	202
Average volume of balancing energy that can be activated by the requesting TSO from balancing energy bids as a sum of volumes of BEBs**	Positive	2224	2177	2129	2151	2079	2093	2030	1983	1954	1954	1944	2114	2069
	Negative	2223	2247	2170	2212	2140	2064	1888	1909	1897	1900	1877	2163	2058

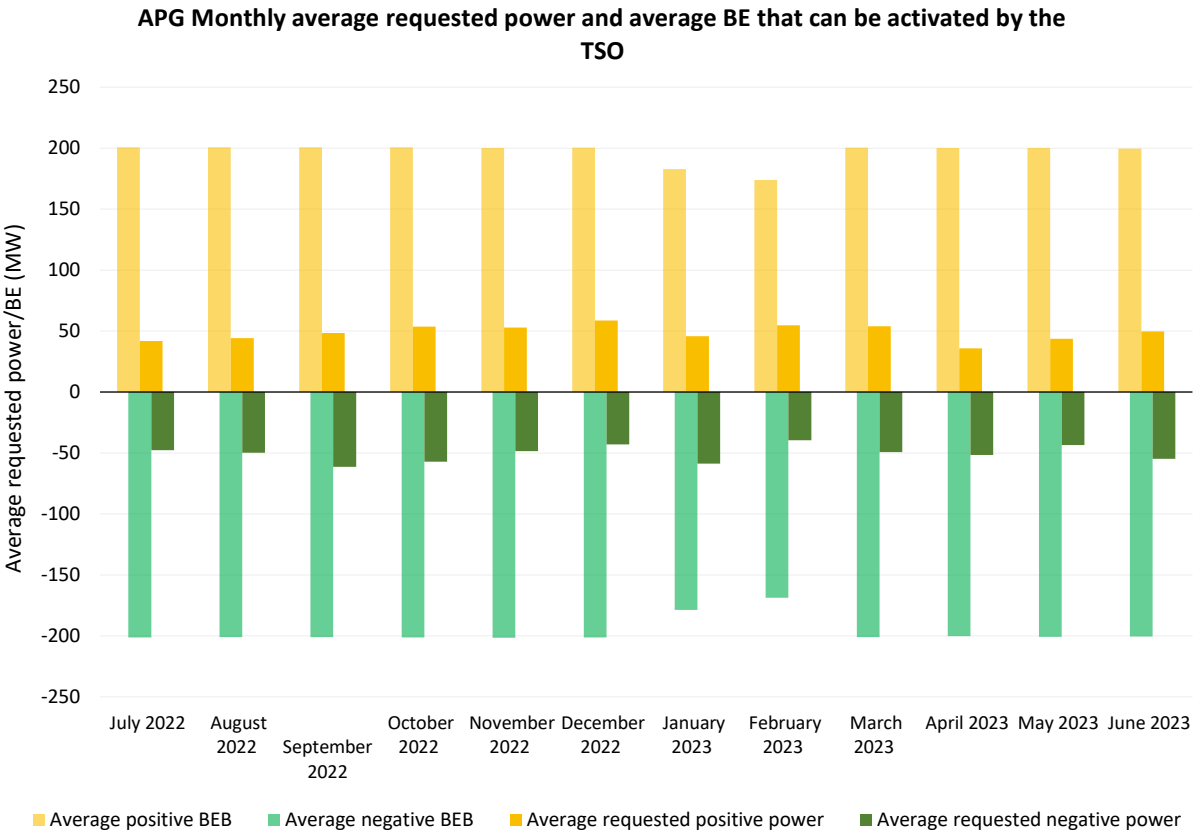


Figure 1: Monthly amount of average aFRR requested power and balancing energy requested by APG in MW

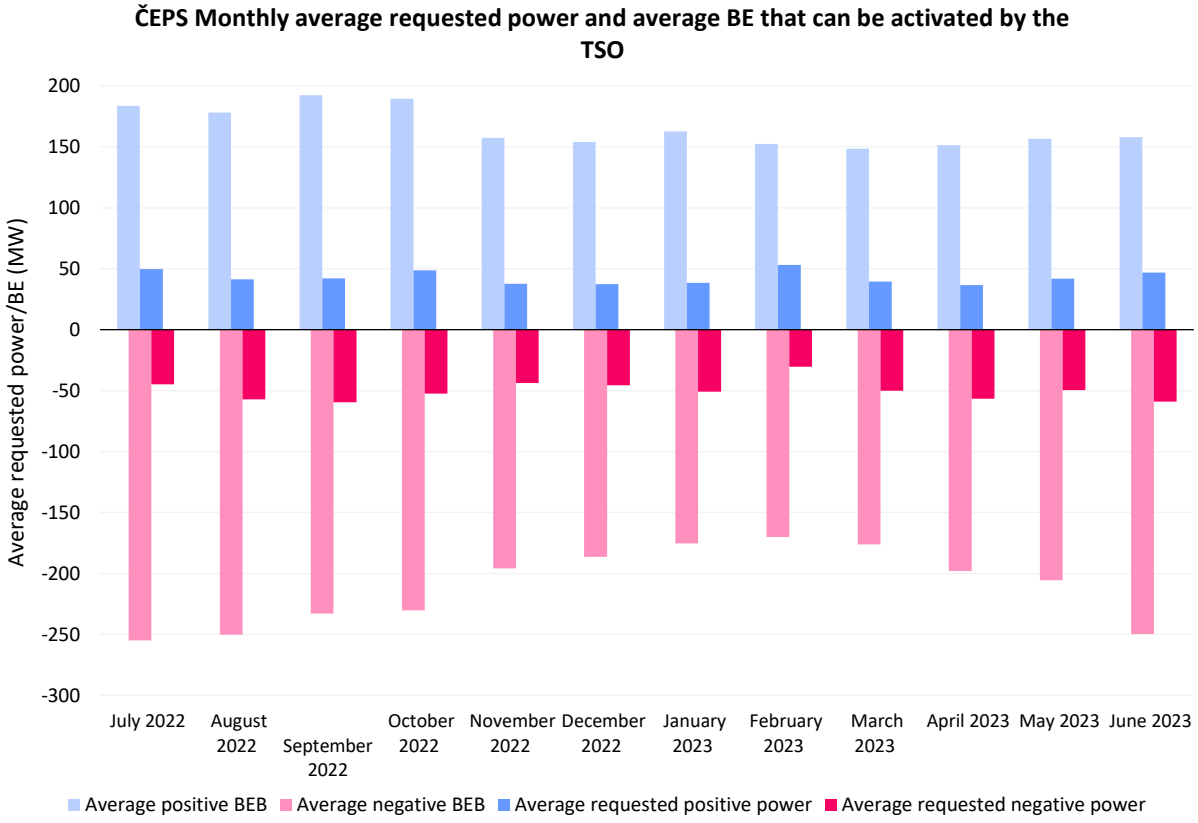


Figure 2: Monthly amount of average aFRR requested power and balancing energy requested by ČEPS in MW

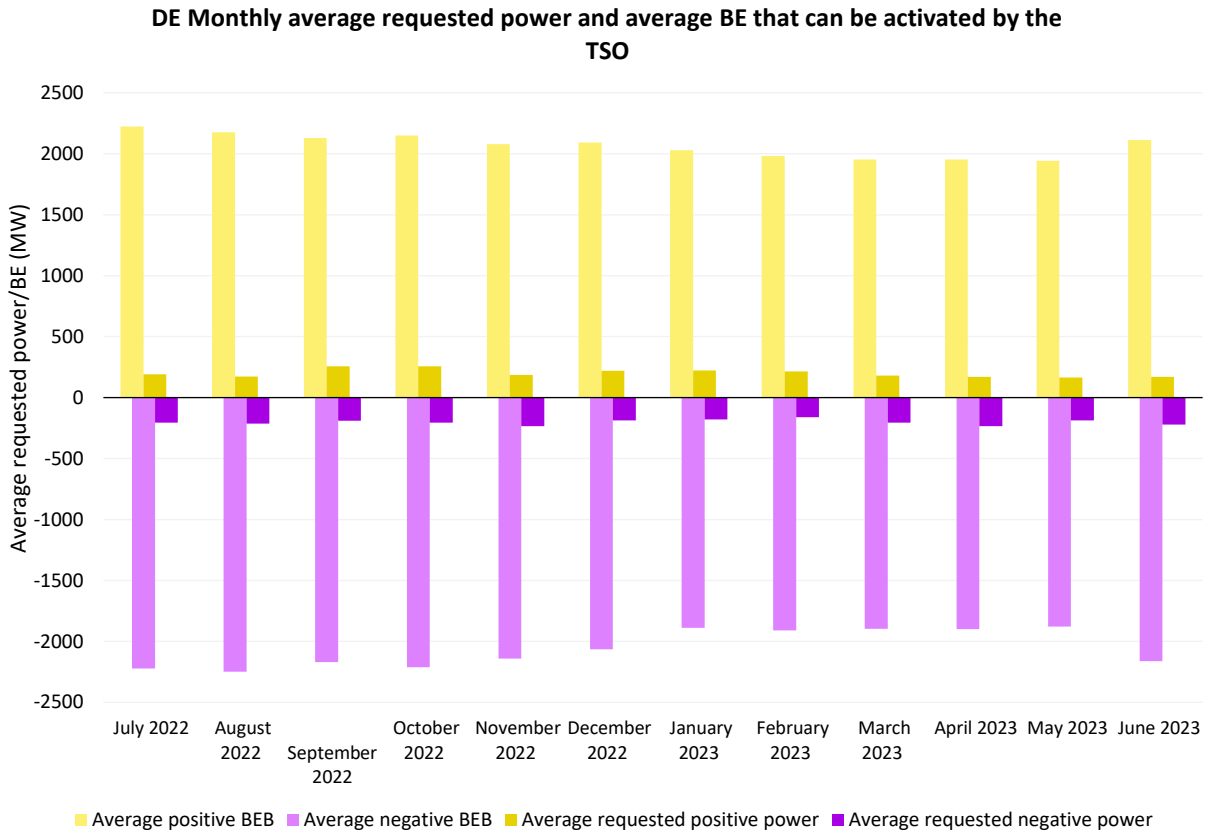


Figure 3: Monthly amount of **average** *aFRR requested power and balancing energy requested by* **DE** *in MW*

4.3. *aFRR IF 13(1)(c): The frequency and volume of deviations between the activation of bids by each participating TSO and the selection of bids by the AOF as referred to in paragraph 3(b) and (c), pursuant to Article 29(5) of the EB Regulation*

According to Article 29(5) of EB Regulation: "*In the event that the activation of balancing energy bids deviates from the results of the activation optimisation function, the TSO shall publish the information about the reasons for the occurrence of such deviation in a timely manner.*"

Due to the application of the control demand model, the actual volumes of standard aFRR balancing energy product bids requested by TSOs from their BSPs may deviate from the volumes of selected standard aFRR balancing energy product bids as determined by AOF. These deviations depend on the local characteristics of the load frequency controllers but cannot be prevented completely. The volume of occurred deviations per TSO participating in PICASSO is shown in in Table *3* and Figure *4*.

The absolute deviations are strongly impacted by the magnitude of the selected volume in each LFC area and thus by the structure of the CMOL. To compensate this effect, the deviations are additionally shown in relation to the total volume selected by the AOF. This relative deviation is mainly impacted by the dynamic behavior of the load frequency controllers. However, it must be considered that the way to measure the "activation of bids by each participating TSO" is not harmonized, differences in the local implementation to quantify this amount do also contribute to differences in the relative deviations between TSOs.

Table 3: The volume of deviations of each participating TSO

	Volume of deviations in MWh	Volume of deviations in relation to volume selected by AOF
TTG	39 570	34,4%
50HZT	72 917	26,6%
AMP	55 045	29,9%
TNG	229 577	20,6%
APG	119 751	38,6%
CEPS	114 861	47,5%
Total	503 441	23,2%

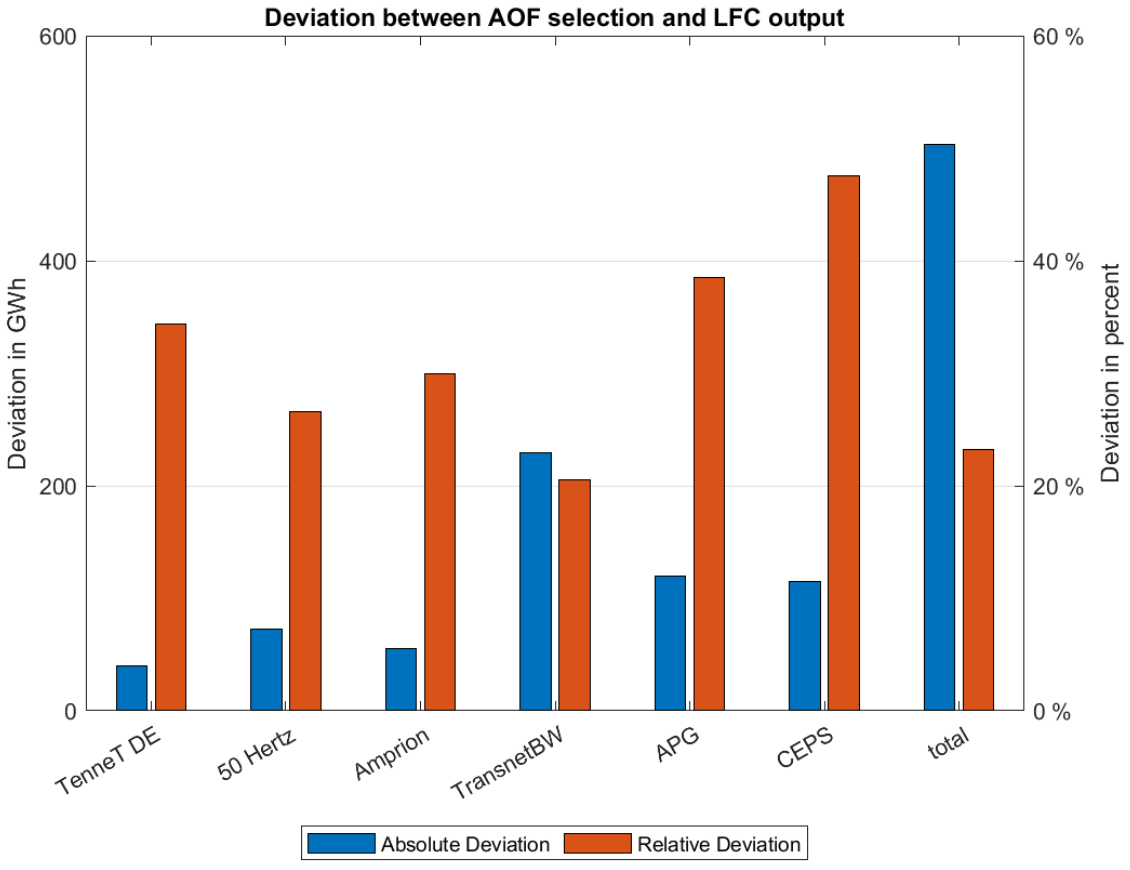


Figure 4: The absolute and relative volume of deviations of each participating TSO

To evaluate the frequency of deviations between the activation of bids by each LFC and the bid selection by the AOF, the deviations are grouped in 20 MW intervals. The frequency of the occurence of each interval is shown as histogram plot per LFC area in Figure 5.

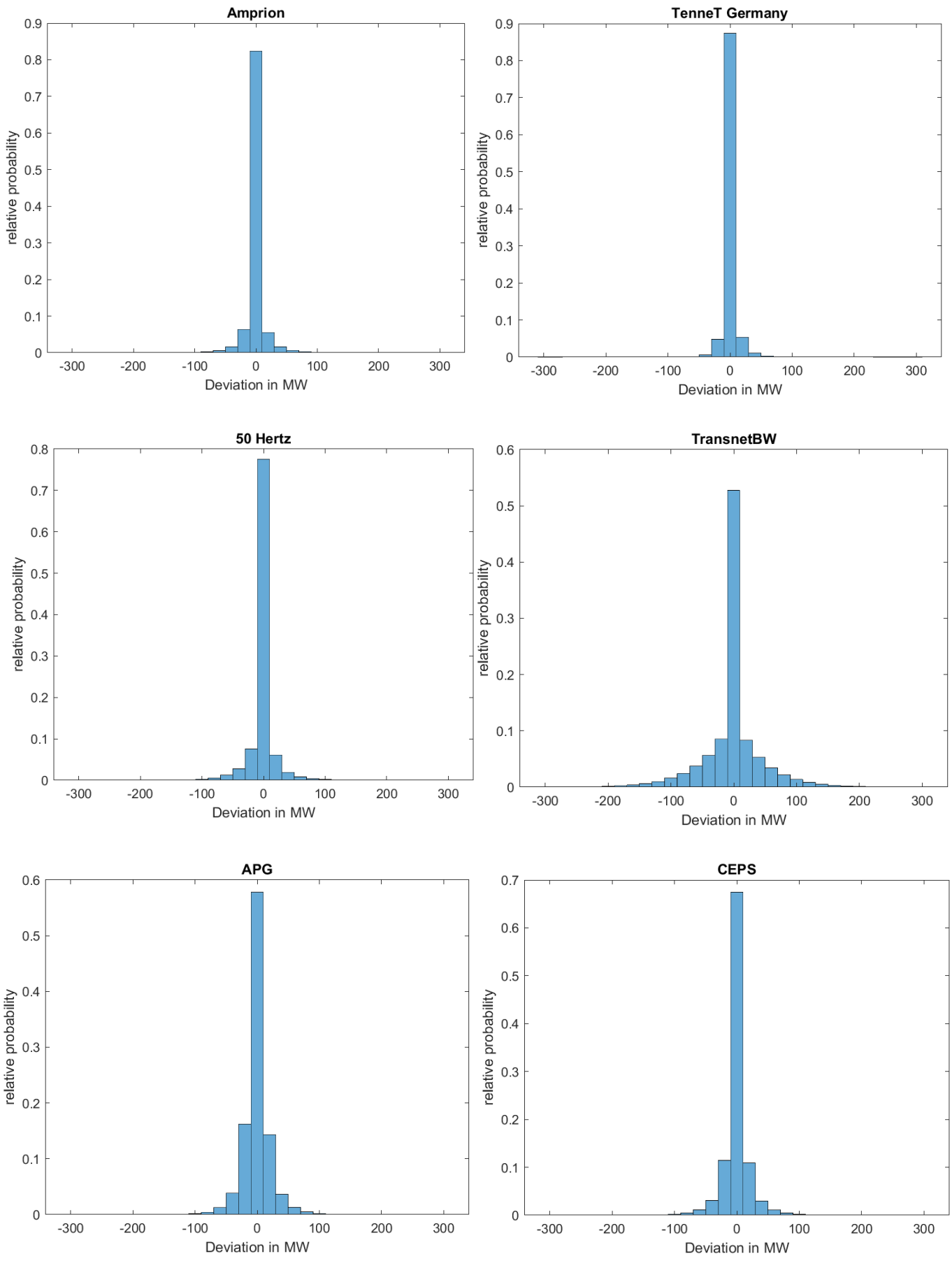


Figure 5: Frequency of Deviations per LFC area as Histograms

As seen from the figures above, in all LFC areas the deviations are smaller than +/- 10 MW most of the time. The probability of higher deviations depends mostly on the MOL structure and LFC settings.

It needs to be considered that the shown deviations are not equal to “non-AOF-volumes” that require remuneration of bids at a bid-price that is higher than the Cross-Border-Marginal Price. The deviations between bids activated by the LFC and bids selected by the AOF can be divided in differences in the activation phase, deactivation phase and imperfect activation (over- or undershooting LFC output). Only the differences in the deactivation phase and overshoots in the bid activation contribute to “non-AOF-volumes”.

4.4. aFRR IF 13(1)(d): The impact on the economic surplus of minimising the volume of selected standard aFRR balancing energy product bids for balancing energy pursuant to Article 11(2)(b)

According to Article 11(2) of the aFRR IF the prioritized objectives functions of the optimisation algorithm are listed as follows:

(a) First priority: maximise satisfaction of the aFRR demand of individual LFC areas;
(b) Second priority: minimise the volume of selected standard aFRR balancing energy product bids;
(c) Third priority: maximise the economic surplus;
(d) Fourth priority: minimise the amount of the automatic frequency restoration power interchange on each aFRR balancing border.

For this KPI, the economic surplus generated by the PICASSO platform has first been calculated by comparing the consumer rent, producer rent and congestion rent of the aFRR market to a (hypothetical) reference scenario in which the same bids and demands are considered but no cross-border exchange of aFRR is performed. For this calculation, the same method is applied as in the Entso-E Balancing Report 2022. It must be considered that:

- economic surplus generated by the additional satisfaction of demands that would not have been satisfied without PICASSO is not considered in these numbers, since the price of these volumes is not unambiguous,
- economic surplus from the aFRR interchange within the control block of Germany is not considered, even though it is also controlled b the PICASSO platform.

The economic surplus is shown per month and participating country in Figure *6*. The total economic surplis equaled 166.3 Mio Euro.

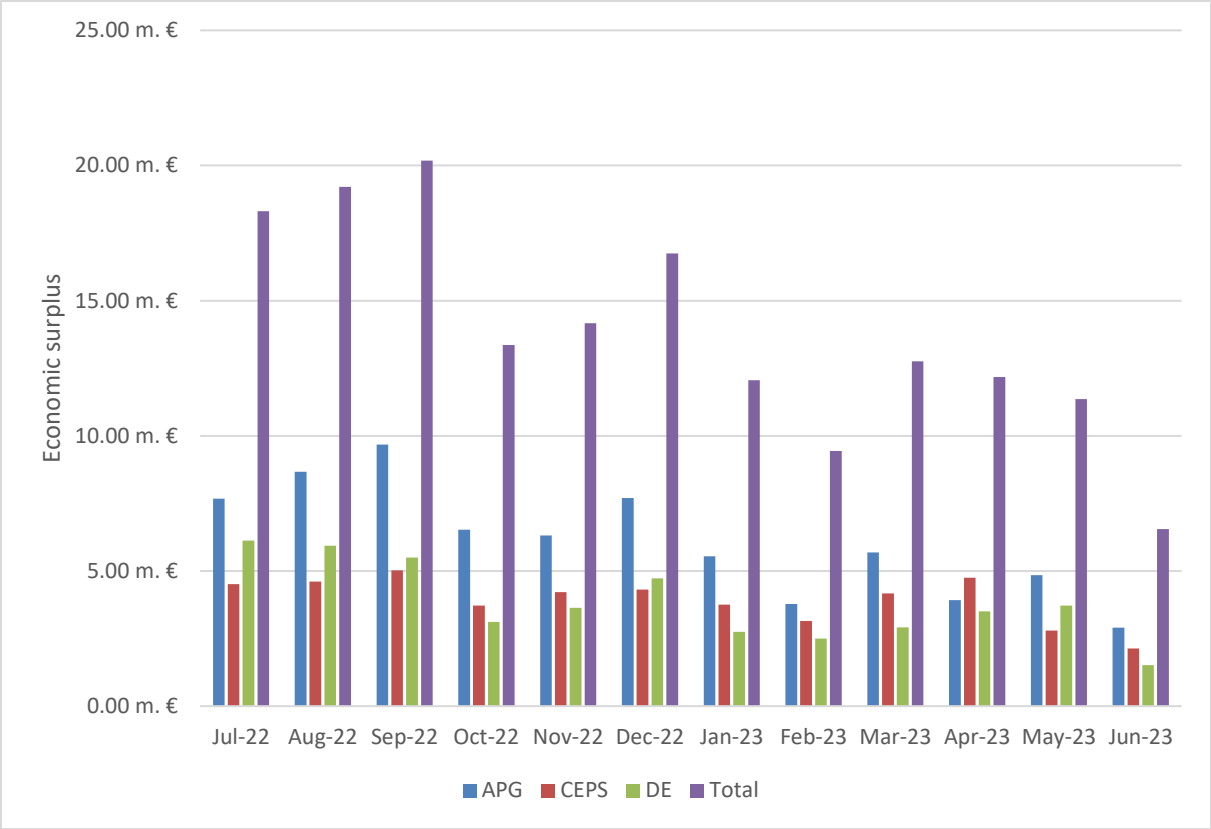


Figure 6: Economic surplus of the PICASSO platform

This economic surplus is then compared to the surplus in a hypothetical scenario in which the volumes of selected standard aFRR energy bids is not minimised and the parallel selection of positive and negative bids within the same uncongested area is possible for economic reasons is not prevented by the AOF. The additional economic surplus in this scenario is shown in Figure *7*.

In the first operational Year of the PICASSO platform this hypothetical additional surplus yielded 57,500 €, which is 0.03 % of the total economic surplus.

This analysis show that the gain of the additional surplus from not minimizing the volume of selected standard aFRR balancing energy product bids is very limited and does not exceed the risk of technical burdens and impact on the original purpose of balancing energy market, which is providing an ancillary service through activating the minimum amount of balancing energy necessary for the efficient elimination of power imbalances. The effect of minimizing the volume of selected standard aFRR balancing energy product bids will continue to be monitored by TSOs.

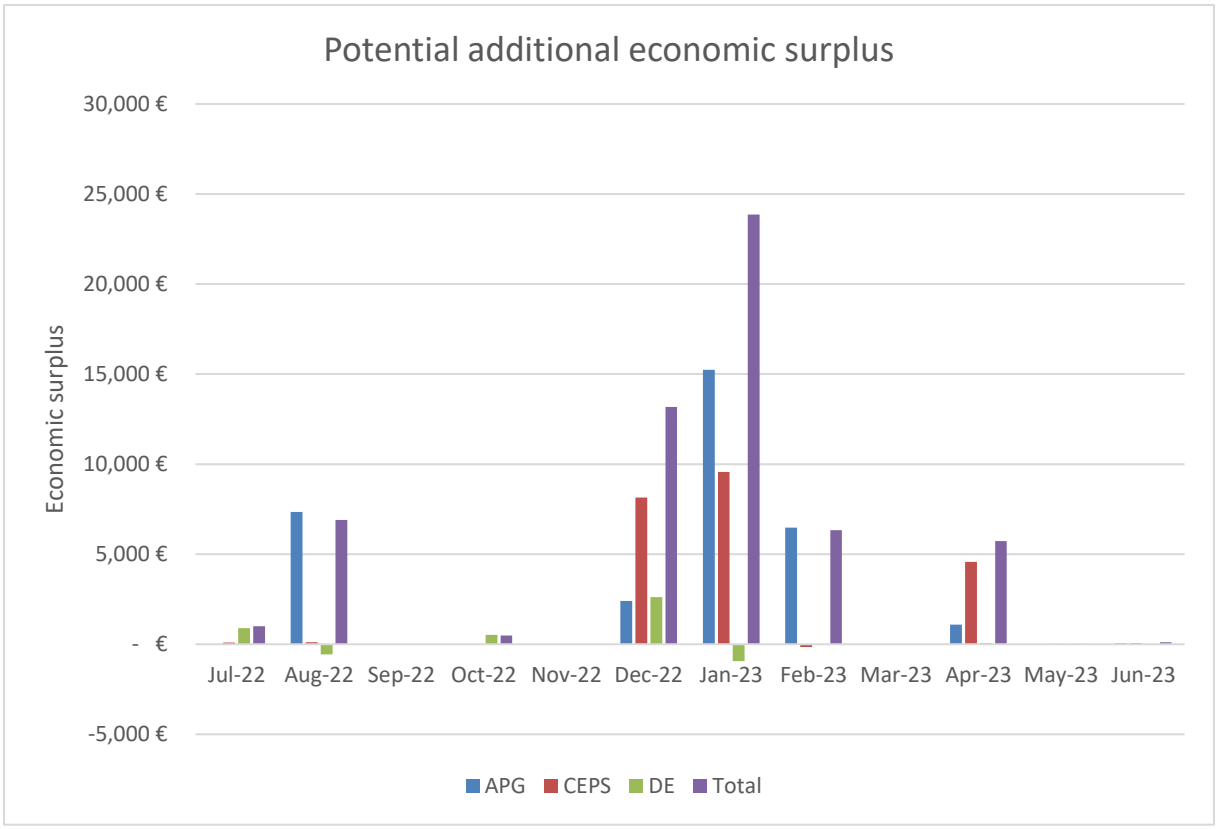


Figure 7: Additional economic surplus of the PICASSO platform when not minimising the selection of bids

4.5. aFRR IF 13(1)(e): Aggregated information and detailed statistics on the bids which were declared as unavailable by TSOs in accordance with Article 9

Article 9 (2) of the aFRRIF allows TSOs to change the availability status of bids in accordance with Article 29 (14) of EG Regulation. However, none of the TSOs that have participated in the first operational Year of the PICASSO platform have implemented the respective process and thus, no changes of the availability status have been registered.

4.6. aFRR IF 13(1)(f): The efficiency of the pricing method for aFRR pursuant to Article 30 of the EB Regulation and the availibility of cross-zonal capacity for the aFRR exchange on the platform

The efficiency of the pricing method pursuant to Article 13(1)(f) of aFRR Implementation Framework is corresponding with the provisions of "Entso-E definition of performance indicators in accordance with ACER Decision 03/2022 on the amended Pricing Methodology in accordance with Article 30(1) of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing". Therefore, the performance indicators methodology used for the purpose of the Quarterly Pricing Reports was also used for the purpose of this Key performance indicator report prepared on a yearly

basis. The the availability of cross-zonal capacity for the aFRR exchange on the platform is reported in this chapter under 3.6 c).

The Article 30 of the EB Regulation is a basis for the development and implementation of the Balancing Pricing Methodology. Balancing Pricing Methodology was adopted by ACER on 24.1.2020 as amended by the ACER decision 03/2022 published in February 2022. The Balancing Pricing Methodology introduced a transitory upper price limit of 15 000 EUR/MWh and a transitory lower price limit of - 15 000 EUR/MWh for the first 4 years of the European balancing platforms' operations, until July 2026.

The measurement of the efficiency of the pricing method for aFRR is based on three indicators defined in article 9(4) of the amended Balancing Pricing Methodology that are reported on yearly basis:

a) monthly average values of used and available cross-zonal capacity for the exchange of balancing energy per each bidding zone border and direction;

b) average percentage of both submitted and activated standard balancing energy bids per product and per direction with prices higher (and lower) than 50%, 75%, 90%, 95% and 99% of the upper (and lower) transitional price limit;

c) volume weighted average price of the last (most expensive) 5% of the volume of submitted standard balancing energy bids for each European balancing platform per direction and per participating TSO;

4.6.1. Monthly average values of used and available cross-zonal capacity for the exchange of balancing energy

The monthly average values of used and available cross-zonal capacity (CZC) for the exchange of balancing energy are calculated for each balancing energy platform per bidding zone border in both directions. Please note that the calculation of monthly average values does not allow to draw specific conclusions about the availability of CZC in single MTUs. Please note also that the use of CZC from A to B does not distinguish between fulfilment of an upward balancing energy demand in B or fulfilment of a downward balancing energy demand in A.

Legal reference according to Article 9(4) of the common methodology for the pricing of balancing energy and cross-border capacity.

Data source is from the European balancing platform PICASSO.

Data are calculated as

1. CZC available per BZ border and direction for the aFRR exchange
2. CZC used per BZ border and direction for the aFRR exchange

Table 4: PICASSO – Monthly average values of used and available cross-zonal capacity for the exchange of aFRR [MW]

	July 2022	August 2022	September 2022	October 2022

	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC
DE->CZ	407	9	501	10	445	14	150	8
CZ->DE	298	28	330	29	624	32	348	33
DE->AT	287	30	359	36	348	47	255	39
AT->DE	1361	53	1144	48	1371	37	1751	38
CZ->AT	32	6	60	10	74	9	128	13
AT->CZ	1100	20	990	18	764	23	758	31
	November 2022		December 2022		January 2023		February 2023	
	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC
DE->CZ	82	4	446	18	240	13	293	12
CZ->DE	797	32	348	28	607	23	644	31
DE->AT	165	40	320	48	253	47	274	45
AT->DE	2655	33	1454	34	2185	38	1645	37
CZ->AT	89	7	84	9	106	8	137	12
AT->CZ	1284	39	1545	39	1189	36	904	34
	March 2023		April 2023		May 2023		June 2023	
	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC	Available CZC	Used CZC
DE->CZ	199	13	685	28	570	29	779	24
CZ->DE	697	30	700	26	544	15	583	20
DE->AT	381	45	601	45	703	47	706	38
AT->DE	1392	51	667	51	424	40	500	47
CZ->AT	197	16	278	17	748	25	600	16
AT->CZ	782	36	379	26	143	15	145	15

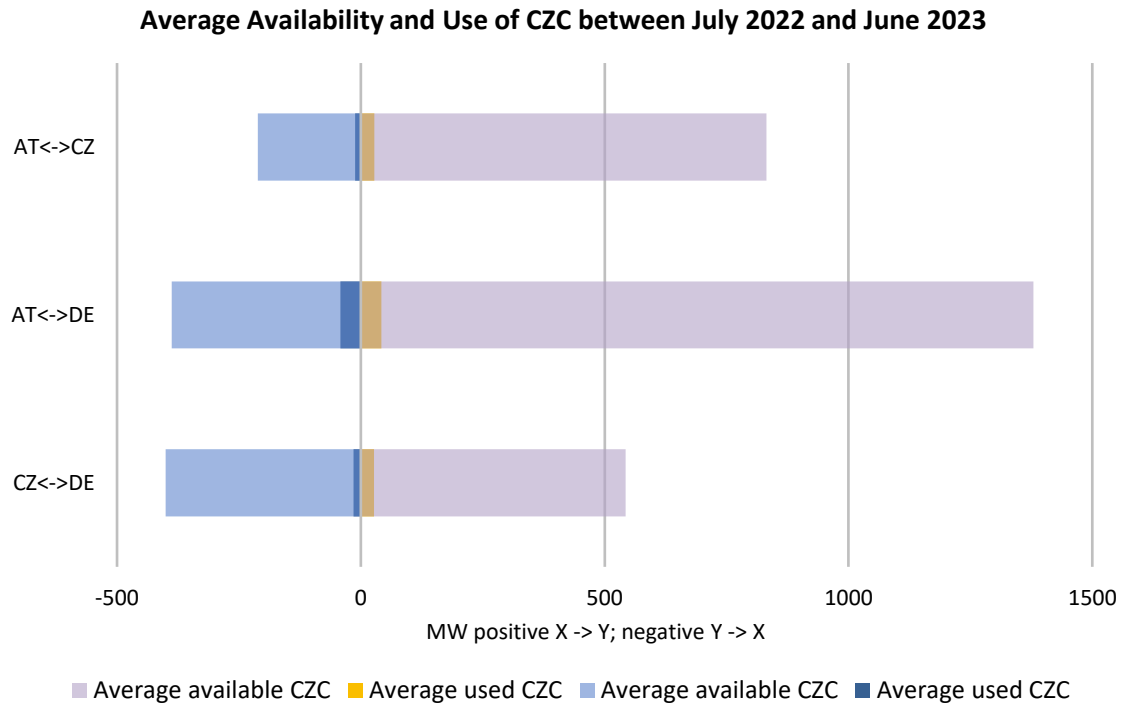


Figure 8: **PICASSO – Average used and available cross-zonal capacity for the exchange of aFRR [MW]**

4.6.2. Average percentage of submitted and activated standard balancing energy bids compared the upper (and lower) transitional price limit

This PI calculates the average percentage of all submitted (CMOL) and selected standard balancing energy bids on a monthly basis. In total, 20 values are to be reported per platform: five values (50%, 75%, 90%, 95% and 99%) in upward and respectively in downward direction for a) submitted and b) selected balancing energy bids. In summary, this indicator is calculated as:

1. Submitted upward balancing energy bids with prices higher than [50%, 75%, 90%, 95%, 99%] of the transitional price limit
2. Submitted downward balancing energy bids with prices lower than [50%, 75%, 90%, 95%, 99%] of the transitional price limit
3. Upward balancing energy with prices higher than [50%, 75%, 90%, 95%, 99%] of the transitional price limit
4. Downward balancing energy with prices lower than [50%, 75%, 90%, 95%, 99%] of the transitional price limit

Legal reference according to Article 9(4) of the common methodology for the pricing of balancing energy and cross-border capacity.

Data source is from the European balancing platform PICASSO.

Table 5: PICASSO – Average percentage of submitted bids over certain price limits

	Positive aFRR	Negative aFRR

Threshold	50%	75%	90%	95%	99%	50%	75%	90%	95%	99%
July 2022	11,40%	9,84%	9,11%	8,26%	8,10%	9,78%	7,95%	7,30%	6,88%	6,75%
August 2022	10,69%	8,43%	7,35%	6,94%	6,69%	3,99%	2,64%	2,31%	2,16%	2,06%
September 2022	5,04%	3,40%	2,98%	2,87%	2,79%	3,40%	1,81%	1,47%	1,37%	1,31%
October 2022	10,19%	7,35%	6,25%	5,94%	5,75%	3,22%	2,02%	1,83%	1,77%	1,68%
November 2022	6,78%	4,25%	3,58%	3,39%	3,24%	4,15%	3,03%	2,69%	2,58%	2,48%
December 2022	13,39%	9,33%	7,85%	7,52%	7,24%	6,68%	5,51%	4,97%	4,77%	4,65%
January 2023	13,62%	10,29%	8,63%	8,25%	7,97%	11,83%	9,61%	8,55%	8,18%	7,90%
February 2023	11,26%	9,08%	7,44%	7,12%	6,85%	7,92%	6,16%	5,60%	5,41%	5,25%
March 2023	7,02%	5,66%	5,08%	4,79%	4,72%	7,70%	5,60%	5,09%	4,86%	4,55%
April 2023	5,96%	4,65%	4,44%	4,36%	4,27%	7,09%	5,53%	5,00%	4,76%	4,49%
May 2023	6,94%	5,04%	4,86%	4,73%	4,63%	6,53%	4,93%	4,61%	4,37%	4,11%
June 2023	7,68%	5,22%	4,97%	4,82%	4,72%	7,32%	5,36%	4,95%	4,66%	4,36%

Table 6: PICASSO – Average percentage of selected bids over certain price limits

	Positive aFRR					Negative aFRR				
Threshold	50%	75%	90%	95%	99%	50%	75%	90%	95%	99%
July 2022	0,169%	0,033%	0,032%	0,029%	0,029%	0,020%	0,011%	0,009%	0,008%	0,008%
August 2022	0,087%	0,070%	0,062%	0,058%	0,054%	0,072%	0,057%	0,052%	0,048%	0,039%
September 2022	0,024%	0,005%	0,005%	0,005%	0,005%	0,024%	0,003%	0,002%	0,002%	0,002%
October 2022	0,085%	0,070%	0,069%	0,068%	0,067%	0,056%	0,022%	0,016%	0,014%	0,013%
November 2022	0,015%	0,008%	0,008%	0,008%	0,008%	0,005%	0,003%	0,003%	0,003%	0,002%
December 2022	0,004%	0,001%	0,001%	0,001%	0,000%	0,008%	0,004%	0,004%	0,004%	0,004%

January 2023	0,013%	0,003%	0,003%	0,003%	0,003%	0,021%	0,018%	0,015%	0,014%	0,013%
February 2023	0,013%	0,005%	0,003%	0,003%	0,003%	0,019%	0,010%	0,008%	0,008%	0,008%
March 2023	0,231%	0,157%	0,152%	0,149%	0,146%	0,028%	0,016%	0,012%	0,010%	0,009%
April 2023	0,045%	0,032%	0,032%	0,032%	0,031%	0,131%	0,066%	0,052%	0,045%	0,036%
May 2023	0,101%	0,057%	0,053%	0,053%	0,046%	0,108%	0,006%	0,004%	0,004%	0,004%
June 2023	0,060%	0,022%	0,021%	0,021%	0,021%	0,044%	0,007%	0,007%	0,006%	0,006%

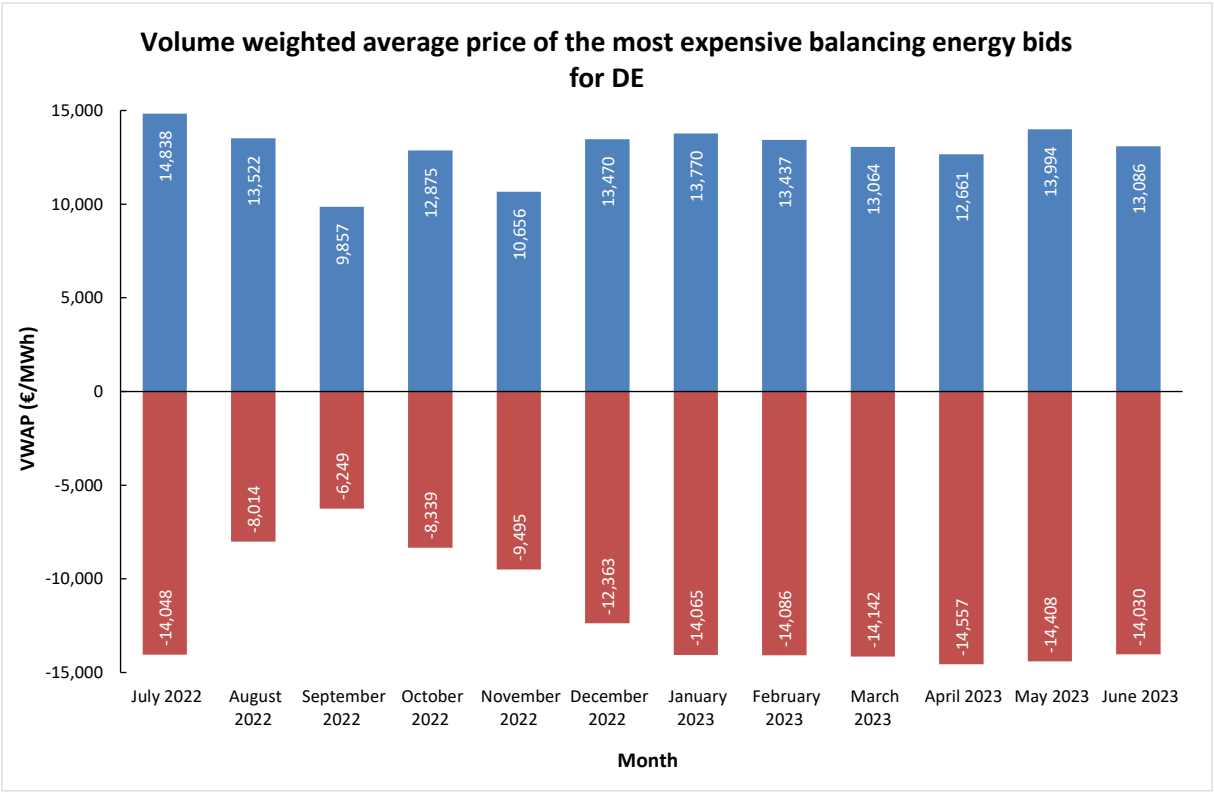
4.6.3. Volume weighted average price of the most expensive balancing energy bids

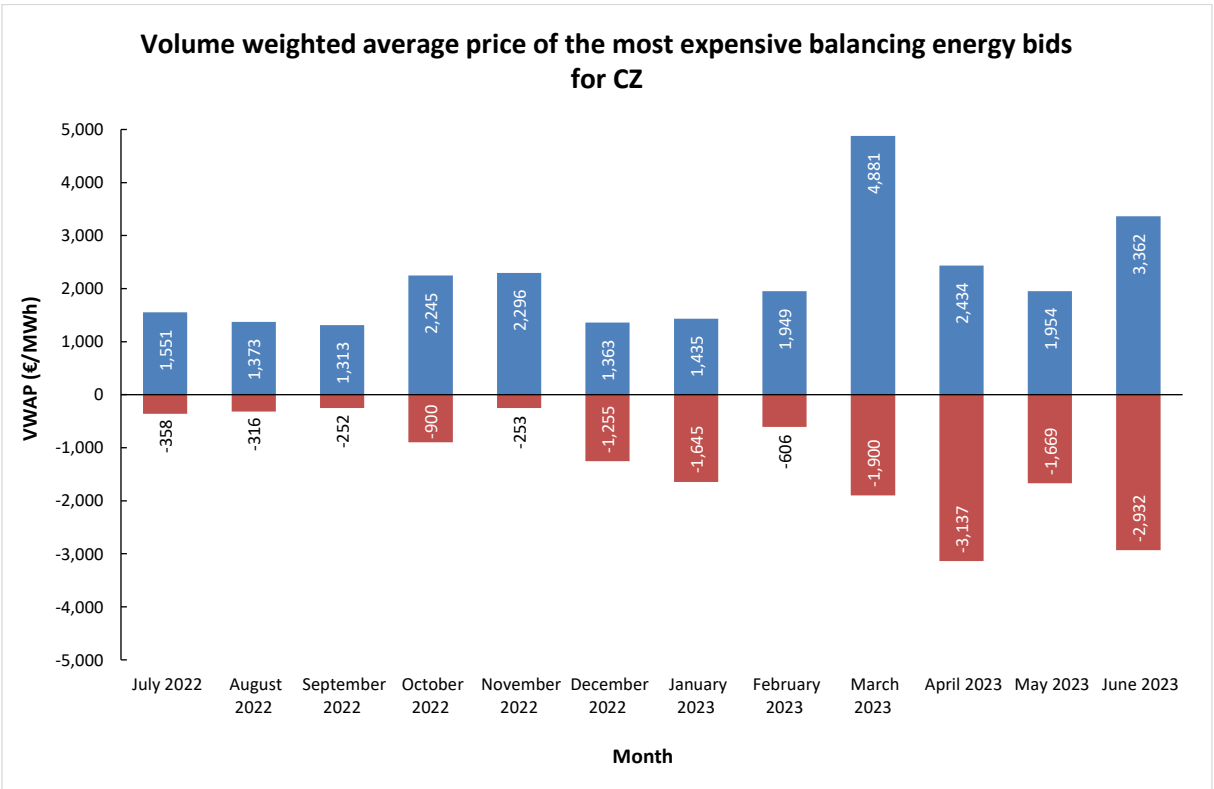
The VWAP of the last 5% of the submitted bids per platform, per direction and per participating TSO is calculated on a monthly basis. Each balancing platform provides two values per connected TSO, one for upward and one for downward direction. Calculation of VWAP as defined in Quarterly Pricing Reporting is as following:

1. VWAP of the last 5% of the upward balancing energy bids submitted per TSO connected to the platform
2. VWAP of the last 5% of the downward balancing energy bids submitted per TSO connected to the platform

Legal reference according to Article 9(4) of the common methodology for the pricing of balancing energy and cross-border capacity.

Data source is from the European balancing platform PICASSO.


Volume weighted average price of the most expensive balancing energy bids for DE
VWAP (€/MWh)
15,000
10,000
5,000
0
-5,000
-10,000
-15,000
14,838
13,522
9,857
12,875
10,656
13,470
13,770
13,437
13,064
12,661
13,994
13,086
-14,048
-8,014
-6,249
-8,339
-9,495
-12,363
-14,065
-14,086
-14,142
-14,557
-14,408
-14,030
July 2022
August 2022
September 2022
October 2022
November 2022
December 2022
January 2023
February 2023
March 2023
April 2023
May 2023
June 2023
Month


Volume weighted average price of the most expensive balancing energy bids for CZ
VWAP (€/MWh)
5,000
4,000
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
1,551
1,373
1,313
2,245
2,296
1,363
1,435
1,949
4,881
2,434
1,954
3,362
-358
-316
-252
-900
-253
-1,255
-1,645
-606
-1,900
-3,137
-1,669
-2,932
July 2022
August 2022
September 2022
October 2022
November 2022
December 2022
January 2023
February 2023
March 2023
April 2023
May 2023
June 2023
Month

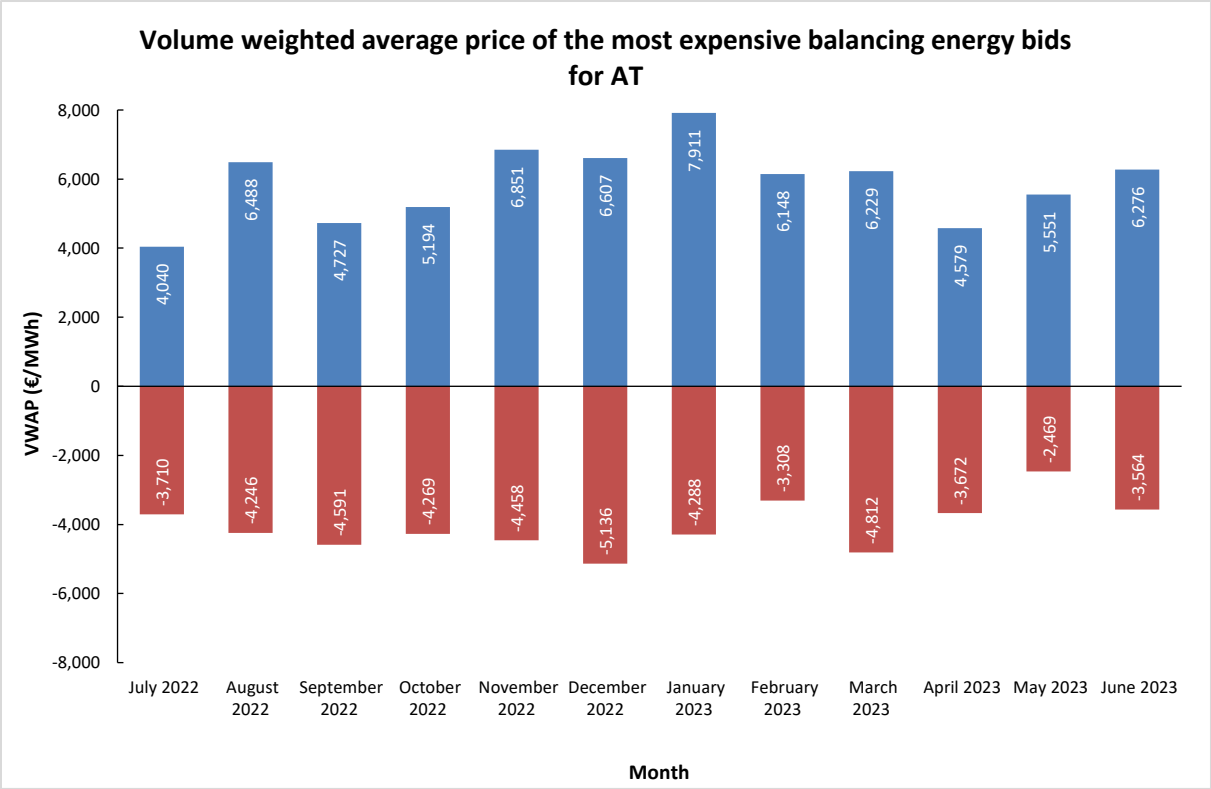


Figure 9: PICASSO – VWAP of the 5% most expensive aFRR bids submitted [EUR/MWh] per country

5. aFRR IF 13(1)(h): The results of the survey conducted in accordance with Article 16(2)(a)

All TSOs shall continuously evaluate the terms and conditions for BSPs in order to identify harmonisation needs. A stakeholder survey shall be organised every year, with the first survey occurring during the first operational year of the aFRR-Platform. This survey shall support the identification by all TSOs of a short list of prioritised harmonisation needs with close involvement of all relevant regulatory authorities. The Outcomes of IF survey were categorized and scoped to several points and one of them is following:

Not covered/Partially covered under the NC DR or other (candidates considered for short-list in further process):

- Harmonisation of communication requirements.
- Harmonisation of technology-specific regulations (e.g., on LER).
- Harmonisation of provisions on indivisible bids.
- Harmonisation of data and information flows as well as settlement processes.
- Harmonisation of the Automatic Programming Interface (API) for bidding, activations clients etc.

The the IF Survey - Harmonisation Recommendation Report with the Short list of prioriotized harmonization options is already final and is a subject to further analysis and processing by ENTSO-E.