ANCILLARY
SERVICES

PRELIMINARY REPORT 2017

RED
ELÉCTRICA
DE ESPAÑA

COMPONENTS OF THE AVERAGE FINAL PRICE OF ENERGY IN THE PENINSULAR SYSTEM

€/MWh

Reference supply and free contracting

Price (€/MWh) (1)	J	F	M	A	M	J	J
Day-ahead market	**73.56**	**53.04**	**43.93**	**44.20**	**47.60**	**50.77**	**49.14**
Intraday market	**0.03**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**-0.01**
Ancillary Services	**2.89**	**2.84**	**3.13**	**3.27**	**2.13**	**1.24**	**1.65**
Technical constraints PDBF (2)	1.48	1.82	2.22	2.40	1.45	0.69	1.14
Additional upward power reserve	0.27	0.02	0.07	0.01	0.00	0.01	0.00
Secondary control band	0.87	0.65	0.52	0.69	0.65	0.50	0.43
Real-time technical constraints	0.17	0.24	0.14	0.09	0.03	0.02	0.05
Non-fulfilment of balancing energy	-0.05	-0.04	-0.03	-0.02	-0.02	-0.03	-0.03
Deviation cost	0.30	0.37	0.34	0.25	0.14	0.17	0.17
Deviation balance	-0.11	-0.15	-0.07	-0.11	-0.08	-0.08	-0.06
Power factor control	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.05
Deviation balance between systems	0.03	0.00	0.00	0.02	0.01	0.01	0.00
Generic Units Nomination failure (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capacity payments	**3.26**	**3.17**	**2.52**	**2.38**	**2.37**	**2.90**	**3.22**
Interruptibility service	**1.88**	**2.17**	**2.06**	**2.28**	**2.15**	**2.00**	**1.93**
Average final price 2017	**81.62**	**61.23**	**51.65**	**52.13**	**54.25**	**56.91**	**55.93**
Average final price 2016	**47.42**	**38.12**	**37.69**	**33.42**	**35.56**	**46.70**	**48.18**
Final energy (GWh) (4)	**23,054**	**19,942**	**21,063**	**18,914**	**20,168**	**21,659**	**22,393**

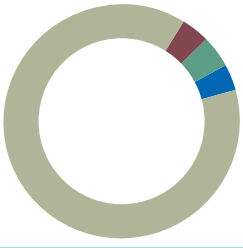
	A	S	O	N	D	Total	% 17/16
Day-ahead market	**48.04**	**49.55**	**57.63**	**60.52**	**60.16**	**53.41**	**31.5**
Intraday market	**-0.01**	**-0.03**	**-0.03**	**0.02**	**0.00**	**0.00**	**0.0**
Ancillary Services	**2.49**	**2.20**	**2.79**	**1.66**	**2.24**	**2.36**	**-23.9**
Technical constraints PDBF (2)	1.86	1.55	1.14	0.76	1.06	1.45	-30.0
Additional upward power reserve	0.02	0.03	0.66	0.17	0.03	0.11	-26.7
Secondary control band	0.46	0.47	0.82	0.61	0.95	0.63	-11.3
Real-time technical constraints	0.05	0.05	0.12	0.08	0.05	0.09	-25.0
Non-fulfilment of balancing energy	-0.02	-0.02	-0.04	-0.05	-0.05	-0.03	50.0
Deviation cost	0.23	0.23	0.25	0.13	0.30	0.24	26.3
Deviation balance	-0.07	-0.07	-0.11	-0.01	-0.02	-0.08	14.3
Power factor control	-0.05	-0.05	-0.06	-0.06	-0.08	-0.06	0.0
Deviation balance between systems	0.01	0.01	0.01	0.03	0.00	0.01	0.0
Generic Units Nomination failure (3)	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Capacity payments	**2.16**	**2.41**	**2.41**	**2.58**	**3.15**	**2.72**	**-1.4**
Interruptibility service	**1.99**	**2.14**	**2.16**	**2.08**	**1.96**	**2.06**	**6.7**
Average final price 2017	**54.67**	**56.27**	**64.96**	**66.86**	**67.51**	**60.55**	**25.1**
Average final price 2016	**48.11**	**51.11**	**61.21**	**63.87**	**68.96**	**48.42**	
Final energy (GWh) (4)	**21,750**	**20,122**	**20,039**	**20,811**	**22,106**	**252,022**	**1.1**

(1) The prices are calculated using the latest settlements available from the System Operator. (2) PDBF: Daily Base Operating Schedule. (3) Generic Programming Units. (4) Includes closing of the energy market and own consumption of power generation ancillary services.

COMPONENTS OF THE AVERAGE FINAL PRICE 2017

%

Day-ahead and intraday markets	88.2
Ancillary Services	3.9
Capacity payments	4.5
Interruptibility service	3.4



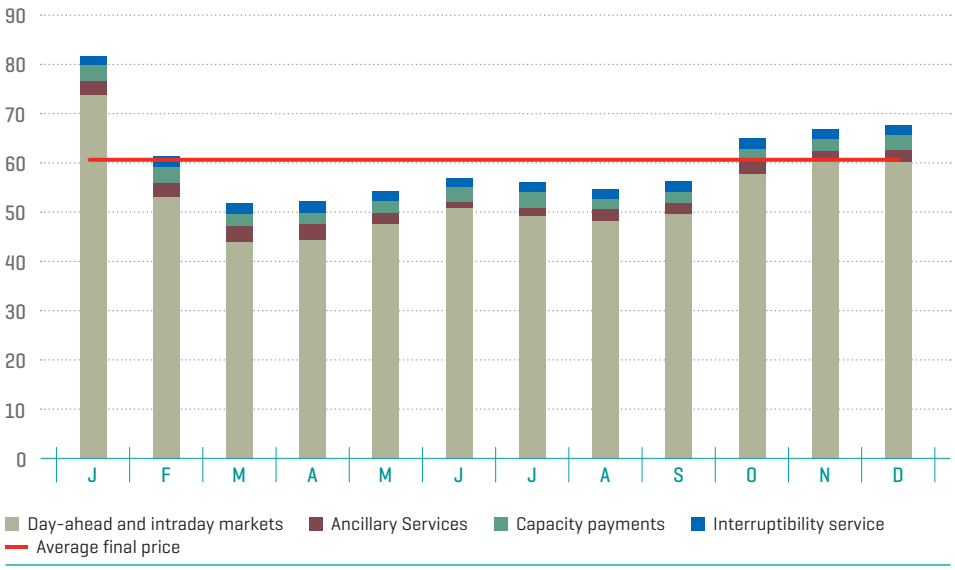
AVERAGE FINAL PRICE

60.55 €/MWh

EVOLUTION OF THE COMPONENTS OF THE AVERAGE FINAL PRICE

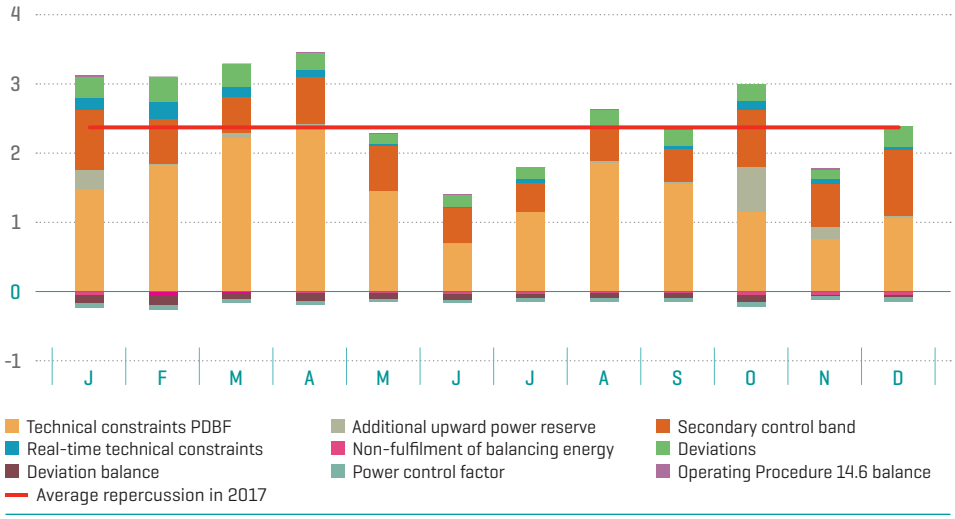
€/MWh

Reference supply and free contracting



REPERCUSSION OF ANCILLARY SERVICES IN THE AVERAGE FINAL PRICE

€/MWh



ENERGY MANAGED VIA ANCILLARY SERVICES

GWh

	2016		2017		% 17/16	
	Upward	Downward	Upward	Downward	Upward	Downward
Technical constraints (PDBF) (1)	11,834	181	11,035	739	-6.8	308.7
Secondary control	1,530	1,012	1,203	1,212	-21.3	19.7
Tertiary control	2,557	1,553	2,348	1,806	-8.2	16.3
Deviation management	1,183	465	1,006	760	-15.0	63.3
Real-time technical constraints (2)	390	645	207	434	-46.9	-32.7
Total energy managed		**21,351**		**20,751**		**-2.8**

Does not include energy associated to cross-border balancing services. // (1) Upward or Downward Energy in phase 1 of the resolution of technical constraints PDBF (O.P. 3.2). (2) Includes energy redispatches of the interconnection between the Spanish Peninslar Electricity System and the Balearic Islands' Electricity System.

AVERAGE WEIGHTED ENERGY PRICES IN THE PENINSULAR SYSTEM'S ANCILLARY SERVICES

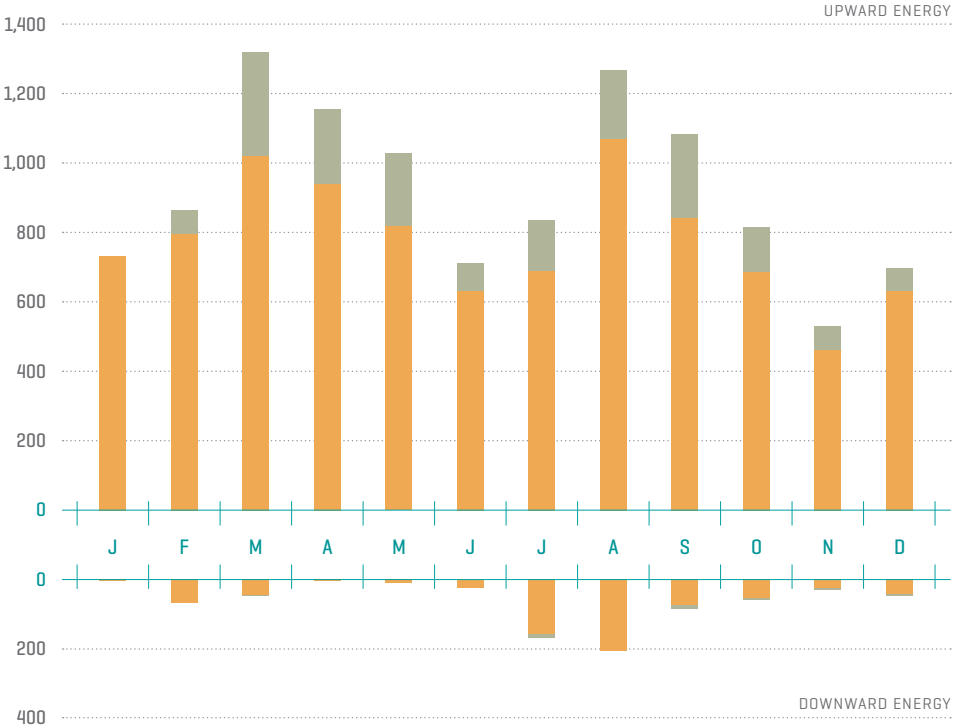
€/MWh

	2016		2017		% 17/16	
	Upward	Downward	Upward	Downward	Upward	Downward
Technical constraints (PDBF)	78.9	35.2	81.5	48.2	3.3	37.0
Secondary control	43.0	32.4	54.8	45.0	27.3	38.9
Tertiary control	50.2	19.4	64.3	32.8	28.1	69.5
Deviation management	47.8	26.3	66.5	38.2	39.3	45.2
Real-time technical constraints (1)	101.3	22.0	19.1	27.9	17.6	26.7

(1) Includes the interconnection between the Spanish Peninsular Electricity System and the Balearic Islands' Electricity System. Takes into account only redispatched energy.

RESOLUTION OF TECHNICAL CONSTRAINTS (PDBF) BROKEN DOWN BY TYPE OF CONSTRAINT

GWh

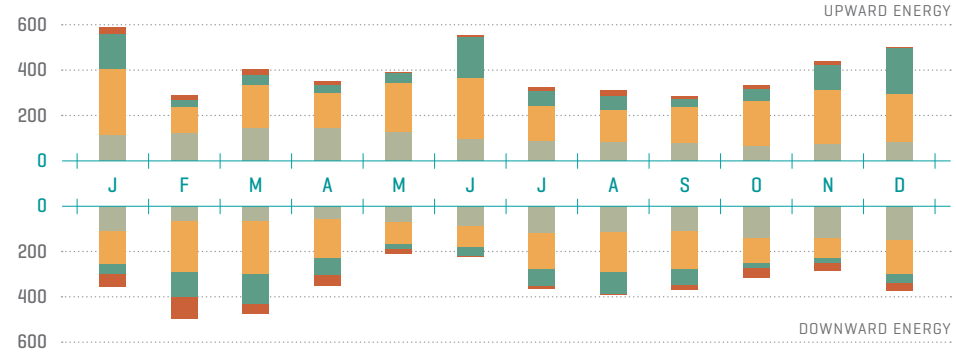


Power transmission grid Electricity distribution network

PDBF: Daily Base Operating Schedule.

ANCILLARY SERVICES MARKET ENERGY MANAGED

GWh

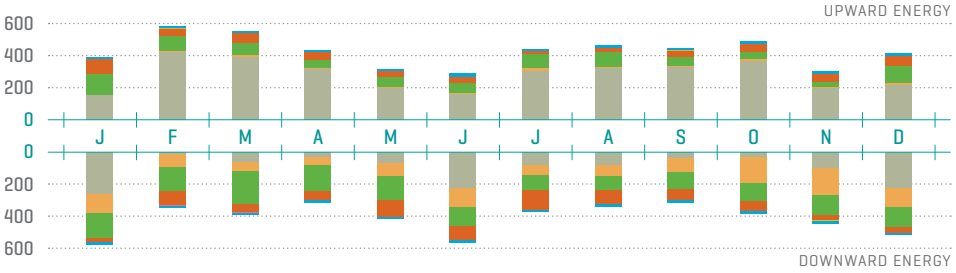


Secondary control Tertiary control Deviation management Real-time technical constraints

Does not include technical constraints (PDBF).

MEASURED NET DEVIATIONS

GWh

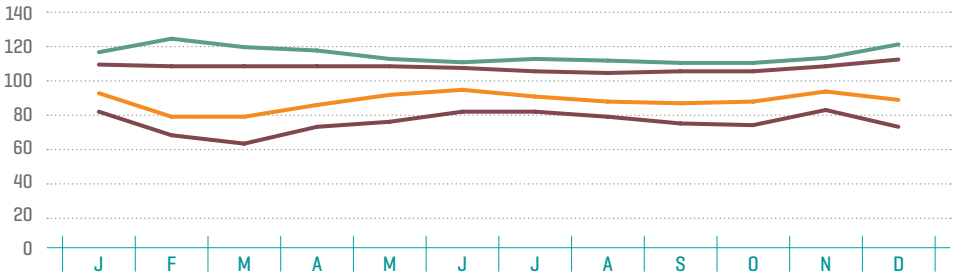


Traders/Retailers
Conventional generation
Wind power
Other renewable, cogeneration and waste (1)
Imports
Exports
Deviations between systems

(1) Except facilities within scope of regulation that are included in conventional generation.

DEVIATION PRICE IN RELATION TO THE DAY-AHEAD MARKET PRICE

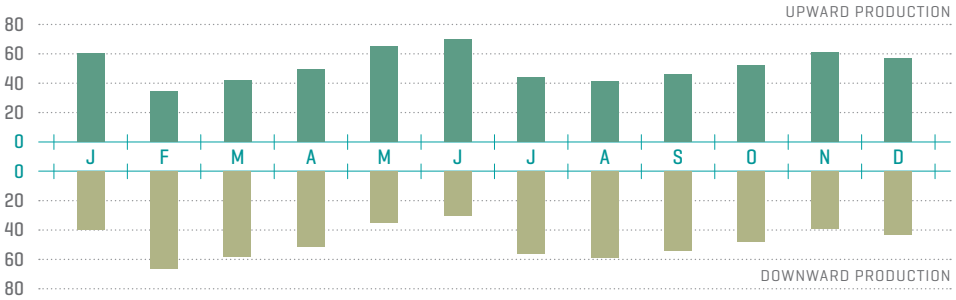
%



Downward deviation
Downward deviation against the system
Upward deviation
Upward deviation against the system

DEVIATION HOURS AGAINST THE SYSTEM

%

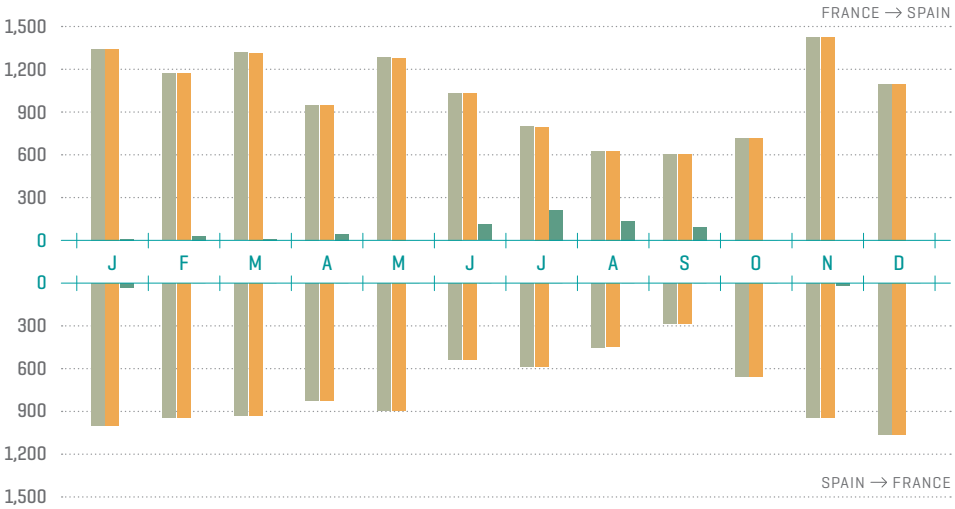


Hours of **downward** deviation when the system requires **upward** production
Hours of **upward** deviation when the system requires **downward** production

CAPACITY NEGOTIATED IN THE EXPLICIT LONG-TERM AUCTIONS

GW

In the interconnection with France (IFE)



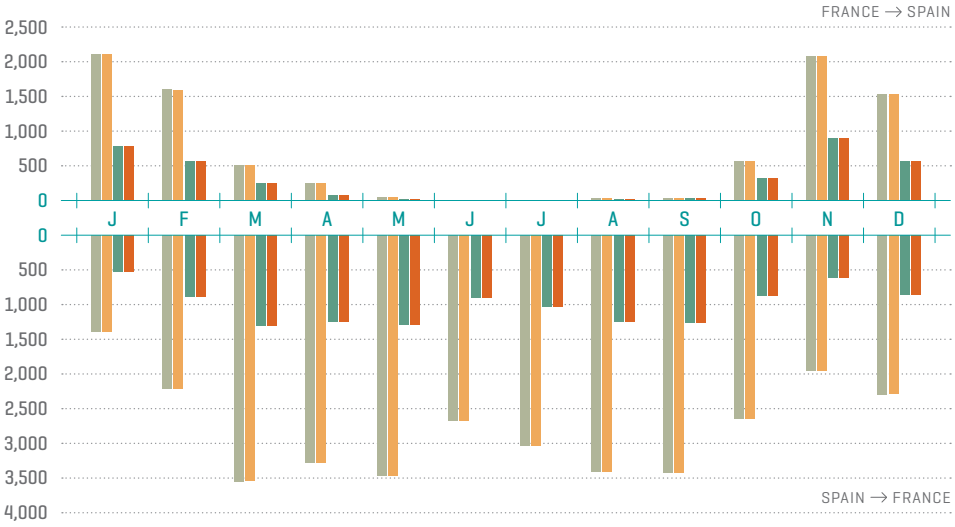
Capacity offered Capacity acquired Nominated capacity

Annual and monthly capacities.

CAPACITY NEGOTIATED IN THE EXPLICIT INTRADAY AUCTIONS

GW

In the interconnection with France (IFE)

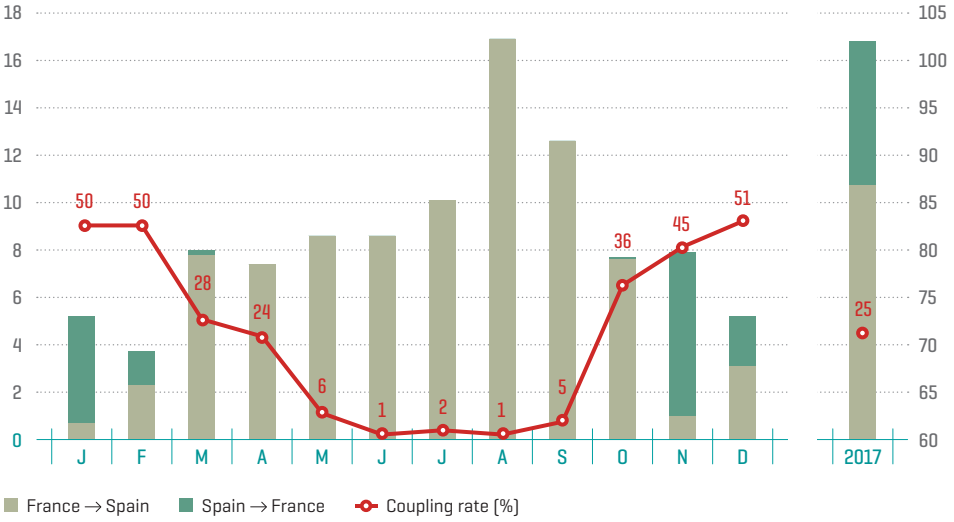


Capacity offered 1st intraday Capacity acquired 1st intraday Capacity offered 2nd intraday Capacity acquired 2nd intraday

CONGESTION RENTS AND COUPLING RATES IN THE INTERCONNECTION WITH FRANCE

€ Million

Derived from day-ahead market coupling (Multi-Regional Coupling)



Does not include counter-trading costs nor other costs.
Coupling Rate: percentage of hours without congestion in the day-ahead horizon.

CONGESTION RENTS IN THE INTERCONNECTION WITH FRANCE

Derived from capacity auctions and day-ahead market coupling (Multi-Regional Coupling)

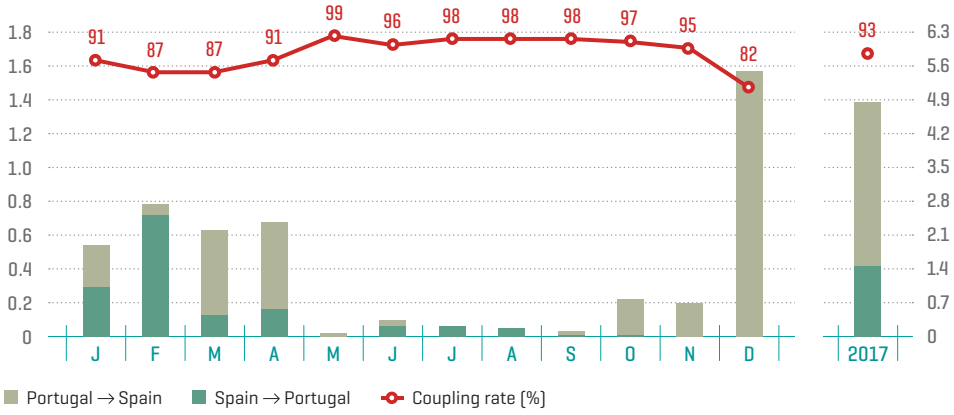
	France → Spain		Spain → France		Total	
	Thousands of €	%	Thousands of €	%	Thousands of €	%
S. annual	45,929.3	20.9	11,404.8	5.2	57,334.1	26.0
S. monthly	48,605.9	22.1	10,526.3	4.8	59,132.2	26.9
S. intraday	970.5	0,4	673.7	0.3	1,644.2	0.7
Market coupling	86,841.5	39.5	15,158.6	6.9	102,000.0	46.3
Total	**182,347,2**	**82.8**	**37,763.4**	**17.2**	**220,110.5**	**100.0**

Does not include counter-trading costs nor other costs.

CONGESTION RENTS AND COUPLING RATES IN THE INTERCONNECTION WITH PORTUGAL

Derived from day-ahead market coupling

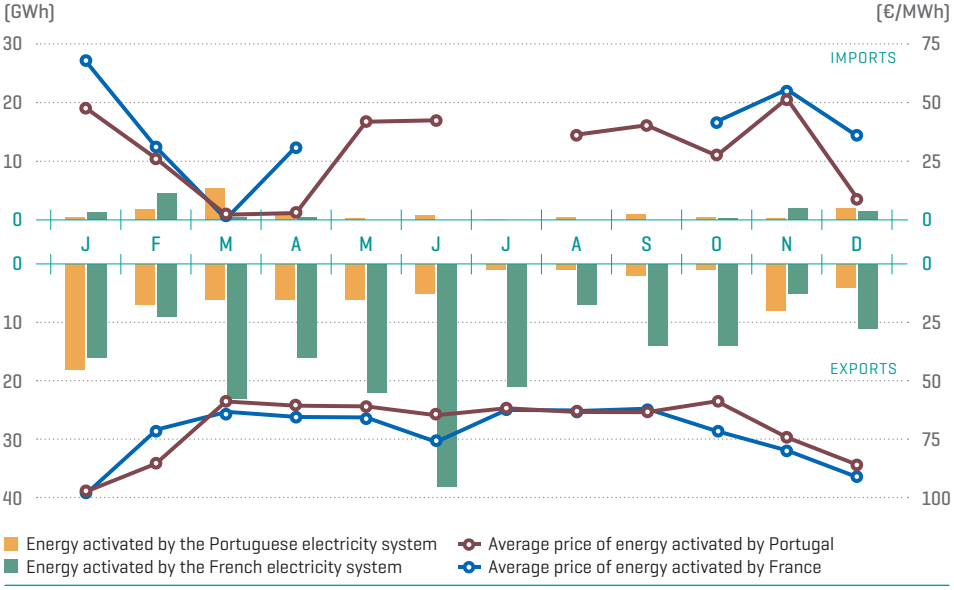
€ Million



Does not include counter-trading costs nor other costs.
Coupling Rate: % hours without congestion in the intraday horizon.

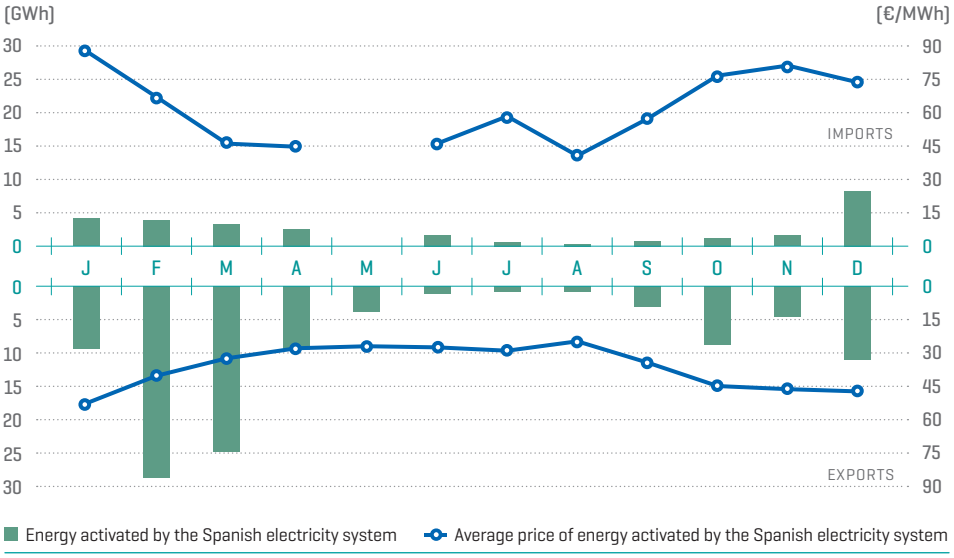
ENERGY AND AVERAGE PRICES OF CROSS-BORDER BALANCING SERVICES

Activated by external electricity systems



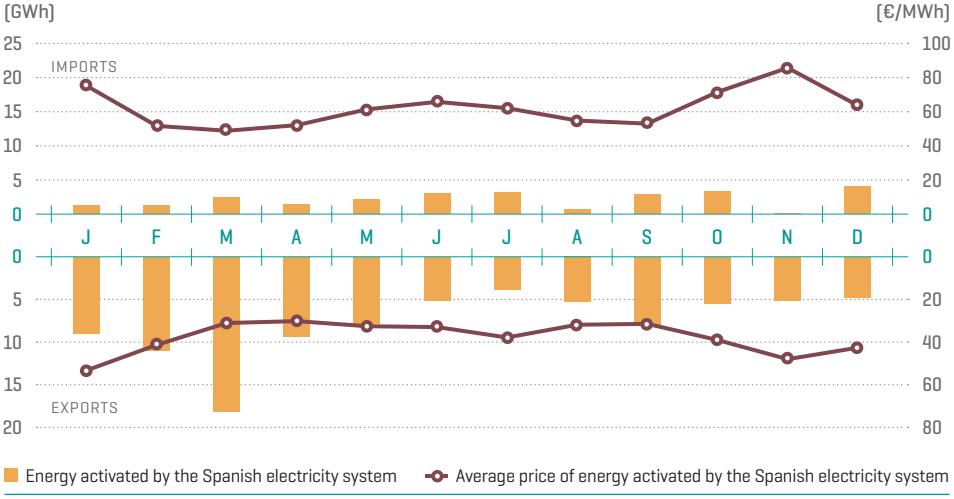
ENERGY AND AVERAGE PRICES
OF CROSS-BORDER BALANCING SERVICES

Activated by the Spanish electricity system through the interconnection with France



ENERGY AND AVERAGE PRICES
OF CROSS-BORDER BALANCING SERVICES

Activated by the Spanish electricity system through the interconnection with Portugal



GLOSSARY OF TERMS

ADDITIONAL UPWARD RESERVE POWER

Is the upward power reserve value that may be required with respect to that available in the Provisional Daily Viable Schedule (PDVP) in order to guarantee the security of the electricity system on the Spanish peninsula. The contracting and management of the additional upward power reserve is performed by the system operator, if and when the system conditions require it, through a specific market mechanism.

CAPACITY AUCTION

Process used to allocate interconnection capacity with France based on market mechanisms, through explicit auctions on different time horizons.

CAPACITY PAYMENT

Regulated payment to finance the medium and long-term power capacity service, offered by the generation facilities to the electricity system.

CONGESTION RENTS

Revenues derived from the management of the interconnection capacity between electricity systems.

COUNTER-TRADING

Schedule for exchanging energy between two electricity systems. It is established in real time and is carried out in a coordinated way between both system operators.

This is super-imposed on the pre-existing final exchange schedules, whilst maintaining these, in order to solve a congestion situation identified in real time in the interconnection.

CROSS BORDER BALANCING SERVICES

Hourly scheduled energy balancing between two interconnected electricity systems through the coordinated action of the operators of the electricity systems, using vacant exchange capacity after the intraday market.

DAILY BASE OPERATING SCHEDULE (PDBF)

Is the daily energy schedule, broken-down in scheduled periods for the different energy generation selling and purchasing agents/units within the Spanish peninsular electricity system. This schedule is established by the System Operator based on the schedule resulting from matching the day-ahead market and the data regarding the execution of bilateral contracts with physical dispatch of energy.

DEMAND IN REFERENCE SUPPLY MARKET

Electricity demand of the consumers on the Spanish peninsula (measured at power station busbars after subtracting standard losses) who contract energy from a last resort trader/reseller.

DEVIATION BALANCE

Difference between the amount of the settlements of the deviations and the energy used to maintain the generation-demand balance.

DEVIATION MANAGEMENT

The mechanism of deviation management is anoptional service managed and remunerated by market mechanisms. The objective is to resolve the deviations between generation and demand superior to 300 MWh which could appear in the period between the end of one intraday market and the beginning of the next intraday market horizon.

DISTRIBUTION NETWORK TECHNICAL CONSTRAINTS

Are those technical constraints, corresponding to requests sent by the distribution network managers to the System

Operator, to guarantee the security of the distribution network under its management.

INTERRUPTIBILITY

This is a demand-side management tool used to provide rapid and efficient response to the needs of the electricity system according to technical criteria (system security) and economic (least cost for the system), that consists on the reduction of the demanded active power in response to an order issued by Red Eléctrica as System Operator. According to the regulation on the competitive allocation mechanism for the demand-side interruptibility service (Order IET/2013/2013 and subsequent amendments) the interruptible resource is allocated through an auction procedure; it is the System Operator who is responsible for organizing and managing said auction system.

MARKET COUPLING

Mechanism for managing the exchange capacity which allows the prices and net positions of the coupled day-ahead markets to be obtained simultaneously and allowing the resulting energy flows to be determined implicitly while respecting the available exchange capacity.

MEASURED DEVIATIONS

Difference between the energy measured at the power station busbars and the energy scheduled in the market.

MEASURED DOWNWARD DEVIATIONS

Measured downward deviations are those which result when the production measured at the power station busbars is less than that scheduled in the market, or when the consumption measured at the busbars is higher than that scheduled in the market. Therefore, the system must manage that difference by increasing production or reducing pumped storage consumption through the ancillary services market in real time.

MEASURED UPWARD DEVIATIONS

Measured upward deviations are those which result when the production measured at the power station busbars is greater than that scheduled in the market, or when the consumption measured at the busbars

is lower than that scheduled in the market: Therefore, the system must manage that difference by reducing production or increasing pumped storage consumption through the ancillary services market in real time.

NATIONAL DEMAND IN THE FREE MARKET

Electricity demand of the consumers on the Spanish peninsula (measured at power station busbars) who directly contract energy from a trader or in the market.

NON-COMPLIANCE OF BALANCING ENERGY

Non-compliance of net requested deviation management and tertiary energy.

POWER FACTOR CONTROL

Article 7, paragraph e), of Royal Decree 413/ 2014, of June 6, by which the electricity production activity from renewable energy sources, cogeneration and waste is regulated, establishes measures to control the power factor applicable for facilities within the scope of this Royal Decree.

RESOLUTION OF REAL-TIME TECHNICAL CONSTRAINTS

The process carried out by the System Operator consisting of the resolution of the technical constraints identified during real-time operation of the system by means of the limitation, or if deemed necessary, the modification of the schedules of the Programming Units.

REFERENCE SUPPLY

Electricity supply scheme established for low-voltage consumers connected to the system, and whose contracted power is not higher than 10 kW.

SECONDARY CONTROL BAND AND SECONDARY CONTROL

Secondary control is an optional ancillary service with the objective of maintaining the generation-demand balance, correcting deviations with respect to the anticipated power exchange schedules, and frequency deviations. Its temporary action horizon ranges from 20 seconds to 15 minutes. This service is remunerated by means of market mechanisms via two concepts: availability (control band) and usage (energy).

SYSTEM ANCILLARY / BALANCING SERVICES

Services managed by the System Operator that are required to ensure the electricity supply under the necessary conditions of quality, reliability and security. The ancillary services (also known as balancing services) can be of an obligatory or can be of an obligatory or optional character. Solving of constraints due to guarantee of supply, solving technical constraints of the system, ancillary services (additional upward power reserve, primary control, secondary control, tertiary control and voltage control of the transmission grid) and deviation management are all considered ancillary services.

TECHNICAL CONSTRAINTS PDBF SOLUTION

A mechanism managed by the System Operator for the resolution of the technical constraints identified in the Daily Base Operating Schedule by means of the limitation, or if deemed necessary, the modification of the schedules of the Programming Units and the subsequent process of re-balancing generation-demand.

TERTIARY CONTROL

An optional ancillary service that, if subscribed to, is accompanied by the obligation to bid (for active units) and is managed and compensated by market mechanisms. Its objective is to resolve the deviations between generation and consumption and the restitution of the secondary control reserve used. This is done by means of the adaptation of the operating schedules of the programming units corresponding to generation stations and pumped storage consumption facilities. The tertiary reserve is defined as the maximum variation of power generation that a generation unit can carry out within a maximum of 15 minutes, and which can be maintained for at least 2 hours.

TRANSMISSION GRID TECHNICAL CONSTRAINTS

Are those technical constraints identified within the global system (generation-transmission grid), that require a modification to the schedules in order to comply with the operation and security criteria for operating the system.

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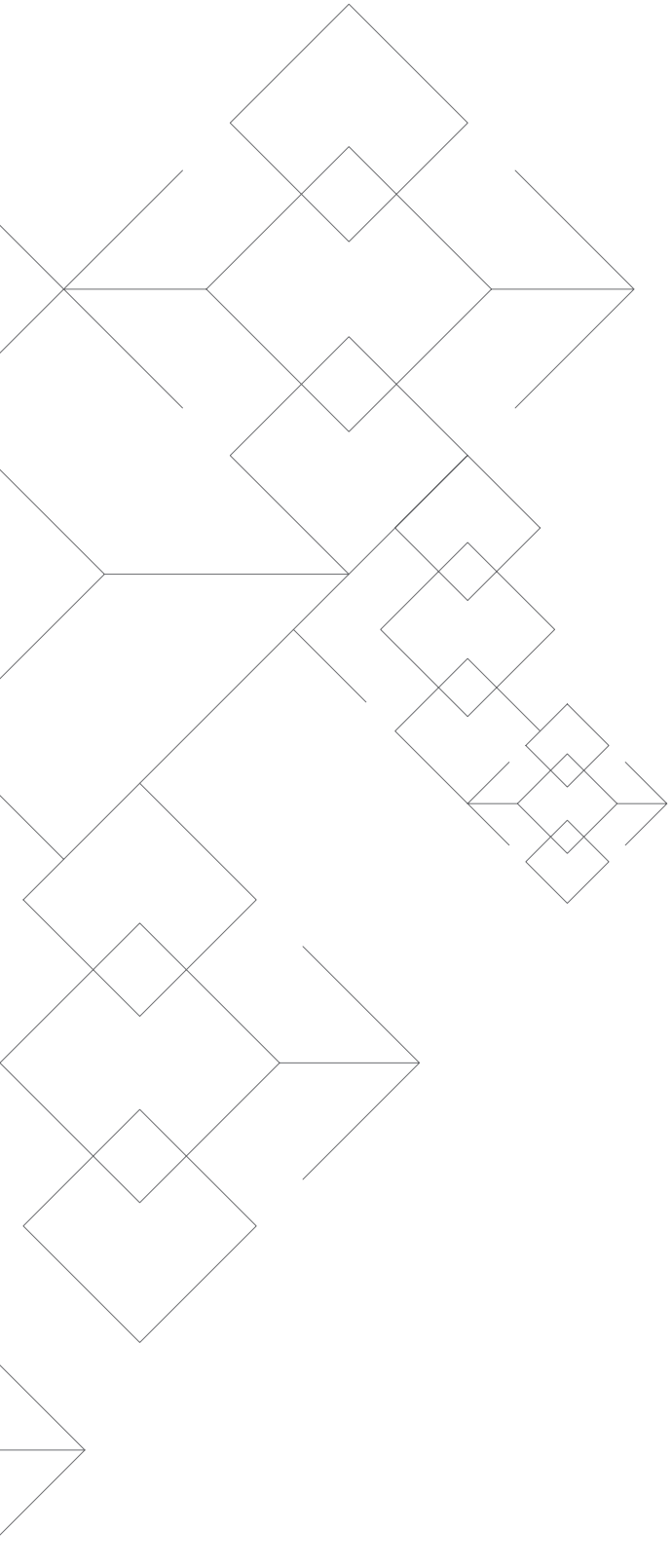

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