



RTE report on balancing



2020-2021, two years of balancing the
French electric system

1. Executive summary

1.1. Introduction

Réseau de Transport d'Electricité (hereinafter referred to as 'RTE') is the French TSO. It is part of the Continental Europe (CE) synchronous area, and manages its LFC block which is equal to its LFC area, scheduling area and monitoring area.

Pursuant Art. 60(1) of the Electricity Balancing Regulation, RTE publishes a report on balancing covering the calendar years 2020 and 2021 which can be found [here](#).

The French market is underpinned by the concept of balance responsible party. The balance responsible parties are financially responsible for their imbalances. The French balancing model is based on a decentralised dispatch of power generating units or demand response facilities.

Closer to real-time, the power system is managed in a centralised and proactive way by RTE. The French balancing market relies on a unit-based scheduling process which gives TSO very detailed forecast information about the status of the power system. In order to balance the French power system, RTE uses a dynamic system for sizing the balancing capacity required during the course of the day.

Supply-demand balance and network constraints are jointly managed. This results in integrated processes: an action performed for balancing purposes within the balancing market is also analysed against the impact that it has on the grid.

Convinced of the benefits of establishing a European balancing market, RTE was involved since the early phase in almost all the European projects and took an important step in December 2020 by joining the Trans European Replacement Reserves Exchange platform (TERRE platform).

RTE is also preparing its connection to the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (PICASSO platform) by the end of 2022.

In 2021, 200 BRP were active on the French balancing market. The average system imbalance is 385 MWh for an ISP with a positive imbalance and 362 MWh for a negative imbalance. In average, the system has a positive imbalance 50.6% of the ISPs and a negative imbalance 49.4% of the ISPs.

As to the BSP, 75 were active in 2021 which include: producers connected up to the transmission grid with a legal obligation to offer their available power on the balancing market, renewable energy producer, aggregators providing demand side flexibility.

The French balancing market has already undergone major changes to take into account the specificities of technologies such as storage, renewables and demand-side management and will pursue its evolution towards an efficient integration of flexibility sources.

Demand-side response is now able to participate to all French balancing markets for the different timeframes and in 2021, demand-side management contributed to respectively 20% of the FCR and 45% of mFRR/RR procured volumes.

The switch of a procurement through prescription with a secondary market to a primary market with a tender for FCR and the participation to the inter TSO FCR cooperation has increased the participation of storage facilities, especially batteries. In 2020 and 2021, 190 MW of batteries were certified for FCR. Since 2017, the whole certified volume of batteries have been activated.

1.2. Progress, timeline towards joining the European platforms and / or balancing capacity cooperations

European balancing platform for the activation of balancing energy	Accession timeline	Reasoning for derogation and status of the derogation (granted or not)
RR Platform	Connected since December 2020	
aFRR Platform	Q4 2022	Under discussion with French regulator - CRE
mFRR Platform	Q3 2024	Under discussion with French regulator - CRE
IN Platform	Connected since February 2016	

Balancing capacity cooperations	FCR cooperation memberStatus (MoU, project, member, observer...)	Accession timeline
FCR cooperation	Member	Connected since January 2017

1.3. Evolutions of the terms and conditions for BRPs and BSPs related to the EB regulation implementation during the last 2 calendar years and further evolutions foreseen for the Future

Evolution of the terms and conditions for BSP	
<p>Frequency ancillary services Terms and Conditions¹ (FCR and aFRR)</p> <ul style="list-style-type: none"> • Introduction of standard energy bids for aFRR (approved and Version applicable as of 1 January 2020) • Introduction of a national daily tender for the procurement of aFRR capacities (approved and Version applicable as of 1 September 2021) <p>Rules relating to Scheduling, the Balancing Mechanism and Recovery of Balancing Charges section 1² (mFRR and RR)</p> <ul style="list-style-type: none"> • Introduction of standard energy bids for RR (approved and Version applicable as of 1 July 2019) • Precision in relation to the TSO balancing timeframe : no activation for balancing purpose before the intraday gate closure time is allowed (approved and Version applicable as of 1 April 2022) <p>mFRR-RR terms and conditions³</p> <ul style="list-style-type: none"> • Introduction of a national daily tender for the procurement of mFRR and RR capacities (approved and Version applicable as of 1 January 2021) 	
Evolution of the terms and conditions for BRP ⁴	
<ul style="list-style-type: none"> • Implementation of the European methodology defining the new imbalance settlement at synchronous borders in accordance with Articles 50(3) and 51(1) of the Electricity Balancing Guideline (approved and Version applicable as of 1 September 2021) • Establishment of the European methodology for the harmonisation of balance responsible party imbalance settlement, based on Article 52(2) of the Electricity Balancing Guideline. (approved and Version applicable as of 1 September 2021) • Implementation of the 15 minutes Imbalance Settlement Period in accordance with Article 53(1) (approved and Version applicable as of 1 April 2022. In accordance with the provisions of Article 62(9) of the EB regulation, the French regulator has granted a derogation to defer the introduction of a 15 minute imbalance settlement period to 1 January 2025.) 	

¹[Frequency ancillary services Terms and conditions](#)

²[Rules relating to Scheduling, the Balancing Mechanism and Recovery of Balancing Charges Section 1](#)

³[mFRR-RR terms and conditions.](#)

⁴[Rules relating to Scheduling, the Balancing Mechanism and Recovery of Balancing Charges Section 1](#)

Evolution of the terms and conditions for BRP – “Content” should include, among other information, the following content as per the Articles 52, 53, 54 and 55 in the EB Regulation:

Question:	Please select an option:
Q1. Was 15-min Imbalance Settlement Period (ISP) implemented by 1 January 2022?	Derogation
1.1. If response in Q1 is "derogation" or "exemption", until when was this derogation/exemption granted?	January 2025
Q2. Has your TSO made use of additional components pursuant ISH Methodology Art 9(6) as per 1 January 2022?	Yes
2.1. Scarcity component?	Not considered
2.2. Incentivizing component?	Implemented (with a dedicated coefficient)
2.3. Component related to financial neutrality of the TSO?	Implemented (with a dedicated coefficient)
Q3. Has your TSO made use of dual pricing as per 1 January 2022?	No
3.1. Condition (a)	Not considered
3.2. Condition (b)	Not considered
3.3. Condition (c)	Not considered
3.4. Condition (d)	Not considered
3.4. Condition (e)	Not considered

1.4. Summaries and main results of the analysis of Articles 60(2)(a-f):

Procurement of reserves capacities

During the course of the year 2021, RTE has introduced new mechanisms for the procurement of aFRR and mFRR/RR capacities.

In November 2021, RTE has introduced a daily tender for the procurement of aFRR capacities. The tender has been suspended one month later at the request of the French regulator and RTE has resumed its procurement through a national prescription since then.

In June 2021, RTE has introduced a daily tender for the procurement of mFRR and RR.

- RTE has procured on average 512 MW of FCR through a European tender, the FCR cooperation, performed daily:

	2020	2021
TSO need (MW)	516	508
Total procurement cost (M€)	30,5	77,5
Average annual capacity price (k€/MW/y)	59,1	152,5

- RTE has prescribed daily an average of 620 MW of aFRR to the French stakeholders:

	2020	2021
TSO need (MW)	605	638
Total procurement cost (M€)	104,0	103,1
Average annual capacity price (k€/MW/y)	153,8	162,1

And procured during the national aFRR tender in operation from November 3rd until November 23rd 2021:

	Upward	Downward
TSO need (MW)	682	699
Total procurement cost (M€)	30,3	25,2
Average capacity price (€/MW/h)	85,45	70,60

- RTE has jointly procured mFRR and RR through an annual national tender and a daily tender:

RR RC	2020		2021			
	Annual		Annual*		Daily*	
	mFRR	RR	mFRR	RR	mFRR	RR
TSO need (MW)	1500		1000*		500*	
Average annual capacity price (k€/MW/y)	5,6	3,9	8,3*	7,3*	11,33*	13,55*

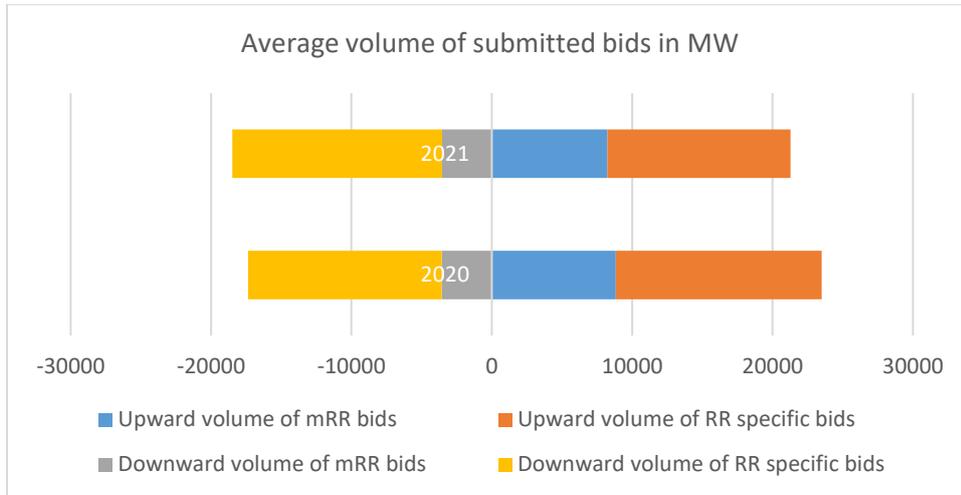
*The start of the the daily tender took place on June 1st 2021. As a consequence the actual volume of the daily tender was 0 for the first half of 2021 and 500 MW for the second half. The actual volume of the annual tender was 1500 MW for the first half of 2021 and 1000 MW for the second half.

RTE actively contributes to the European discussions about the opportunities for the exchange of balancing capacity and sharing of reserves but considers that certain pre-requisites have to be met before joining such a cooperation for the procurement of balancing capacity (resumption of the national tender for aFRR capacities, connection to the PICASSO platform, the approval of the different methodologies to build any cooperation on a stable and comprehensive regulatory framework).

Balancing the French system in real-time

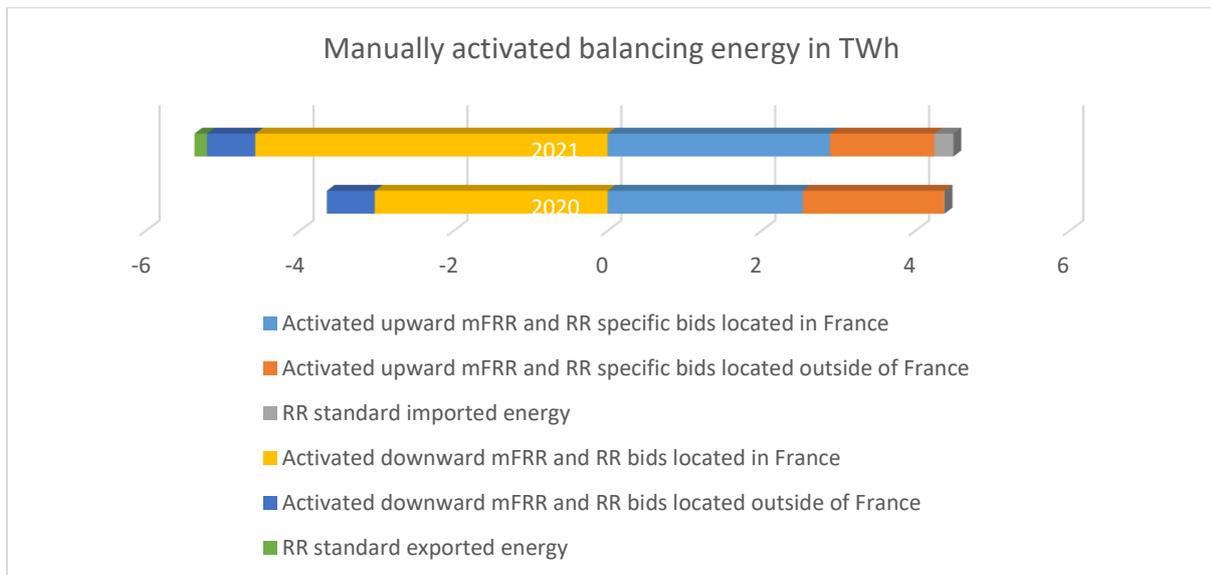
In December 2020, RTE joined the TERRE platform. In order to ensure a smooth transition towards new processes guaranteeing system and operational security, RTE introduced a period of operation under control. During this period, RTE gradually increased its participation by connecting to a limited number of gates per day at the beginning, in working hours, to reach a 24/7 operation in March 2022.

Figure 1 : Volume of submitted bids in MW for 2020 and 2021



In 2020 and 2021, there were on average 22 GW of upward submitted bids and 17.5 GW of downward submitted bids per ISP.

Figure 2: Volume of activated bids in TWh for 2020 and 2021



In 2020, the volume of activated mFRR and RR balancing energy delivered by a facility outside of France, through specific bids, represents 42% of the total upward volume activated and 17% of the total downward volume activated.

In 2021, the volume of activated mFRR and RR balancing energy delivered by a facility outside of France, through specific bids, represents 30% (1 357 GWh) of the total upward volume activated and 12% (629 GWh) of the total downward volume activated. These volumes are gradually decreasing being replaced by the use of standard products: 224 GWh of upward needs and 200 GWh of downward needs were satisfied by TERRE in 2021.

Justification for using specific mFRR and RR energy products

Specific products activated locally will remain necessary to balance the system as the standard products does not allow for all imbalance to be reabsorbed.

Besides, as presented previously, the liquidity on TERRE is gradually increasing but is not yet sufficient. Therefore, as RTE cannot request more than what is submitted by French BSPs on the platform, the use of specific products to balance the system in energy is still required.

Then, these specific products are necessary for coordinated management of supply-demand balance and network constraints.

Moreover, activating only standard balancing energy bids from mFRR and RR could have foreclosure effects on certain capacities actually participating to these markets.

Finally, specific products remain necessary to continuously monitor available adequacy margins and risks at various relevant times, and where necessary restore the required level of margins by activating means with a longer activation time. Standard products, available close to real time, are shared by definition (they can be activated to satisfy another TSO need) and consequently they cannot meet this purpose.

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2. Whereas

This document provides a report in accordance with Article 60 of the Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing (hereafter referred to as the “Electricity Balancing regulation”) for years 2020-2021.

Article 60

TSO report on balancing

- 1) *At least once every two years, each TSO shall publish a report on balancing covering the previous two calendar years, respecting the confidentiality of information in accordance with Article 11.*
- 2) *The report on balancing shall:*
 - a) *include information concerning the volumes of available, procured and used specific products, as well as justification of specific products subject to conditions pursuant to Article 26;*
 - b) *provide the summary analysis of the dimensioning of reserve capacity including the justification and explanation for the calculated reserve capacity requirements;*
 - c) *provide the summary analysis of the optimal provision of reserve capacity including the justification of the volume of balancing capacity;*
 - d) *analyse the costs and benefits, and the possible inefficiencies and distortions of having specific products in terms of competition and market fragmentation, participation of demand response and renewable energy sources, integration of balancing markets and side-effects on other electricity markets;*
 - e) *analyse the opportunities for the exchange of balancing capacity and sharing of reserves;*
 - f) *provide an explanation and a justification for the procurement of balancing capacity without the exchange of balancing capacity or sharing of reserves;*
 - g) *analyse the efficiency of the activation optimisation functions for the balancing energy from frequency restoration reserves and, if applicable, for the balancing energy from replacement reserves.*
- 3) *The report on balancing shall either be in English or at least contain an executive summary in English.*
- 4) *Based on previously published reports, the relevant regulatory authority in accordance with Article 37 of Directive 2009/72/EC shall be entitled to require changes to the structure and content of the next TSO report on balancing.*

3. Abbreviations

Abbreviation	Full name
ACER	Agency for the Cooperation of Energy Regulators
BRP	Balance responsible party
BSP	Balance service provider
CRE	Commission de régulation de l'énergie – French NRA
DSO	Distribution system operator
EB	Electricity Balancing
FCR	Frequency containment reserve
aFRR	Automatic frequency restoration reserve
mFRR	Manual frequency restoration reserve
IGCC	International Grid Control Cooperation
ISP	Imbalance settlement period
LER	Limited Energy Reservoir
MARI	Manually Activated Reserves Initiative
MW	Mega-watt
MWh	Mega-watthour
TWh	Tera-watthour
NRA	National regulatory authority
PICASSO	Platform for the International Coordination of Automated frequency restoration and Stable System Operation
RTE	Réseau de Transport d'Electricité
RR	Replacement reserve
SO	System operation
TERRE	Trans European Replacement Reserves Exchange
TSO	Transmission system operator
TURPE	“Tarif d'Utilisation du Réseau Public d'Electricité” - tariff paid by grid users

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5. Electricity Balancing in France

The electricity balancing market is the final deadline to ensure frequency stability on the power system. It continuously maintains equality between the power injected into the grid (electricity generated nationally or imported from abroad) and the power withdrawn from it (electricity consumed nationally or exported abroad). On an open market where a multitude of market parties can independently manage their asset portfolio (producers, suppliers, traders, etc.), it is also the final deadline to ensure compliance with the technical constraints of the power system, such as those linked to the network flows.

In France this task has been entrusted to RTE in accordance with the provisions of article L. 321-10 of the French Energy Code.

5.1. Design of the French power system's balancing

The model implemented in France is underpinned by two fundamental pillars:

- provide the balance responsible parties (hereinafter referred to as the “BRPs”) with the ability to optimize their portfolios and anticipate the balance of their perimeter up to a timescale that is relatively close to real time ;
- enable the TSO to take the most appropriate decisions for balancing the system, including when making forecasts, and ensure centralised and coordinated management of the grid constraints associated with the supply-demand balance and grid power flows. These decisions rely on predictive analyses produced by the TSO based on data sent by the market parties at different timeframes.

In France, the BRPs are financially responsible for their imbalances. It is the imbalance price which provides these incentives. The way this price is made up has therefore aimed to encourage the balancing of BRPs starting on D-1 and to reduce the need for the TSOs to take action in real-time.

Balancing the French power system involves decentralised management of the way in which generation means or consumption flexibility are dispatched. The market parties are responsible for dispatching available capacity (production means and consumption flexibilities).

Closer to real time, the power system is managed in a centralised way by the TSO. After the cross border intraday gate closure, only RTE is authorised to perform operations which might affect the system's balance.

In order to balance the French power system, RTE uses a dynamic system for sizing the capacity required during the course of the day. This model involves continuously monitoring of available margins and risks at various relevant times. In the event of discrepancy between available margins and the margins required in relation to the risk criteria as defined by the public authorities, special measures are implemented as part of the balancing market in order to increase the capacity available to RTE. This dynamic sizing ensures that the system remains reliable: a low volume of reserves is procured by the TSO ahead of the intraday, and measures are only implemented if they are strictly necessary, based on information communicated by the market parties and predictive analyses produced by the TSO.

5.2. Actors of the French balancing model

In 2021, 200 BRP were active on the French Balancing market. The average system imbalance is 385 MWh for an ISP with a positive imbalance and 362 MWh for a negative imbalance. In average, the system has a positive imbalance 50.6% of the ISPs and a negative imbalance 49.4% of the ISPs.

As to the BSP, 75 were active in 2021 which include: producers connected up to the transmission grid with a legal obligation to offer their available power on the balancing market, renewable energy producer, aggregators do demand side flexibility or renewables.

The French balancing market has already undergone major changes and will pursue its evolution towards a more open to all sources of flexibility including storage, renewables and demand-side management by adapting market rules to take into account the specificities of new technologies.

- RTE continuously aims at removing all the barriers that could prevent the full participation of renewable energy resources.
- Demand-side response is now able to participate to all French balancing markets for the different timeframes.

It's possible to offer demand response on the balancing mechanism for industrial demand response since 2003 and, for distributed load shedding since 2007.

Since 2008, RTE has been contracting with BSP for demand response capacity to guarantee the availability of their capacity to the balancing mechanism. In July 2014, industrial customers have been able to participate in frequency ancillary services by offering demand response (1 MW minimum). RTE has since further opened the market: for instance in 2021, demand-side management contributed to respectively 20% of the FCR and 45% of mFRR/RR procured volumes.

- Storage facilities can participate to the balancing markets to ensure system security.

Since 2014, an experimentation has been conducted in France in order to allow storage facilities (other than hydropower plants or pumped-storage power plan) to participate to frequency ancillary services (FCR and aFRR). These reserves, which can be automatically activated in timeframes ranging from a few seconds to a few minutes, are critical to keeping supply and demand balanced. The switch of a procurement through prescription with a secondary market to a primary market with a tender for FCR and the participation to the European platform for FCR has increased the participation of storage facilities, especially batteries. In 2020 and 2021, 190 MW of batteries were certified for FCR. Since 2017, the whole certified volume of batteries have been activated.

The participation of storage facilities, with the exception of pumped-storage power plant, is still limited for aFRR. Nevertheless, the participation of RTE to the aFRR platform foreseen by the end of 2022 and new provisions in the terms and conditions for BSP which will entry into force in 2022 would enhance the participation of new storage facilities.

As of now, there is no participation of batteries to the balancing market for manually activated bids (mFRR and RR).

6. Procurement of capacity balancing

6.1. Dimensioning of balancing capacity

In accordance with art-60(b), RTE provides the summary analysis of the dimensioning of reserve capacity including the justification and explanation for the calculated reserve capacity requirements.

Main principles for the dimensioning of balancing reserves are stipulated in the European System Operation Regulation and further specified for RTE in the Load-frequency control block agreement approved by the French regulatory authority in accordance with the System Operation Regulation.

RTE is forming one load-frequency control block (LFC Block) and applies the following main principles:

- After an incident, the TSO shall be able to restore frequency and cross-border exchanges in its balancing area in less than 15 min. The dimensioning of reserves available in less than 15 min shall be based on the dimensioning incident. For RTE, it corresponds to the loss of the biggest production unit connected to the grid, which is a 1500 MW nuclear power plant (upward) and usually a pump storage unit of 1280 MW or a HVDC link of 1000 MW (downward) ;
- The dimensioning of reserves shall allow to respect control deviation quality criteria stipulated in the System Operation Regulation, which are for RTE in 2021:
 - o control deviation, on a quarter hour period, shall be below 238 MW with a probability greater than 70% ;
 - o control deviation, on a quarter hour period, shall be below 450 MW with a probability greater than 95%.

In accordance with these principles, RTE dimensions the required reserve capacity with a combination of automatic and manual reserves:

- at least 500 MW of automatic frequency restoration reserve (aFRR), upward and downward, which can be activated in less than 6min40s (650 MW in average) ;
- at least 1000 MW of manual frequency restoration reserve (mFRR), upward only, which can be activated in less than 13 min, with a maximum of 2 activations of 2 hours per day ;
- a maximum of 500 MW of replacement reserve (RR), upward only, which can be activated in less than 30 min, with a maximum of 2 activations of 1h30 hour per day.

As of today, this dimensioning of reserves ensures compliancy with the associated indicators to assess the frequency control deviation quality management. However, RTE keeps monitoring these indicators and implements a strategy to alleviate the risk of frequency quality degradation. For instance, RTE has implemented a differentiated upward and downward procurement of aFRR since November 2021 applying a new methodology for dimensioning, based on historical imbalances, and studies the possibility to procure downward mFRR and RR capacity.

6.2. Procurement of balancing capacity

In accordance with art-60(c), RTE provides the summary analysis of the optimal provision of reserve capacity including the justification of the volume of balancing capacity

6.2.1. Prequalification of balancing reserves

In accordance with the System Operation regulation, the connecting TSO is responsible for the qualification of the balancing capacities.

RTE has described in its terms and conditions regarding FCR and aFRR, all the steps to qualify the capacities based on the requirement of the System Operation regulation.

More recently, RTE has introduced the qualification criteria to qualify as a FCR capacity as a Limited Energy Reservoir (LER). RTE now qualifies a LER if it is able to provide the full FCR capacity during 2 hours upward and downward. In case the reserve providing group is qualified as a LER, the modality of ensuring the full delivery on the normal state is checked. In case the reserve providing group is a LER, it has to have a stock equivalent to 15min activation upward and downward at any time when entering alert or emergency state.

RTE has also specified in its terms and conditions the additional properties of FCR according to SO regulation which have to be approved by the French regulator before the end of June 2022.

6.2.2. Frequency containment reserves (FCR) – European tender

Procurement modalities

In January 2017, RTE joined the FCR cooperation, a European tender organised by six European countries: Germany, Austria, Belgium, Denmark, the Netherlands and Switzerland. Henceforth, France has replaced its national prescription by a cross-border European tender of FCR.

Between 2020 and 2021, Belgium, Denmark and Slovenia have joined the FCR cooperation and the market design has evolved.

This tender covers 1444 MW of procured FCR capacity, which represents almost half of the 3000 MW required at the continental European synchronous area level.

From July 1st of 2020 onwards, the FCR cooperation runs a daily day-ahead tender with 4-hour granularity products.

The objectives pursued by the successive evolutions are (i) to improve economic efficiency and reduce procurement costs of frequency containment reserve, (ii) to foster competition and (iii) to facilitate the entry of new market participants and new technologies.

Results of the FCR tender

The cost of procuring FCR is covered by the tariff paid by grid users called TURPE for “Tarif d’Utilisation du Réseau Public d’Electricité”.

	2020	2021
TSO need (MW)	516	508
Total procurement cost (M€)	30,5	77,5
Average annual capacity price (k€/MW/y)	59,1	152,5

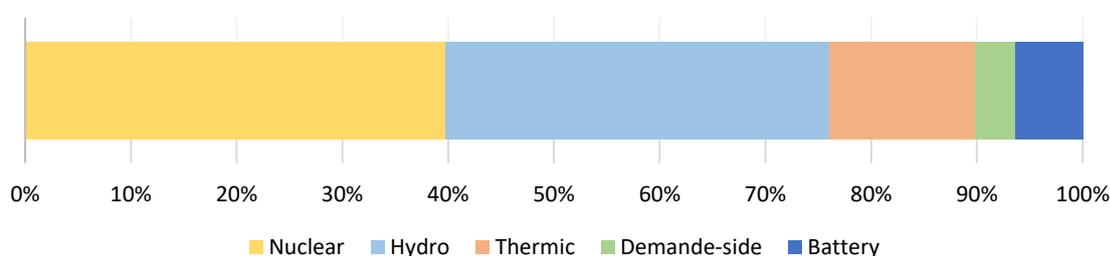
In 2020, France has exported 64 MW in average compared to a total need of 516 MW. The average price of FCR in France was 6.73 €/MW/h, with a maximum price at 31.54 €/MW/h in July and a minimum at 0.32 €/MW/h in December.

In 2021, RTE has exported 30 MW in average compared to a total need of 508 MW. The average price of FCR in France was 17.41 €/MW/h, with a maximum price at 408.64 €/MW/h in October and a minimum at 0.18 €/MW/h in March.

Like the SPOT price, FCR prices have risen very sharply in 2021 with a peak in October.

By the end of 2021, there are 116 MW of demand side management and 201 MW of batteries certified.

Figure 3 : Certified capacities for FCR as of 1st April 2022



6.2.3. Automatic frequency restoration reserve (aFRR) – National prescription

Procurement modalities

Actual modalities

The procurement of aFRR is performed through a national prescription to mandatory market participants with production units capable of providing ancillary services to the system and paid at a regulated price, around 20€/MW/h. Prescriptions are symmetric (upward and downward), on a pro-rata basis taking into consideration actual scheduling of capable production units. Capable capacities not under prescription (consumption sites and batteries) can propose their capacity to the mandatory market participants through a secondary market for the exchange or reserves between market participants.

RTE set up an over-the-counter exchange mechanism to allow market participants to exchange reserves (FCR and aFRR). This mechanism, accompanied by an obligation to notify RTE of the exchange, optimizes how ancillary services (FCR and aFRR) are provided by capable capacities through a market mechanism. Mandatory market participants can transfer their obligation to another certified market participant. CRE has authorized RTE through the derogation to the Article 32 of the Electricity Balancing regulation in order to let the time to change the process.

Future modalities

In accordance with Article 32 of the Electricity Balancing regulation, procurement of aFRR capacity should be market-based and dissymmetric (different between upward and downward). Besides, the

Electricity regulation, revised by the Clean Energy Package, stipulates that the procurement should be performed on a primary market through a tender. Therefore RTE will transform its procurement from a prescription with a secondary market to a primary market with a tender.

The national tender for the procurement of aFRR capacity was launched in November 2021. The design proposed was as follows:

- 1 hour dissymmetric capacity product
- 1 MW granularity
- Possibility of linking upward and downward bid to form symmetric offers
- Possibility of linking a bid on several hours to form block bids

Capacities were remunerated at pay-as-clear prices, different for each hour and each direction. Prices observed after the launch of the tender were very high and the liquidity limited. The French regulator asked RTE to suspend the tender until further notice a few days after its beginning. A rollback procedure was possible in the terms and condition for one year after the beginning of the tender. The situation is still under analysis by the French regulator to define conditions to resume the tender.

Results of the national prescription of aFRR

The cost of procuring is determined by the need and a regulated price called “*Prix forfaitaire de la capacité*”. The cost of procuring aFRR is covered by the tariff paid by grid users called TURPE.

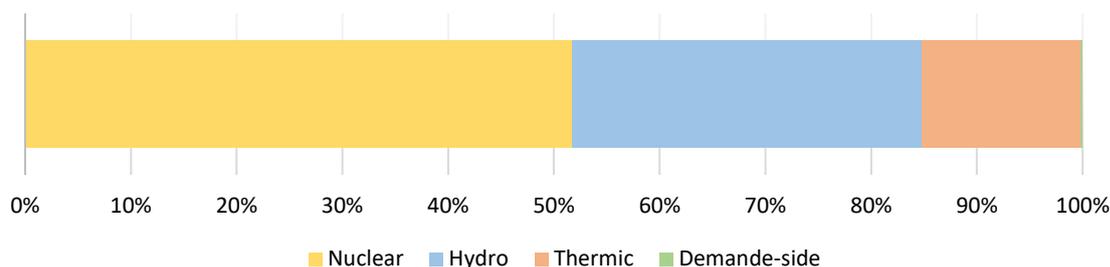
	2020	2021
TSO need (MW)	605	638
Total procurement cost (M€)	104,0	103,1
Average annual capacity price (k€/MW/y)	153,8	162,1

Results of the national aFRR tender

The national aFRR tender was in operation from November 3rd until November 23rd 2021:

	Upward	Downward
TSO need (MW)	682	699
Total procurement cost (M€)	30,3	25,2
Average capacity price (€/MW/h)	85,45	70,60

Figure 4 : Certified capacities for aFRR as of 1st April 2022



6.2.4. Tertiary reserves (mFRR and RR) – National daily and annual tender

Procurement modalities

Since June 1st 2021, RTE procures 1500 MW of upward mFRR and RR balancing capacity through an annual and daily call for tender: at least 1000 MW of mFRR, available in 13 minutes, and the complementary volume of RR, available in 30 minutes. These tenders are open for production and consumption sites connected either to the TSO or the DSOs.

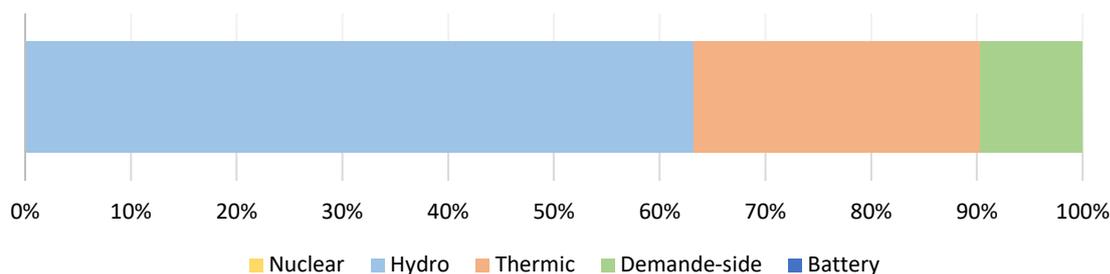
The current share contracted through the daily and the annual call for tender is the following: one third of the total volume (500 MW) contracted through the daily tender, and two thirds of the total volume (1000 MW) contracted through the annual tender. This share is to be re-evaluated each year and is validated by the French National Regulatory Authority (CRE), in accordance to the Clean Energy Package. The volume contracted through the daily call for tender is increased by a part of the volume contracted through the annual call for tender when the BSPs have declared their incapacity to fulfill their commitments on the concerned periods.

Results of the national annual tender (mFRR and RR)

	2020		2021			
	Annual		Annual*		Daily*	
	mFRR	RR	mFRR	RR	mFRR	RR
TSO need (MW)	1500		1000*		500*	
Total procurement cost (M€)	8,16		8,53*		3,06	
Average annual capacity price (k€/MW/y)	5,6	3,9	8,3*	7,3*	11,33*	13,55*

*The start of the daily tender took place on June 1st 2021. As a consequence the actual volume of the daily tender was 0 for the first half of 2021 and 500 MW for the second half. The actual volume of the annual tender was 1500 MW for the first half of 2021 and 1000 MW for the second half.

Figure 5 : Certified capacities for mFRR/RR as of 1st April 2022



Evolutions on the capacity market for mFRR/RR

In 2020, RTE simplified the modalities of the mFRR/RR procurement in order to improve the conditions for market participants as well as for RTE. Those simplifications included amongst other evolutions:

- The transformation from “mFRR-RR procurement contract” to “mFRR-RR terms and conditions”;
- The reduction to only 2 capacity products (improving the understanding of market participants);
- The modification of penalties in case of default in order to be less restrictive for market participants;
- The evolution of the mFRR-RR prequalification process in order to reduce the efforts and the timing both for RTE and the market participants to prequalify the mFRR-RR capacities.

6.3. Establishing the framework for the future regional exchange of procured reserves

In accordance with art-60(e), RTE analyses the opportunities for the exchange of balancing capacity and sharing of reserves

Nowadays, in France and in Europe, procurement of reserves is mostly performed at the national/local scale. RTE believes that organizing the procurement of reserves at a regional scale is an interesting step forward as it increases market size and encourages competition.

FCR cooperation

Since January 2017, RTE is part of the FCR cooperation, a European tender. The FCR cooperation has evolved towards a day-ahead tender with 4-hour products since July 1st of 2020. RTE took actively part in the evolutions and will pursue its involvement in this cooperation.

Exchanging of balancing capacity or sharing of reserves - aFRR, mFRR, RR

Contrary to the FCR, the cross-border procurement of balancing capacity such as aFRR, mFRR and RR requires to allocate cross-zonal capacity to ensure the service procured can be delivered.

To foster the emergence of regional cooperation for the procurement of reserve, the Electricity Balancing regulation introduced the possibility for TSOs to allocate cross-zonal capacity for the exchange or the sharing of reserves, which was not possible before. The methodologies on “Cross

Zonal Capacity Allocation for the exchange of balancing capacity or sharing of reserves” in accordance with Article 40 (co-optimization) and with Article 41 (market based) of the Electricity Balancing regulation were approved at regional level by NRAs and ACER. Besides, a harmonized methodology across all the capacity calculation regions will be submitted by December 2022.

6.4. Justification for the procurement of balancing capacity without the exchange of balancing capacity or sharing of reserves

In accordance with art-60(f), TSO has to provide an explanation and a justification for the procurement of balancing capacity without the exchange of balancing capacity or sharing of reserves.

Pending the submission and approval of the Cross Zonal Capacity Allocation harmonized methodology, CORE TSOs have started to implement the regional market based methodology and a first balancing capacity cooperation composed of German, Austrian and Czech TSOs targets to apply this methodology by end of 2023.

RTE actively contributes to the European discussions but considers that certain pre-requisites have to be met before joining such a cooperation for the procurement of balancing capacity:

- Resumption of the national tender for aFFR capacities ;
- Connection to PICASSO and harmonization of the full activation time period (FAT) to 300s for aFFR products expected by 2025 ;
- The approval of the different methodologies to build any cooperation on a stable and comprehensive regulatory framework.

7. Balancing the system in real time

According to art-60(a), this report includes information concerning the volumes of available, procured and used specific products, as well as justification of specific products subject to conditions pursuant to Article 26;

7.1. Use of specific and standard bids

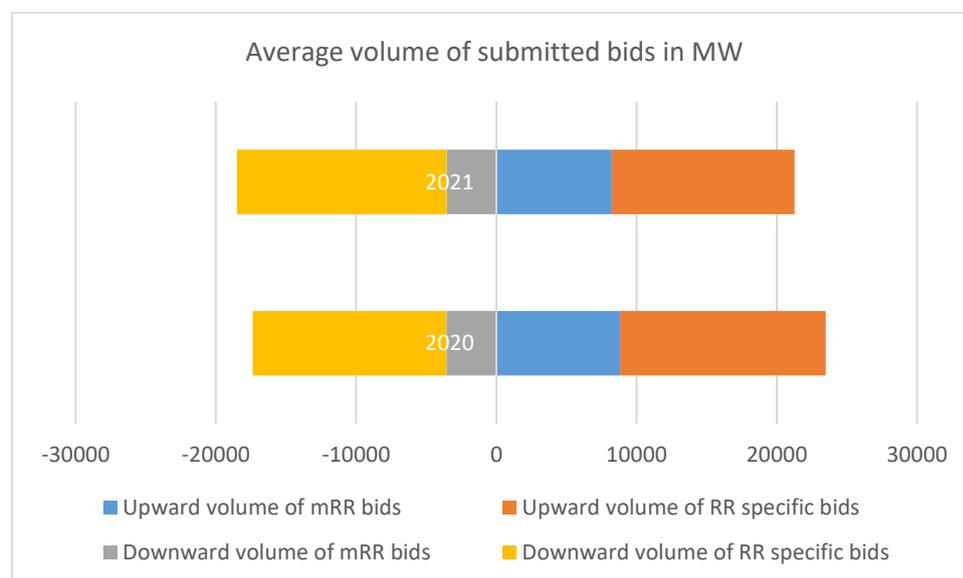
7.1.1. Connection to the European balancing platforms

In December 2020, RTE joined the Trans European Replacement Reserves Exchange platform (TERRE platform). In order to ensure a smooth transition towards new processes guaranteeing system and operational security, RTE introduced a period of operation under control. During this period, RTE gradually increased its participation by connecting to a limited number of gates per day at the beginning, in working hours, to reach a 24/7 operation in March 2022.

RTE is also preparing its connection to the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation (PICASSO platform) by the end of 2022. In 2020 and 2021, activated volumes of frequency reserves with automatic activation (aFRR) were not based on energy bids but on signal sent by RTE and settled with the scheduling volume with the reference French day-ahead spot price. RTE is then adapting its process in order to get standard aFRR energy bids by changing its Scada to switch to a merit order activation of bids.

7.1.2. Volumes of submitted bids

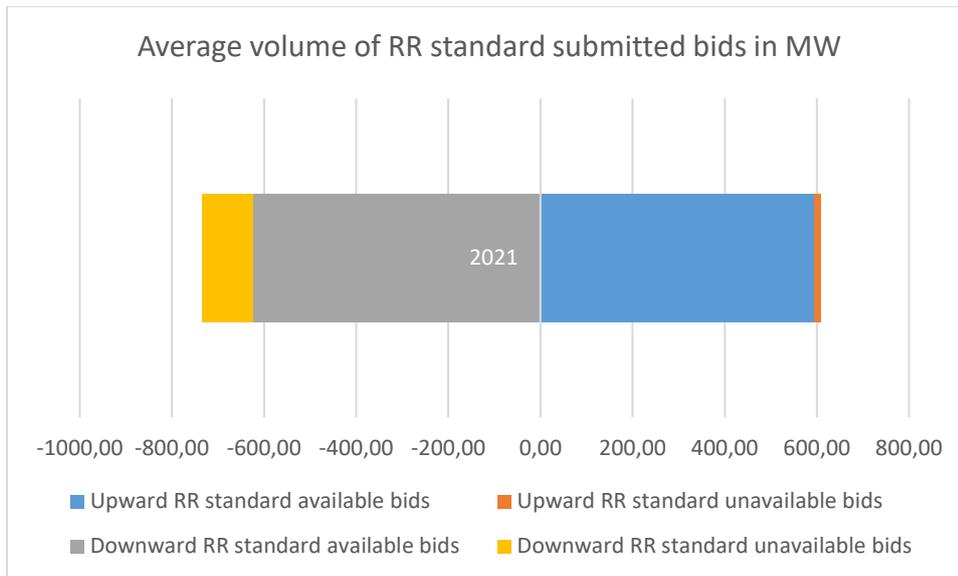
Figure 6 : Average volume of submitted bids in MW for 2020 and 2021



Implicit and explicit bids can be submitted as early as D-1 and updated every hour of the day until one hour before real time. The total volume includes normal, complementary and emergency bids. These bids can be activated for different reasons: balancing, congestion management, margins or ancillary services reconstitution.

In 2020 and 2021, there were on average 22 GW of upward submitted bids and 17.5 GW of downward submitted bids per ISP.

Figure 7 : Average volume of RR standard submitted bids in MW



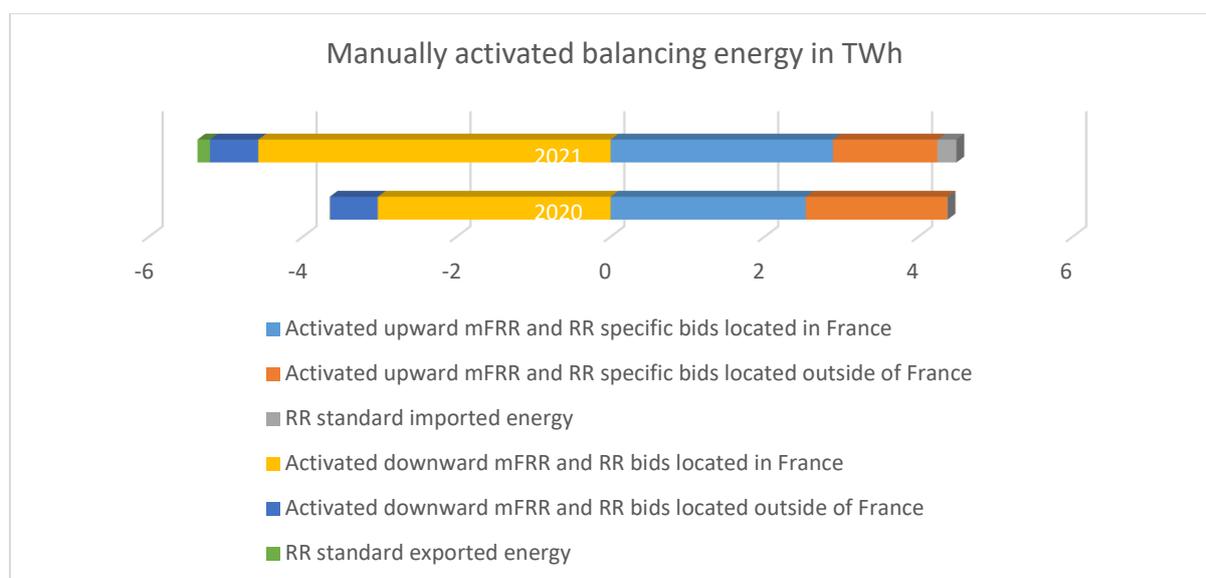
RR standard bids can be submitted up to fifty five minutes before real time and are currently activated for balancing purpose only. The average volume is calculated per time step where RTE has connected to TERRE, which represents 37% of the time over the year 2021. There were on average 594 MW of upward available bids and 625 MW of downward available bids per balancing time unit.

The unavailable bids represent 2.5% of upward submitted bids and 15% of downward submitted bids. These bids are not shared to the RR platform for different reasons: for margin management, for congestion management or because a specific bid submitted for the same unit is being activated for security reasons.

7.1.3. Volumes of activated bids

The balancing market for manually activated bids (mFRR and RR) has been open to contributions from balancing resources located abroad since it was created. Those balancing capacities amount for a third of manually activated balancing volumes. In addition to using the French balancing mechanism to activate energy located abroad, RTE has been exchanging standard RR products via the TERRE platform since December 2020.

Figure 8 : Volume of activated balancing energy in TWh



In 2020, the volume of activated balancing energy from mFRR and RR delivered by a facility outside of France represents 42% of the total upward volume activated and 17% of the total downward volume activated.

In 2021, the volume of activated balancing energy from mFRR and RR delivered by a facility outside of France represents 30% (1 357 GWh) of the total upward volume activated and 12% (629 GWh) of the total downward volume activated. These volumes are gradually decreasing being replaced by the use of standard products: 224 GWh of upward needs and 200 GWh of downward needs were satisfied by TERRE in 2021.

7.2. Justification for using specific mFRR and RR energy products

First, these specific products activated locally will remain necessary to balance the system as the standard products does not allow for all imbalance to be reabsorbed. RTE could activate specific products to balance the system in power, not only in energy within an imbalance settlement period. Indeed, RTE does not want to use only automatically activated standard balancing energy products to balance in real time the system as they don't allow the same level of flexibility as specific products. For instance, French consumption can vary with a gradient of 11 000 MW per hour, almost 3 000 MW per quarter hour. Assuming that consumption varies linearly during a 30-min period and production follows a staircase profile over a 30-min period, RTE should absorb an instant imbalance up to 3 000 MW at the beginning and at the end of the imbalance settlement period. Those imbalances, if not reabsorbed, lead to frequency deviations. RTE believes that solving those imbalances while not exhausting the frequency containment reserve can be performed through finely tuned locally activated specific products of mFRR and RR, with a granularity of 5 min.

Besides, as presented in the previous section, the **liquidity on TERRE is gradually increasing but is not yet sufficient.** Therefore, as RTE cannot request more than what is submitted by French BSPs on the platform, the use of specific products to balance the system in energy is still required.

Then, **these specific products are necessary for coordinated management of supply-demand balance and network constraints** by using the largest possible set of reserve providing units helps ensure the

French model's good economic performance. On the one hand, specific products will allow before the balancing energy gate closure time to take proactive actions to solve congestion issues identified ex-ante or to avoid entering into unacceptable situation in terms of system operations. On the other hand, these products will ensure that RTE have finely located balancing energy bids to manage flow on the grid.

Moreover, **activating only standard balancing energy bids from mFRR and RR could have foreclosure effects on certain capacities** actually participating to these markets. RTE would like to assess first, in coordination with market participants, their ability to propose such standard products not to annihilate all the efforts done to open the French balancing market to the largest possible number of stakeholders and technologies.

Finally, **specific products remain necessary to continuously monitor available margins and risks at various relevant times, and where necessary restore the required level of margins** by activating means with a longer activation time. Standard products, available close to real time, by definition shared and that could be activated to satisfy another TSO need, cannot meet this purpose.