

# COUPLING ENERGY MARKETS ON THE BALANCING MARKET TIME HORIZON

## *CUPLAREA PIETELOR DE ENERGIE PE ORIZONTUL PIETEI DE ECHILIBRARE*

Catalin CHIMIREL<sup>1</sup>, Laura MĂRGĂRIT<sup>2</sup>

**Abstract:** *Balancing Market is the last instance for the system operators to make the equal approach between generation and demand. The Electricity Balancing Market coupling is about creating a market where participating countries can manage the resources used by their system operators to always make the generation equal to demand. It is also about allowing new players such as aggregators, demand response and renewables to be players in this market. The coupled Balancing Market should help to increase the security of supply, limit emissions and diminish costs to customers. Three major steps are IGCC, PICASSO and MARI projects.*

**Keywords:** balancing, coupling, aFRR (automatic frequency restoration reserve), mFRR (manual frequency restoration reserve).

**Rezumat:** *Piața de Echilibrare este ultima instanță în care operatorii de sistem trebuie să realizeze echilibrarea între producția și cererea de energie. Cuplarea piețelor de echilibrare a energiei electrice are ca scop crearea unei piețe în care țările participante pot gestiona resursele utilizate de operatorii lor de sistem pentru a face ca producția să fie întotdeauna egală cu cererea. De asemenea, este vorba de a permite unor noi actori, cum ar fi agregatorii, răspunsul la cerere și sursele de energie regenerabilă, să participe pe această piață. Piața de echilibrare cuplată ar trebui să contribuie la creșterea securității aprovizionării, la limitarea emisiilor și la reducerea costurilor pentru clienți. Trei etape majore sunt proiectele IGCC, PICASSO și MARI.*

**Cuvinte cheie:** echilibrare, cuplare, RRFa, RRFm

### 1. Introduction

European market is targeting more and more renewables that brings more and more unpredictability and in the same time more efforts for

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balancing within TSOs. According another EU main task, the transmission system operators (TSOs) are looking for further market coupling at all market timeframes. The focus is looking to develop and harmonize sets of technical, operational and market rules to govern the coupling functioning of electricity balancing (EB) markets.

TSOs cooperate on such harmonization efforts and after they agreed for sets of rules, they implemented several projects such as the on-going implementation of the European energy balancing platforms, together with the implementation of the cross-zonal capacity (CZC) calculation and CZC allocation methodologies, and the imbalance settlement harmonization (ISH).

## 2. Paper contents

The purpose of this paper is to present 3 of the most important projects developed at European level for acquiring the balancing market coupling in line with the EB Regulation (COMMISSION REGULATION EU 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing).

a. European Platform for the imbalance netting process (IN-Platform) as The International Grid Control Cooperation (IGCC).



**Figure 1.** The International Grid Control Cooperation

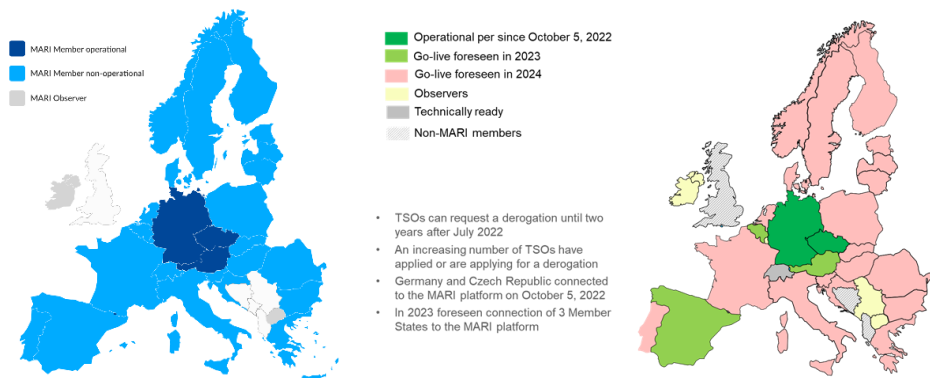
b. The Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation (PICASSO) is the

implementation project endorsed by all TSOs through the ENTSO-E Market Committee to establish the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation or aFRR-Platform.



**Figure 2.** The European platform for the International Coordination of Automated Frequency Restoration and Stable System Operation

c. Manually Activated Reserves Initiative (MARI) is the European implementation project for the creation, future development, and operation of the European mFRR platform.



**Figure 3.** The Manually Activated Reserves Initiative

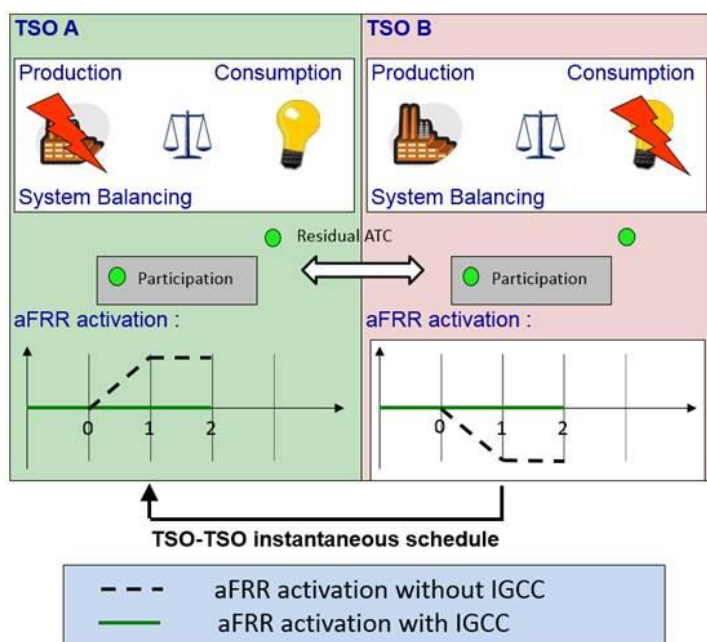
The implementation of European energy balancing platforms was concluded with efforts made by TSOs to ensure that each country's balancing demand is met through activating the most efficient bids in Europe, while also

considering operational security constraints, as well as increasing the security of supply in Europe.

### 3. IN-Platform

All TSOs as members of IGCC, are obliged to always maintain the balance between electricity generation and consumption in their respective LFC (Load Frequency Control) areas.

Imbalance netting is the process agreed between TSOs of two or more LFC areas that allow avoiding the simultaneous activation of frequency restoration reserves (FRR) in opposite directions by considering the respective frequency restoration control errors as well as the activated FRR, and by correcting the input of the involved frequency restoration processes accordingly. IGCC performs imbalance netting of automatic frequency restoration reserves (aFRR).



**Figure 4.** Imbalance netting as TSOs' collaborative process/  
Preventing simultaneous activation of frequency restoration reserves

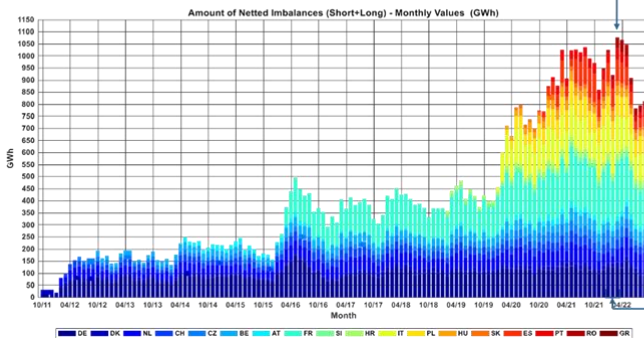
The platform is currently in operation and below we have an image of becoming operational timing:



Figure 5. Snapshot of time horizon of IN Platform evolution

Below is the graphical representation of the savings due to IGCC recorded so far:

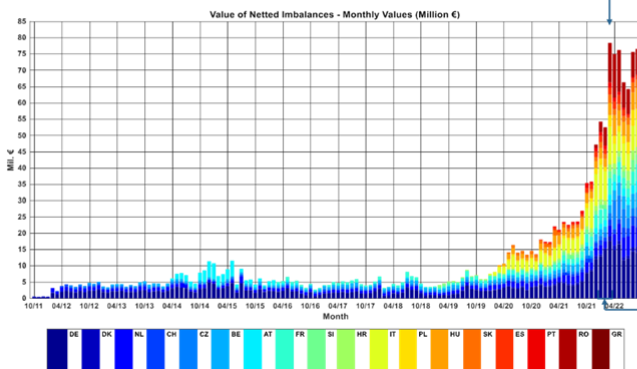
Amount of Netted Imbalances



New record of monthly value amount of netted imbalances: more than 1 TWh in March 2022

The quarterly energy savings in Q1 2022 have reached 3021 GWh

Value of Netted Imbalances



New record of monthly value amount of netted imbalances: nearly 80 million € in March 2022

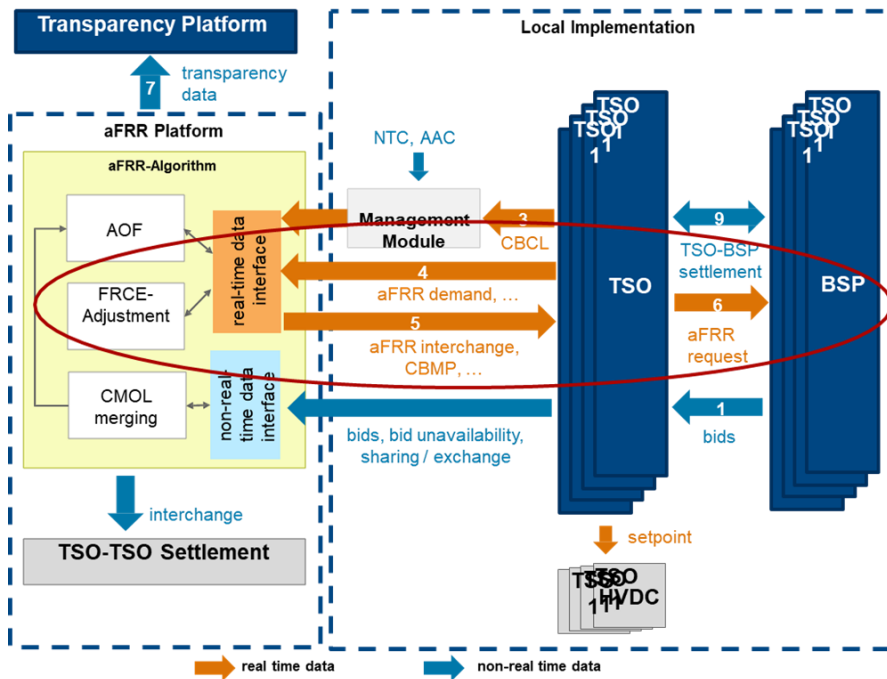
Aggregated savings: surpassed 1.5 billion € savings.

The value of quarterly savings in Q1 2022 has reached 217.61 million €

Figure 6. Graphical overview of recorded savings as net energy amount and net value

#### 4. PICASSO

PICASSO is the European platform for the exchange of balancing energy from the restoration of reserve frequency with automatic activation, operated by the TSO or through an entity established by the TSO, is based on common governance principles and business processes and consists at least of the activation optimization function and the TSO-TSO settlement function. This European platform applies a multilateral TSO-TSO model with a common merit order to exchange all balancing energy bids from all standard products for automatic activation frequency restoration reserves, except for unavailable bids. This includes, implementation of a standard product, harmonized gate closure times, a common merit order list, a central activation optimization function, merit order activation and harmonized balancing energy pricing.



**Figure 7.** Overall PICASSO Platform Process

Overall process is presented in Figure 7:

1. TSO receives bids from balancing service providers (BSPs) in their LFC area;

2. TSO forwards standard aFRR balancing bids to platform;
3. TSOs communicate Cross Border Capacity Limits (CBCL) 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.

The Platform is operational from Q3 2022 with first operators from Germany and Czech Republic. Further coupling schedule is detailed below:

Country	Derogation deadline	TSO	2023												2024			
			1	2	3	4	5	6	7	8	9	10	11	12	Q1	Q2	Q3	Q4
<b>EU:</b>																		
Austria		APG																
Belgium <sup>1</sup>	24.07.2024	Elia																
Bulgaria	30.06.2024	ESO																
Croatia	24.07.2024	HOPS																
Czech republic		CEPS																
Denmark <sup>2</sup>	24.07.2024	Energinet																
Finland <sup>2</sup>	24.07.2024	Fingrid																
France	24.07.2024	RTE																
Germany		50Hz AMP, TNG, TTG																
Greece	24.07.2024	ADME																
Hungary	24.07.2024	MAVR																
Italy	24.07.2023	Terna																
Netherlands <sup>3</sup>	24.07.2024	Tennet BV																
Poland	24.07.2024	PSE																
Portugal		REN																
Romania	01.03.2024	Transelectrica																
Slovakia	24.07.2024	SEPS																
Slovenia		ELES																
Spain	24.07.2024	REE																
Sweden <sup>2</sup>	24.07.2024	SVK																
<b>EEA:</b>																		
Norway <sup>2</sup>	24.07.2024	Statnett																
<b>Non-EU:</b>																		
Switzerland <sup>4</sup>		Swissgrid																

	5.4.(b)(i)	National terms and conditions development
	5.4.(b)(i)	National terms and conditions entry into force
	5.4.(b)(iii)	Interoperability tests between TSO and aFRR-Platform
	5.4.(b)(v)	TSO connection to aFRR-platform / Go-live
	5.4.(b)(vi)	EBGL Article 62 Derogation considered/requested/granted (new deadline listed)

**Figure 8.** The aFRR coupling timeschedule

## 5. MARI

The Manually Activated Reserves Initiative (MARI) project is an European project to develop an European platform for manual activation of frequency restoration reserves (mFRR).

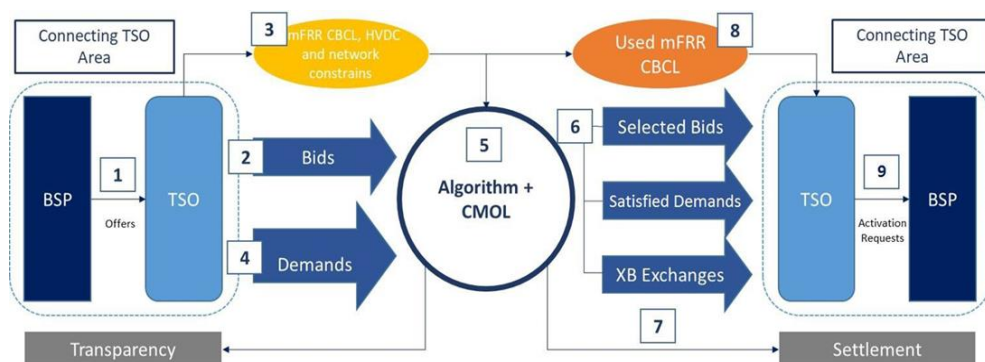
The manual frequency restoration reserve is a balancing reserve, activated by the TSO to restore the power system frequency to its setpoint (nominal) value. mFRR reserves are provided by balancing service providers

(BSP). mFRR is marketed as a standard product reserve that must be able to be fully activated within 12.5 minutes, maintaining a minimum of 5 minutes maximum activation capacity.

The MARI platform allows TSO to activate the most cost-effective set of mFRR offers required for their needs, while also considering the network constraints to enable transactions with these product reserves.

Overall process is presented in Figure 9:

1. TSOs receive bids from BSPs in their imbalance area;
2. TSOs forward standard mFRR balancing energy product bids to the mFRR Platform;
3. TSOs communicate the available mFRR Cross Border Capacity Limits (CBCL) and any other relevant network constraints as well HVDC constraints;
4. TSOs communicate their mFRR balancing energy demands;
5. Optimization of the clearing of mFRR balancing energy demands against BSPs' bids;
6. Communication of the accepted bids, satisfied demands, and prices to the local TSOs as well as the resulting XB exchanges;
7. Calculation of the commercial flows between imbalance areas and settlement of the expenditure and revenues between TSOs;
8. Remaining mFRR CBCL are sent to the TSOs;
9. TSOs send activation requests (direct or scheduled) to BSPs in their imbalance area.



**Figure 9.** Overall MARI Platform Process

The Platform was going live in 15 September 2022 with first operators from Austria, Germany and Czech Republic connected on 05 October 2022. Further coupling schedule is detailed below:

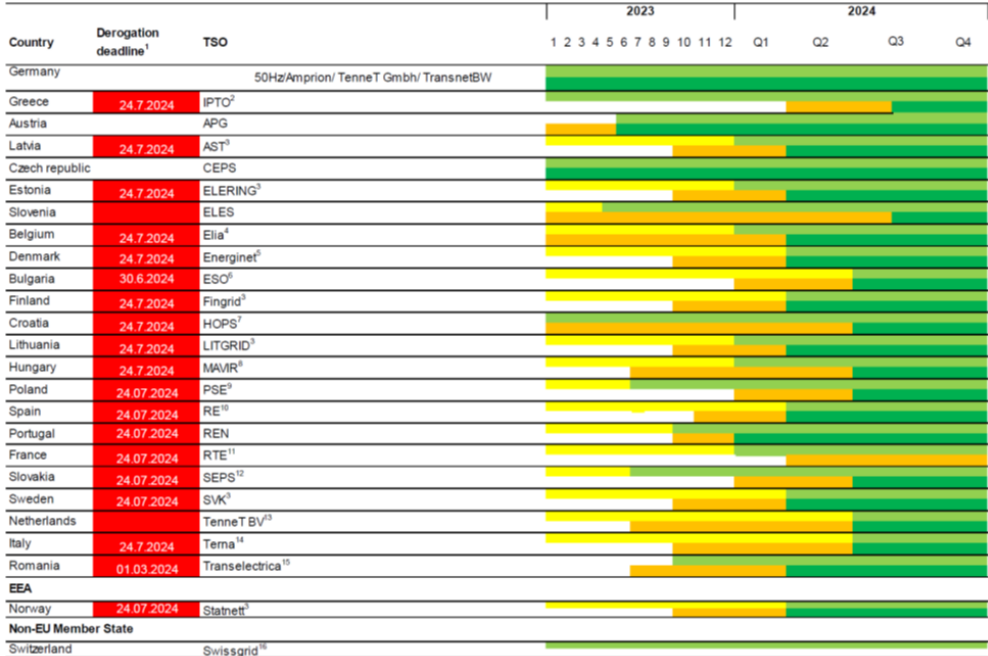


Figure 10. The mFRR coupling timeschedule

## 6. Conclusions

a) IN Platform already proved its efficiency within trans European operations of the power grids with significant savings.

b) European platforms for the exchange of balancing energy from frequency restoration reserves with manual and automatic activation (MARI and PICASSO), are enhancing the efficient use of the aFRR and mFRR within Europe with safety increase and important savings in the operation costs of the TSOs.

c) Market coupling within the balancing market timeframe is completing the coupling stages and creates important chances for market participants to attend a more efficient market approach with optimization premises due to extended harmonization of standard products, closing gates times and settlement rules.

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## Authors' biographies



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