



IPTO'S REPORT ON BALANCING FOR THE YEARS 2020-2021



in accordance with Article 60(2) of COMMISSION REGULATION (EU) 2017/2195 of
23 November 2017 establishing a guideline on electricity balancing

1. INTRODUCTION

This report is issued in accordance with article 60 of EBGL. It contains a description of the terms and conditions rules related to the new Balancing Market, as of November 1st, 2020, as well as information about their evolution and their future amendments. It also contains information regarding balancing capacity and energy usage for the years 2020-2021.

According to RAE's Decision No. 1412/2020, the rules for the operation of the system and the rules for the settlement of the electricity market related to the period until 30 October 2020 are defined in the HETS Management Grid Code¹ issued by RAE's Decision No. 57/2012 (GG B' 103/31.01.2012).

¹ <https://www.admie.gr/en/market/regulatory-framework/esmie-operation-code>

2. GENERAL INFORMATION

Greece is an LFC block and area, as part of the Continental Europe synchronous area and IPTO operates this LFC area by fulfilling the obligations of load frequency control. More details can be found at the table below.

Country	Greece
TSO	IPTO
Scheduling Area / LFC area / LFC block	HETS (Hellenic transmission system)
No of bidding zones/scheduling areas/imbalance areas	1

The dispatch model for the IPTO balancing market is central dispatch. The balancing market includes the Integrated Scheduling Process, the balancing energy market (mFRR and aFRR processes) and the balancing market Settlement Procedure.

Market Name	Execution / time resolution	Product
Integrated Scheduling Process	3 scheduled executions after each scheduled CRIDA session and ad-hoc executions if necessary (ISP1, ISP2, ISP3) / 30 minutes	<ul style="list-style-type: none"> Balancing capacity procurement (upward and downward FCR, aFRR, mFRR) Commitment schedule of Balancing Service Entities
mFRR balancing energy market	Scheduled every 15 minutes, direct activation between scheduled sessions / 15 minutes	<ul style="list-style-type: none"> Activation of mFRR balancing energy offers by issuing real-time Dispatch Instructions to the Balancing Service Entities
aFRR balancing energy market	Every 4 seconds / 4 seconds	<ul style="list-style-type: none"> Activation of aFRR balancing energy offers by issuing AGC Instructions to the Balancing Service Entities
Balancing market Settlement Procedure	Weekly / 15 minutes	<ul style="list-style-type: none"> Metering Calculation of balancing energy, imbalances, prices of energy and imbalances etc. Settlement of energy and capacity

2.1 Integrated Scheduling Process

The Integrated Scheduling Process (ISP) is a mixed integer linear programming algorithm which co-optimizes balancing energy and balancing capacity while considering technical constraints of balancing entities and network constraints and ensuring operational security, in order to minimize the cost of Balancing Energy and Balancing Capacity procurement.

The process aims at covering the forecasted generation/demand imbalances and procuring the required balancing capacity (reserves) requirements, namely upward and downward FCR, aFRR and mFRR while ensuring operational security. Balancing Capacity (reserves) are contracted within the Integrated Scheduling Process.

The ISP results include (a) Balancing Capacity procurement needed to cover the reserves requirement, (b) Commitment schedule of Balancing Service Entities. ISP results also include indicative Balancing Energy quantities needed to cover the forecasted generation/demand imbalances.

The ISP is executed at three scheduled times for each Dispatch Day D as follows:

- **ISP1:** It is executed at 16:45 EET on calendar day D-1 and concerns all Dispatch Periods (48 Dispatch Periods) of Dispatch Day D,
- **ISP2:** It is executed after ISP1 at 00:00 EET on calendar day D, taking into account the updated input data, and concerns all Dispatch Periods (48 Dispatch Periods) of Dispatch Day D.
- **ISP3:** It is executed at 12:00 EET on calendar day D, taking into account the updated input data. The time interval taken into account is from 13:00 EET until the end of Dispatch Day D (24 Dispatch Periods).

IPTO may execute the ISP at any time for all or for certain Dispatch Periods ("ad-hoc ISP"), in case of an event which significantly affects the scheduling of the BSEs or the awarded Balancing Capacity. Such events may include but are not limited to significant changes in the zonal Load Forecast, or zonal RES Units Forecast, or the availability of resources, or the HETS conditions.

BSPs that represent generating units are obliged to submit balancing energy and capacity offers in the Integrated Scheduling Process for each Balancing Service Entity (BSE) they represent, whereas BSPs that represent Dispatchable RES or Load Portfolios participate on a voluntary basis.

BSPs submit volume-price (maximum 10 steps) balancing energy offers and balancing capacity offers per balancing capacity product and direction for each Dispatch Day between 14:00 and 16:45 EET of the day preceding the dispatch day.

2.2 Balancing Energy Market

The balancing energy market includes the mFRR process and the aFRR process. The balancing energy market operates in order to balance energy supply and demand, taking into account the balancing energy offers, the technical characteristics and current state of the BSEs, the Market Schedules (net schedules from DAM and IDM markets) and operational security constraints in real time.

Two products are used in the balancing energy market: (1) upward and downward mFRR balancing energy which is activated by executing the mFRR process per 15 minutes, and (2) upward and downward aFRR balancing energy, which is activated through the operation of the Automatic Generation Control every 4 seconds.

BSPs that represent generating units are obliged to submit mFRR and aFRR balancing energy offers in the balancing energy market for each BSE they represent, whereas BSPs that represent Dispatchable RES or Load Portfolios participate on a voluntary basis, except for the balancing capacity volume corresponding to the mFRR and aFRR Balancing Capacity they were awarded in the ISPs, for which participation is mandatory.

The BSPs can update ISP balancing energy offers in better terms (lower price for upward activation and higher price for downward activation) for participation in the mFRR and aFRR markets. The Balancing Energy Gate Closure Time (BE GCT) for mFRR and aFRR balancing energy offers is 15 minutes before the start of the concerned quarter-hour.

The method of determining the volume of mFRR and aFRR Balancing Energy, as well as of the volume of energy for purposes other than balancing for each Imbalance Settlement Period and for each Balancing Service Entity is set out in art. 84 of the Balancing Market Rulebook and the “Activated Balancing Energy Calculation Methodology”. The method of determining the supplied volume of Balancing Capacity for FCR, mFRR and aFRR for each Imbalance Settlement Period and for each Balancing Service Entity is set out in article 90 of the Balancing Market Rulebook.

Greece consists of one bidding zone. In case of future split in more than one bidding zones the following apply:

- if there is no congestion between bidding zones, the upward (or downward) balancing energy price for mFRR for each Imbalance Settlement Period, is equal to the maximum (or minimum) of the balancing energy offer prices for the mFRR bids that were activated to cover system imbalances.
- If there is congestion between bidding zones, the upward (or downward) balancing energy price for mFRR for each Imbalance Settlement Period, is equal to the maximum (or minimum) of the balancing energy offer prices for the mFRR bids that were activated to cover the deviation in the specific bidding zone.

More details for the method of calculating balancing energy prices for mFRR is set out in article 85 of the Balancing Market Rulebook.

The method of calculating debits and credits to BSPs with respect to balancing energy is set out in article 86 of the Balancing Market Rulebook. The debits or credits to the BSPs, per Imbalance Settlement Period, for activated balancing energy are determined for each direction according to the following table:

	Positive Balancing Energy Price	Negative Balancing Energy Price
Upward Balancing Energy	Payment from Billing Agent to BSP	Payment from BSP to Billing Agent
Downward Balancing Energy	Payment from BSP to Billing Agent	Payment from Billing Agent to BSP

The credits to BSPs per Imbalance Settlement Period, for balancing capacity are determined taking into account the upward or downward balancing capacity contracted in the Integrated Scheduling Process, the availability of the asset and the price of the respective balancing

capacity offer step (pay-as-bid). More details for the method of calculating credits to BSPs with respect to balancing capacity is set out in article 91 of the Balancing Market Rulebook.

In the event that the operation of the Balancing Market is not possible, in particular due to an Emergency Situation, or failure of the Balancing Market System or of the other electronic systems, IPTO applies the rules that are set out in the “Rules for Suspension and Restoration of market activities” and the “Rules for settlement in case of market suspension”.

2.3 Imbalance settlement

The Imbalance Area is the HETS and as of November 2020, the imbalance settlement period is 15-min. The Imbalance Area is the HETS. There is only one Bidding Zone and consequently the Imbalance Price Area is identical to the Imbalance Area.

The Balancing Market Settlement Procedure is implemented on a weekly basis. A correction for settlement week W is carried out 6 weeks after settlement week W and the final settlement is carried out 52 weeks after settlement week W. More details on the Balancing Market Settlement Procedure are defined in article 107 of the Balancing Market Rulebook and the Technical Decision on “Balancing Market Settlement”.

Each BRP can have several final positions per imbalance area for an Imbalance Settlement Period equal to generation schedules of power generating facilities or consumption schedules of demand facilities. The Imbalance of a BSE is equal to the difference between the entity's certified metered energy and the entity's Market Schedule, taking into consideration any possible adjustment deriving from the entity's Dispatch Instruction.

IPTO uses single imbalance pricing for all imbalances. The imbalance price is the weighted average price of activated balancing energy in the predominant direction (upward or downward) for mFRR and aFRR. If there has been no activation of balancing energy, the imbalance price reflects the value of avoided balancing energy activation. No other components are used for the calculation of the imbalance price.

Any remaining balance after the calculation of the debits and credits calculated for the energy and imbalance Settlement is allocated to BRPs through an uplift account that ensures the TSO's financial neutrality.

The imbalance amount for an Imbalance Settlement Period and a BSE is calculated as the final imbalance, in MWh, multiplied by the imbalance price, in €/MWh. The debits or credits to the BSPs, per Imbalance Settlement Period, for their imbalances are determined for each direction according to the following table:

	Positive Imbalance Price	Negative Imbalance Price
Positive imbalance	Payment from Billing Agent to BSP	Payment from BSP to Billing Agent
Negative imbalance	Payment from BSP to Billing Agent	Payment from Billing Agent to BSP

2.4 Registration of entities

To become a Balancing Service Entity, the interested entity must successfully complete the pre-qualification process², which includes control tests to certify that the minimum technical requirements for the supply of FCR and FRR are fulfilled. The parties that are entitled to become a BSP, provided that they have an entity that has successfully completed the pre-qualification process, are: Producers with a power generating unit of installed capacity of over 5 MW, Auto-producers, RES Producers, RES aggregators, Demand Response Aggregators and Consumers.

The parties that can be registered as BRPs are Producers, Auto-producers, RES Producers, RES Aggregators, Demand Response Aggregators, Consumers, Suppliers and Traders.

In the event of a dispute between the IPTO and the BSPs or BRPs regarding the Terms and Conditions, the provisions of article 6 of the Balancing Market Rulebook apply. In the event of non-compliance of the BSP or BRP with the Terms and Conditions, IPTO terminates the Balancing Service and the Balance Responsible Party Contract respectively in accordance with article 7 of the Balancing Market Rulebook. In the event of default of BSPs or BRPs on their financial obligations, the provisions of Chapter 23 of the Balancing Market Rulebook and those of the Clearing Rulebook for Balancing Market Positions apply.

As of December 2020, in the Greek balancing market, the active BSPs were 8 and they represented 44 Balancing Service Entities. The active BRPs were 52 out of which 13 were RES aggregators. As of December 2021, in the Greek balancing market, the active BSPs were 8 and they represented 40 Balancing Service Entities. The active BRPs were 64 out of which 16 were RES aggregators.

The following figure depicts the number of records at IPTO's Registry both in December 2020 and in December 2021.

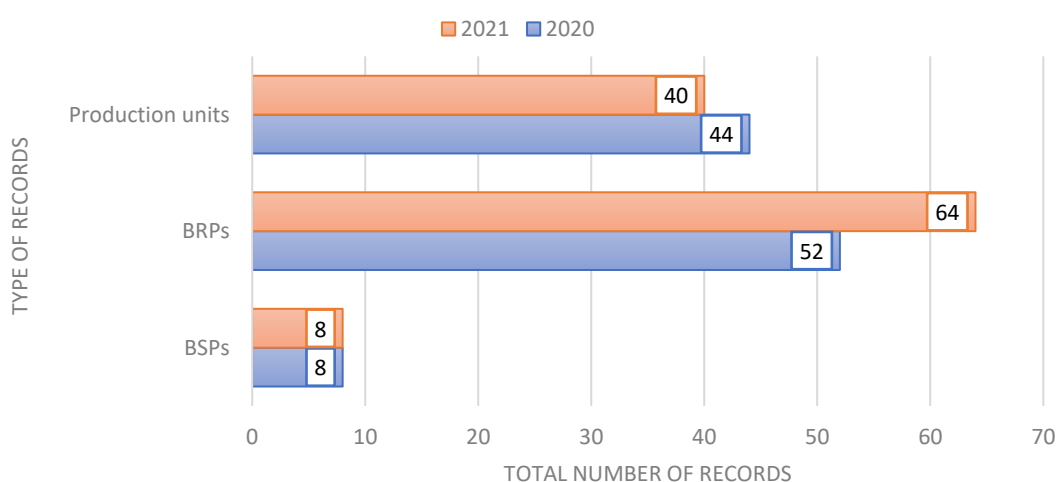


Figure 1: IPTO's Registry records in December 2020 and 2021

²https://www.admie.gr/en/market/regulatory-framework/methodologia-kai-tehnikes-apofaseis?_wrapper_format=html

3. EVOLUTIONS OF THE TERMS AND CONDITIONS FOR BRPS AND BSPS

The Terms and Conditions for BSPs and BRPs are issued in accordance with articles 2 and 5 of the Balancing Market Rulebook, as well as article 18 of EBGL and apply on BSPs and BRPs within the control area of IPTO.

No significant changes were implemented, as of November 2020, regarding the terms and conditions for BRPs and BSPs. In the following table some of the most important are presented.

Year	RAE's Decision	Description
2020	1415/2020	The registration fee for the participation in the balancing market for the BSPs and BRPs was defined.
2021	54/2021	The Balancing Market Rulebook was amended to envisage the following: <ul style="list-style-type: none">• The quantity of the first step of the upward Balancing Energy Offer and the quantity of the last step of the downward Balancing Energy Offer in MW must be equal to, at least, the Technically Minimum Generation for the Balancing Service Entities for which a Technically Minimum Generation is applied.• Balancing Energy Offers with negative prices from all BSPs are suspended until the start of operation of the Transmission Line 400kV Megalopolis-System.
	775/2021	The Balancing Market Rulebook was amended to envisage the settlement rules for the BRPs that are active in the island of Crete.
	1059/2021	The balancing market fee for the participation in the balancing market for the BSPs and BRPs was defined.

In the future changes are expected regarding the terms and conditions for BRPs and BSPs considering both IPTO's participation in the European balancing platforms and the reforms actions envisaged by the Greek Market Reform Plan.

In the context of IPTO's participation in the European balancing platforms, MARI and PICASSO, significant and extensive modifications to both systems, infrastructure, and procedures as well as to the terms and conditions of market participation are required. The required changes to both the systems and the regulatory framework are significant and extensive and affect both the scheduling and real-time processes as well as the settlement rules.

In addition to the above required changes, significant modifications to the existing market model are currently underway in the context of the Greek Market Reform Plan. In particular, IPTO will launch the participation of demand response and dispatchable RES in the Balancing Market within 2022. In parallel, additional modifications will be implemented within 2022 that affect the settlement rules regarding the distinction of balancing energy and energy activated in ISP for reasons other than balancing. At the same time, the launch of Continuous Intraday Coupling will also require modifications to several processes.

4. DIMENSIONING OF RESERVE CAPACITY

IPTO determines the system needs for Balancing Capacity for FCR, aFRR and mFRR, as specified in the "Methodology for Determination of Zonal/Systemic Balancing Capacity Needs³", approved by RAE.

IPTO as a TSO of the CE synchronous area follows the dimensioning rules for FCR described at the EU Regulation 2017/1485 (article 153). The balancing capacity for FCR required for the synchronous area shall cover at least the reference incident (3000 MW in positive and negative direction). The shares of reserve capacity on FCR required for each TSO as initial FCR obligation shall be based on the sum of the net generation and consumption of its control area divided by the sum of net generation and consumption of the synchronous area over a period of one year.

Regarding the FRR dimensioning IPTO determines the required reserve capacity of FRR of its LFC block based on consecutive historical records comprising at least the historical LFC block imbalance values. IPTO determines the size of the reference incident which shall be the largest imbalance that may result from an instantaneous change of active power of a single power generating module, single demand facility, or single HVDC interconnector or from a tripping of an AC line within its LFC block. FRR is categorized according to the way it is activated; automatic (aFRR) and manual (mFRR).

- **aFRR upwards & downwards needs** are calculated for each half hour of the day taking into consideration the following: i) maximum System Load, ii) the largest possible imbalance deficit due to one outage, iii) the minimum stable generation of the largest unit that is currently starting up, iv) the need to cover operational imbalances due to interconnector schedules and v) the need to cover very fast load increases/decreases.
- **mFRR upwards & downwards needs** are calculated for each half hour of the day taking into consideration the following: i) the aFRR need for the same period, ii) the RES generation, iii) the need to cover operational imbalance due to demand deficit, iv) the need to cover operational imbalances due to interconnector schedules and v) the need to cover extreme conditions.

³https://www.admie.gr/en/market/regulatory-framework/methodologia-kai-tehnikes-apofaseis?_wrapper_format=html

5. VOLUMES OF AVAILABLE, PROCURED AND USED RESERVE CAPACITY

IPTO does not exchange balancing capacity nor shares reserves through international interconnections.

The technical capability of a unit to provide FCR, aFRR, mFRR is a parameter registered among its technical operating characteristics for the provision of balancing services. The total volumes of available FCR, aFRR, mFRR can be seen at the table below and are calculated as the summation of the corresponding registered characteristics per unit.

Table 1: Available Balancing Capacity (MW) in December 2021

Balancing Capacity	Total BC UP (MW)	Total BC DN (MW)
FCR	1.059	1.059
aFRR	3.898	3.906
mFRR	4.717	4.657

The volumes of procured FCR, aFRR and mFRR during January 2020 – December 2021 can be seen at the table below. It should be noted that since November 2020 participants are compensated for procured mFRR volumes. For the period January – October 2020 reserves were procured on an hourly basis, whereas since November 2020 reserves were procured on a half-hourly basis.

Table 2: Average volume of procured reserves for years 2020-2021

Years	FCR UP (MW)	FCR DN (MW)	aFRR UP (MW)	aFRR DN (MW)	mFRR UP (MW)	mFRR DN (MW)
2020 (January- October)	60		508	127	880	
2020 (November-December)	39	39	492	120	657	156
2021	47	47	482	119	513	174

The average 30-min procured reserves per product and month for the year 2021 are presented at the following graphs.

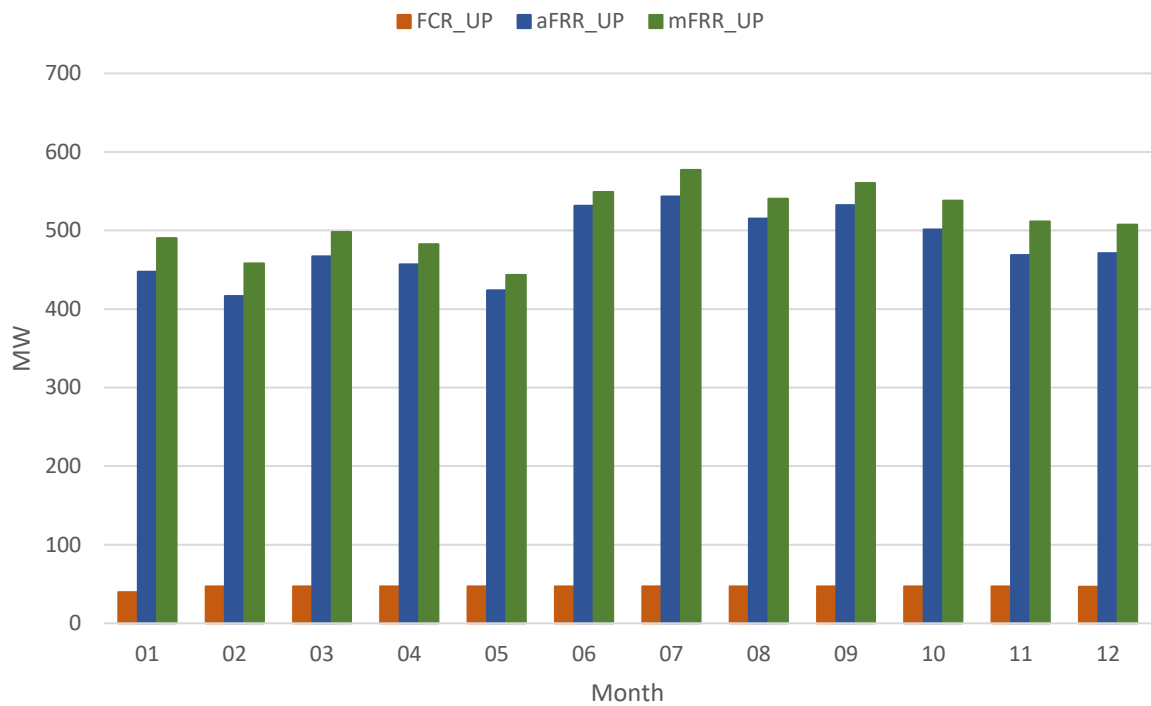


Figure 2: Average 30-min procured upwards reserves per product and month – year 2021

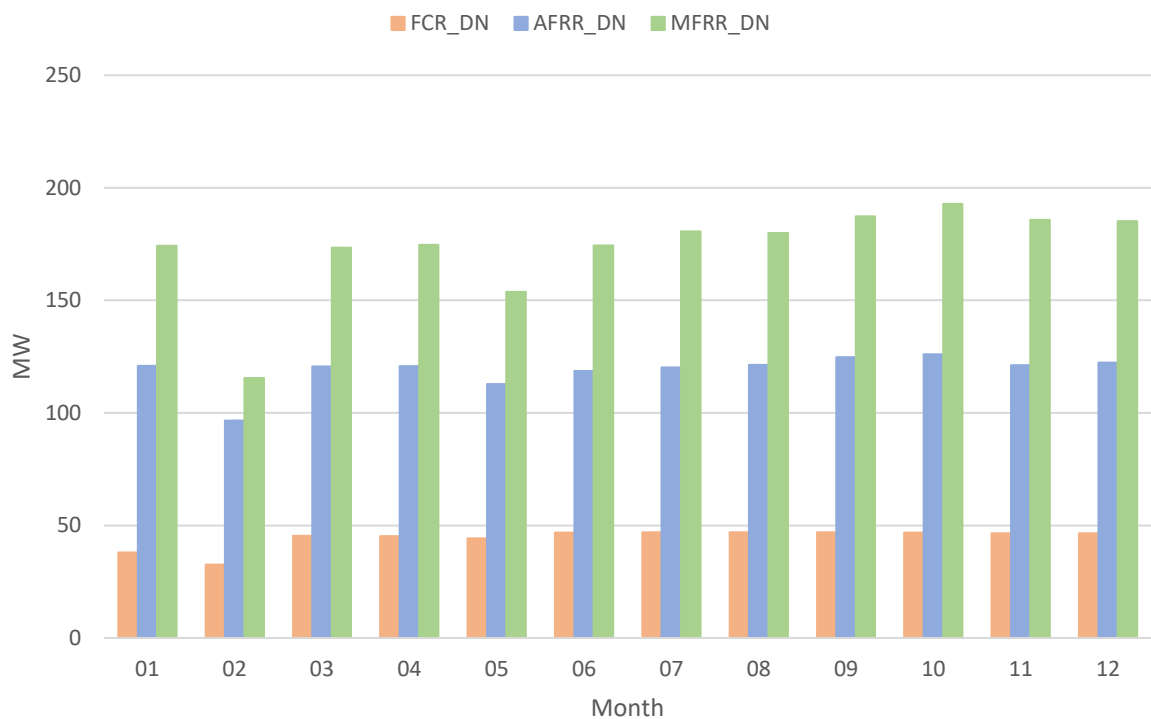


Figure 3: Average 30-min procured downwards reserves per product and month – year 2021

The hourly profiles of the procured reserves per direction for the year 2021 are presented at the following graphs.

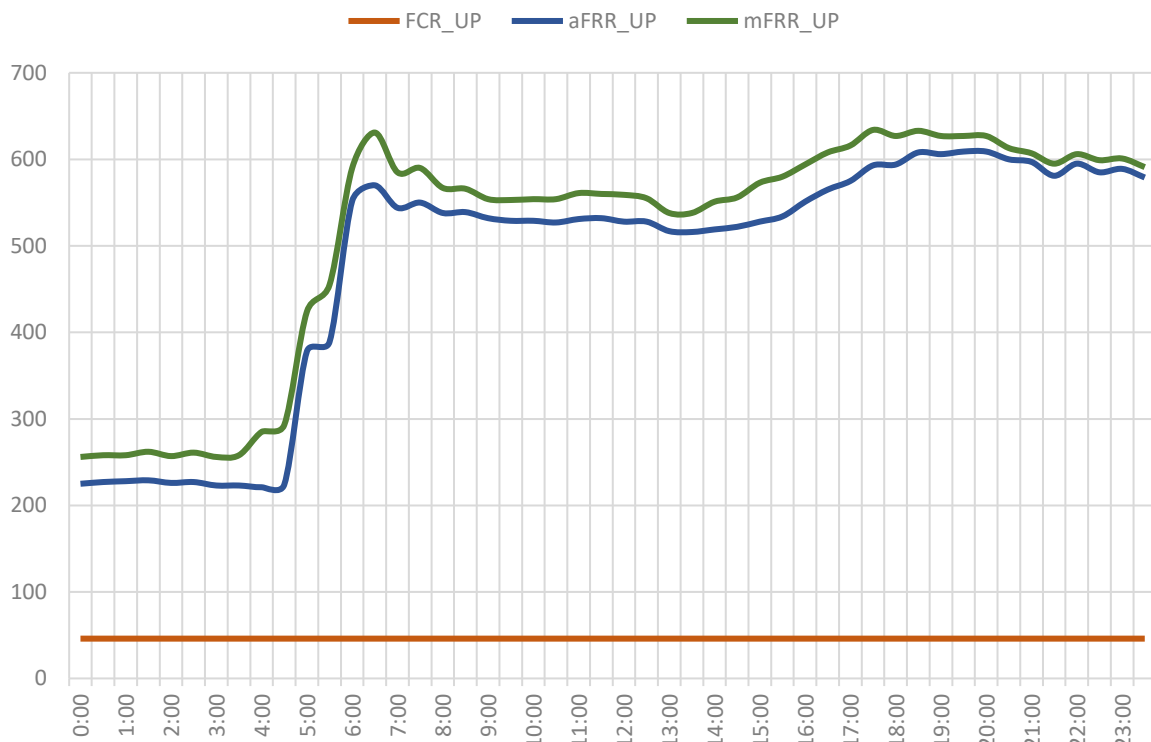


Figure 4: Hourly profile of procured upwards reserves per product – year 2021

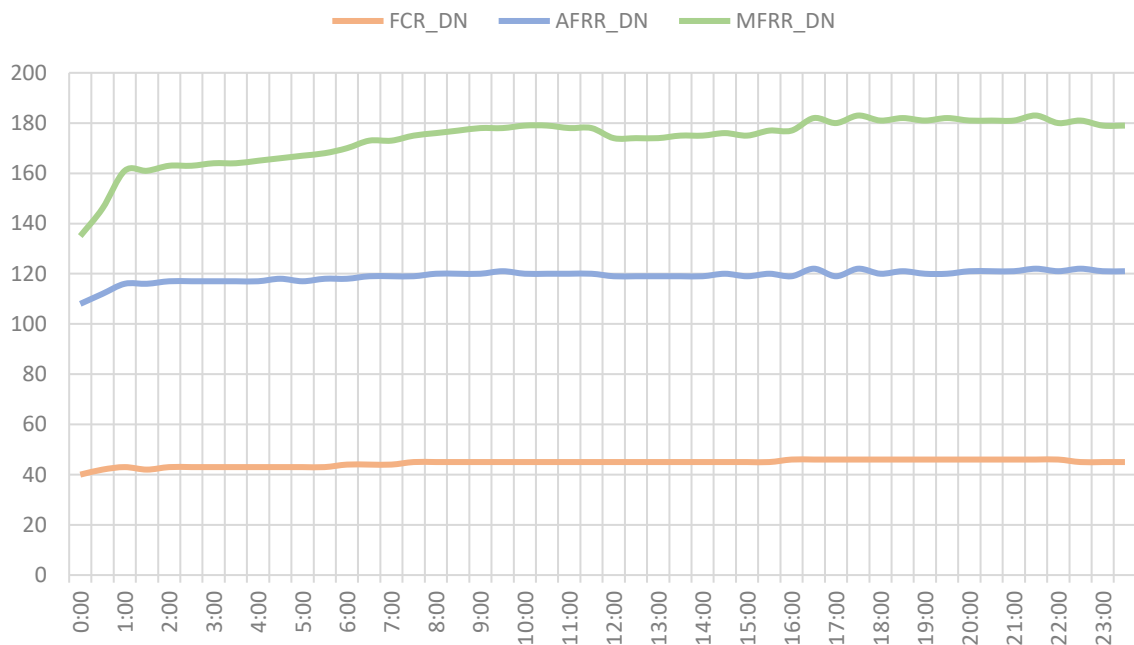


Figure 5: Hourly profile of procured downwards reserves per product – year 2021

6. VOLUMES OF USED BALANCING ENERGY

IPTO uses local balancing energy products. The total annual volumes of used balancing energy (MWh) per product can be seen at the table below exclusively for the year 2021, when the Greek Balancing Market was in force.

Table 3: Annual volumes of used balancing energy

Years	BE UP (MWh)		BE DN (MWh)	
	aFRR UP	mFRR UP	aFRR DN	mFRR DN
2021	1.416.237	995.608	1.075.833	1.067.636

More detailed analysis regarding the monthly total volumes for the year 2021 is depicted at the following graphs.

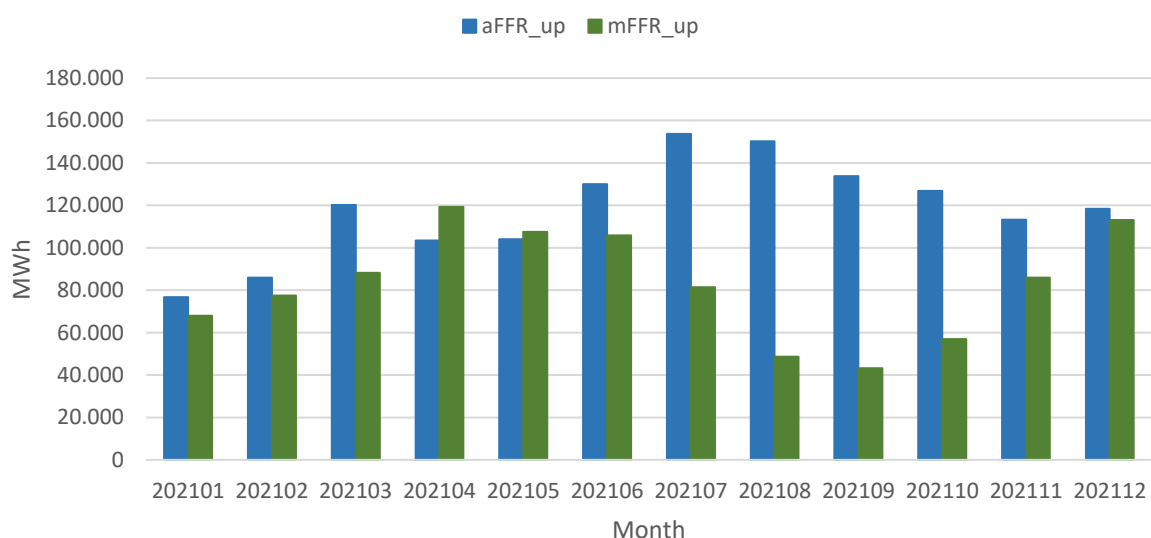


Figure 6: Total activated upwards balancing energy products per month – year 2021

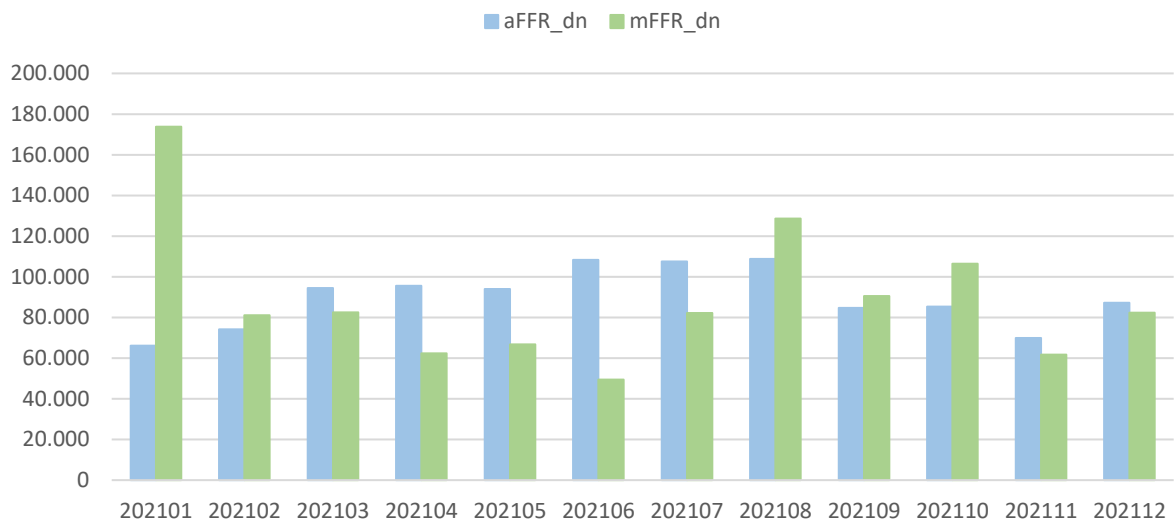


Figure 7: Total activated downwards balancing energy products per month – year 2021

7. PROGRESS, TIMELINE TOWARDS JOINING THE EUROPEAN PLATFORMS

In the following table the timeline towards joining the European balancing platforms is presented:

European balancing platform for the activation of balancing energy	Accession timeline	Status of the derogation
RR Platform (TERRE)	N/A	N/A
aFRR Platform (PICASSO)	July 2024	Granted
mFRR Platform (MARI)	July 2024	Granted
IN Platform (IGCC)	June 2021	

In more detail:

- **RR Platform:** IPTO is not participating in the TERRE project because the RR product is not used in Greece.
- **aFRR and mFRR Platform:** Pursuant to the provisions of article 62 of the EBGL, IPTO has requested a derogation from the provisions of articles 20(6) and 21(6) of EBGL concerning the implementation of the European platform for the exchange of balancing energy from frequency restoration reserves with manual and automatic activation, 'MARI' and 'PICASSO' platforms. The requested derogation period is two years, thus until the 24th of July 2024. Participation in the European platforms MARI and PICASSO is targeted for Q3 2024 as they are both challenging projects that require significant and extensive modifications and adaptations to systems, infrastructures, and procedures related to the mFRR and aFRR and the terms and conditions of BSPs and BRPs, as well as other regulatory framework changes.
- **IN Platform:** IPTO is already participating as of June 2021.

The participation in European balancing platforms of all generating resources is envisaged, including Demand, RES and Storage Portfolios.

IPTO is not part of any cooperation for the exchange of balancing capacity or sharing of reserves. IPTO considers that the exchange of balancing capacity or sharing of reserves provides small opportunities for cooperation since the capacity of interconnections with other member states is not very large and most of the capacity usually has already been used in the previous markets (DAM and IDM).