

**ANCILLARY SERVICES**  
**AND INTERNATIONAL EXCHANGES**  
**PRELIMINARY REPORT**

*Committed to intelligent energy*

2  
0  
1  
9



**Components of the average final price of energy in the peninsular system (€/MWh)**

| <b>Price (€/MWh)<sup>[1]</sup></b>        | <b>Jan</b>    | <b>Feb</b>    | <b>Mar</b>    | <b>Apr</b>    | <b>May</b>    | <b>Jun</b>    | <b>Jul</b>    |
|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>Day-ahead market</b>                   | <b>62.98</b>  | <b>54.93</b>  | <b>49.35</b>  | <b>50.94</b>  | <b>48.93</b>  | <b>47.40</b>  | <b>51.96</b>  |
| <b>Intraday market</b>                    | <b>-0.03</b>  | <b>-0.03</b>  | <b>-0.02</b>  | <b>-0.05</b>  | <b>-0.01</b>  | <b>-0.01</b>  | <b>0.00</b>   |
| <b>Ancillary Services</b>                 | <b>1.15</b>   | <b>1.14</b>   | <b>1.73</b>   | <b>2.56</b>   | <b>1.80</b>   | <b>1.31</b>   | <b>0.81</b>   |
| Technical constraints PDBF <sup>[2]</sup> | 0.63          | 0.71          | 1.05          | 1.64          | 1.21          | 1.01          | 0.51          |
| Additional upward power reserve           | 0.12          | 0.06          | 0.14          | 0.27          | 0.06          | 0.00          | 0.01          |
| Secondary control band                    | 0.35          | 0.37          | 0.41          | 0.51          | 0.39          | 0.25          | 0.23          |
| Real-time technical constraints           | 0.03          | 0.01          | 0.06          | 0.08          | 0.03          | 0.01          | 0.02          |
| Unfulfillment of balancing energy         | -0.02         | -0.02         | -0.02         | -0.03         | -0.02         | -0.02         | -0.02         |
| Deviation cost                            | 0.16          | 0.16          | 0.18          | 0.24          | 0.24          | 0.13          | 0.17          |
| Deviation balance                         | -0.06         | -0.08         | -0.08         | -0.09         | -0.06         | -0.03         | -0.06         |
| Control of the power capacity factor      | -0.07         | -0.06         | -0.06         | -0.06         | -0.06         | -0.06         | -0.05         |
| Operating Procedure 14.6 balance          | 0.01          | -0.01         | 0.05          | 0.00          | 0.02          | 0.02          | 0.00          |
| <b>Capacity payments</b>                  | <b>3.16</b>   | <b>3.08</b>   | <b>2.38</b>   | <b>2.41</b>   | <b>2.30</b>   | <b>2.70</b>   | <b>3.25</b>   |
| <b>Interruptibility service</b>           | <b>0.71</b>   | <b>0.75</b>   | <b>0.72</b>   | <b>0.77</b>   | <b>0.75</b>   | <b>0.75</b>   | <b>0.69</b>   |
| <b>Average final price 2019</b>           | <b>67.97</b>  | <b>59.87</b>  | <b>54.16</b>  | <b>56.63</b>  | <b>53.78</b>  | <b>52.15</b>  | <b>56.71</b>  |
| <b>Average final price 2018</b>           | <b>58.28</b>  | <b>61.94</b>  | <b>49.88</b>  | <b>51.27</b>  | <b>62.09</b>  | <b>64.85</b>  | <b>68.44</b>  |
| <b>Final energy<sup>[3]</sup> (GWh)</b>   | <b>23,271</b> | <b>20,115</b> | <b>20,689</b> | <b>19,483</b> | <b>19,874</b> | <b>19,953</b> | <b>22,659</b> |

| <b>Price (€/MWh)<sup>[1]</sup></b>        | <b>Aug</b>    | <b>Sep</b>    | <b>Oct</b>    | <b>Nov</b>    | <b>Dec</b>    | <b>Annual</b>  | <b>% 19/18</b> |
|---|---------------|---------------|---------------|---------------|---------------|----------------|----------------|
| <b>Day-ahead market</b>                   | <b>45.37</b>  | <b>42.59</b>  | <b>47.74</b>  | <b>43.59</b>  | <b>35.36</b>  | <b>48.59</b>   | <b>-16.4</b>   |
| <b>Intraday market</b>                    | <b>0.00</b>   | <b>-0.01</b>  | <b>-0.02</b>  | <b>-0.03</b>  | <b>-0.02</b>  | <b>-0.02</b>   | <b>0.0</b>     |
| <b>Ancillary Services</b>                 | <b>1.02</b>   | <b>1.08</b>   | <b>1.38</b>   | <b>1.51</b>   | <b>2.07</b>   | <b>1.46</b>    | <b>-37.9</b>   |
| Technical constraints PDBF <sup>[2]</sup> | 0.73          | 0.73          | 0.98          | 1.11          | 1.37          | 0.96           | -34.7          |
| Additional upward power reserve           | 0.00          | 0.00          | 0.03          | 0.00          | 0.00          | 0.06           | -73.9          |
| Secondary control band                    | 0.23          | 0.28          | 0.32          | 0.44          | 0.63          | 0.37           | -32.7          |
| Real-time technical constraints           | 0.01          | 0.05          | 0.07          | 0.05          | 0.09          | 0.04           | -42.9          |
| Unfulfillment of balancing energy         | -0.01         | -0.02         | -0.03         | -0.04         | -0.03         | -0.02          | -33.3          |
| Deviation cost                            | 0.17          | 0.17          | 0.13          | 0.08          | 0.16          | 0.17           | 6.3            |
| Deviation balance                         | -0.07         | -0.07         | -0.06         | -0.05         | -0.08         | -0.07          | 40.0           |
| Control of the power capacity factor      | -0.05         | -0.06         | -0.06         | -0.09         | -0.07         | -0.06          | 0.0            |
| Operating Procedure 14.6 balance          | 0.01          | 0.00          | 0.00          | 0.01          | 0.00          | 0.01           | 0.0            |
| <b>Capacity payments</b>                  | <b>2.07</b>   | <b>2.37</b>   | <b>2.33</b>   | <b>2.49</b>   | <b>3.11</b>   | <b>2.66</b>    | <b>-1.9</b>    |
| <b>Interruptibility service</b>           | <b>0.74</b>   | <b>0.79</b>   | <b>0.77</b>   | <b>0.76</b>   | <b>0.76</b>   | <b>0.75</b>    | <b>-39.0</b>   |
| <b>Average final price 2019</b>           | <b>49.20</b>  | <b>46.82</b>  | <b>52.20</b>  | <b>48.32</b>  | <b>41.28</b>  | <b>53.43</b>   | <b>-17.0</b>   |
| <b>Average final price 2018</b>           | <b>71.14</b>  | <b>77.57</b>  | <b>71.48</b>  | <b>67.66</b>  | <b>67.97</b>  | <b>64.37</b>   |                |
| <b>Final energy<sup>[3]</sup> (GWh)</b>   | <b>21,143</b> | <b>19,905</b> | <b>20,127</b> | <b>20,612</b> | <b>20,765</b> | <b>248,596</b> | <b>-1.9</b>    |

[1] Prices are calculated using the latest settlements available from the System Operator.

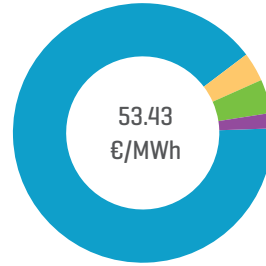
[2] PDBF: Daily base operating schedule.

[3] Includes closing of the energy market and own consumption of power generation ancillary services.

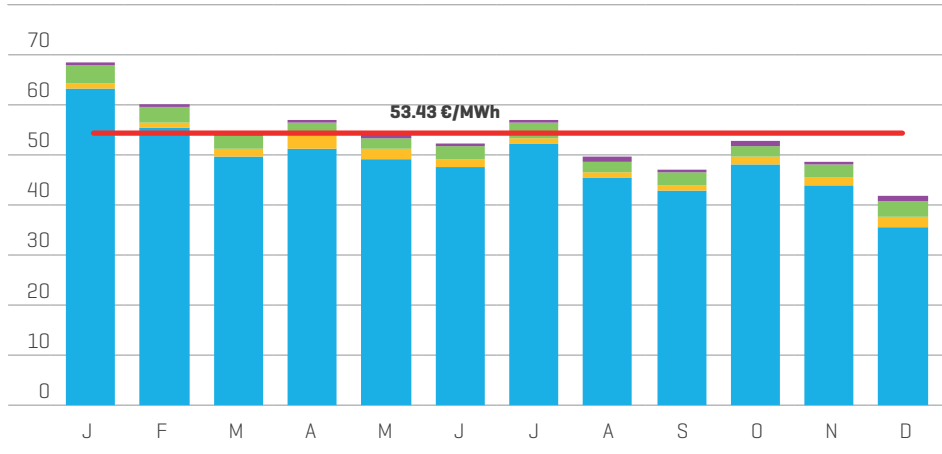
Components of the average final price. 2019

%

|                                |         |
|--------------------------------|---------|
| Day-ahead and intraday markets | 90.91 % |
| Ancillary Services             | 2.73 %  |
| Capacity payments              | 4.96 %  |
| Interruptibility service       | 1.40 %  |



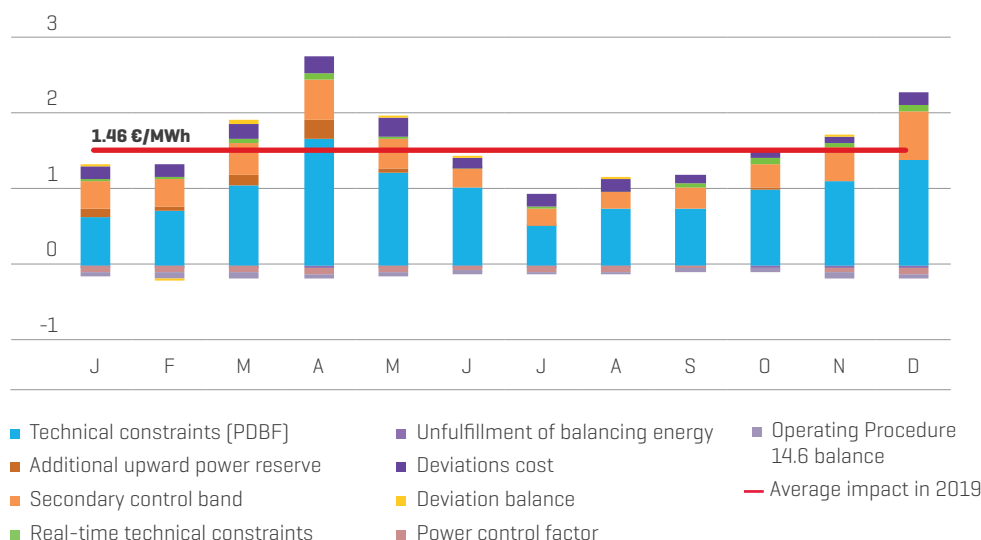
Evolution of the components of the average final price (Reference supply and free contracting) €/MWh



■ Day-ahead and intraday markets    
 ■ Ancillary Services    
 ■ Capacity payments  
■ Interruptibility service    
 — Average final price in 2019

## Impact of ancillary services on the average final price

€/MWh



## Energy managed via the peninsular system's ancillary services

GWh

|   | 2018          |          | 2019          |          | % 19/18      |          |
|---|---------------|----------|---------------|----------|--------------|----------|
|   | Upward        | Downward | Upward        | Downward | Upward       | Downward |
| Technical constraints (PDBF) <sup>(1)</sup> | 10,969        | 374      | 6,801         | 257      | -38.0        | -31.2    |
| Secondary control                           | 1,086         | 1,506    | 971           | 1,679    | -10.6        | 11.5     |
| Tertiary control                            | 1,913         | 1,118    | 1,351         | 681      | -29.4        | -39.1    |
| Deviation management                        | 1,883         | 475      | 2,225         | 866      | 18.1         | 82.5     |
| Real-time technical constraints             | 172           | 290      | 101           | 193      | -41.0        | -33.2    |
| <b>Total energy managed</b>                 | <b>19,785</b> |          | <b>15,126</b> |          | <b>-23.5</b> |          |

Does not include energy managed through cross-border balancing services, nor the application of the interruptibility service due to economic criteria

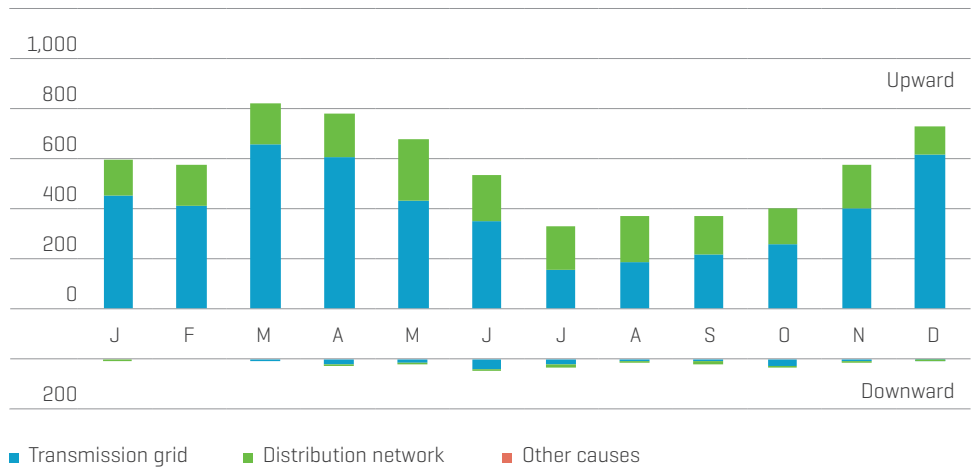
[1] Upward or Downward Energy in phase 1 of the resolution of technical constraints of the PDBF (Operating Procedure 3.2).

**Average weighted energy prices in the peninsular system's ancillary services**

€/MWh

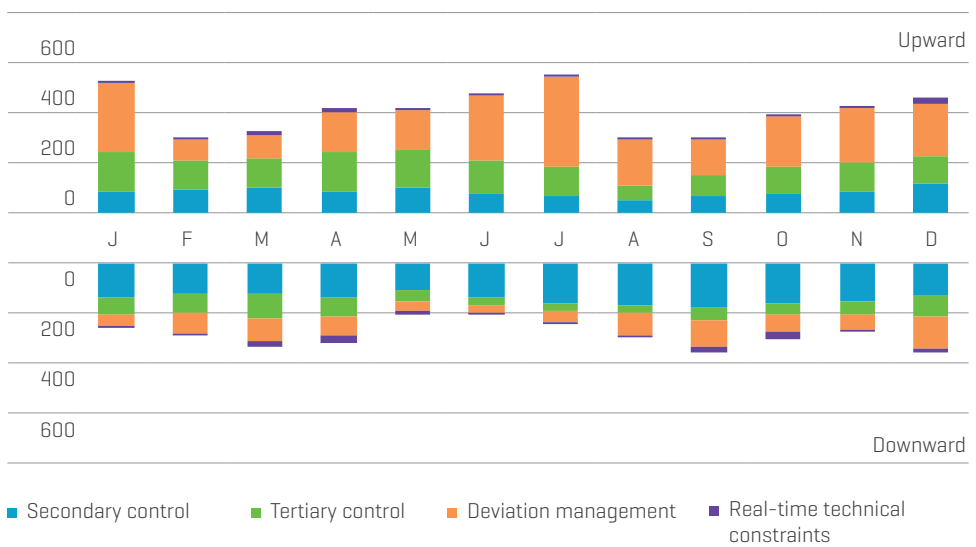
|                                 | 2018   |          | 2019   |          | % 19/18 |          |
|---------------------------------|--------|----------|--------|----------|---------|----------|
|                                 | Upward | Downward | Upward | Downward | Upward  | Downward |
| Technical constraints (PDBF)    | 88.5   | 54.3     | 81.4   | 46.1     | -8.0    | -15.1    |
| Secondary control               | 57.5   | 50.9     | 54.7   | 39.4     | -4.8    | -22.6    |
| Tertiary control                | 65.0   | 34.6     | 57.3   | 31.9     | -11.7   | -8.0     |
| Deviation management            | 67.7   | 44.6     | 56.2   | 32.6     | -16.9   | -27.1    |
| Real-time technical constraints | 113.9  | 21.9     | 105.8  | 16.1     | -7.1    | -26.4    |

**Resolution of technical constraints (PDBF). Scheduled energy broken down by type of constraint GWh**



Other ancillary services markets. Energy managed

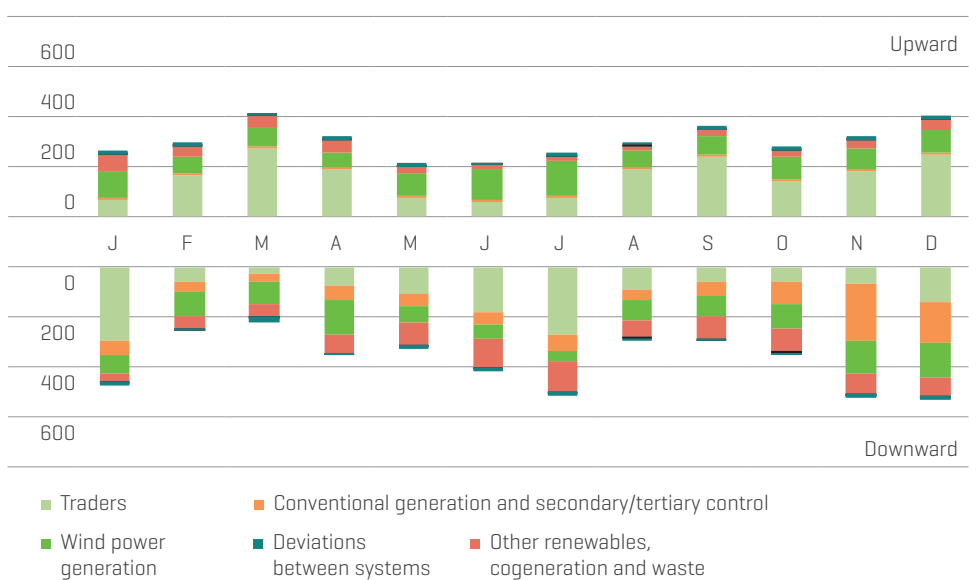
GWh



Does not include technical constraints of the PDBF

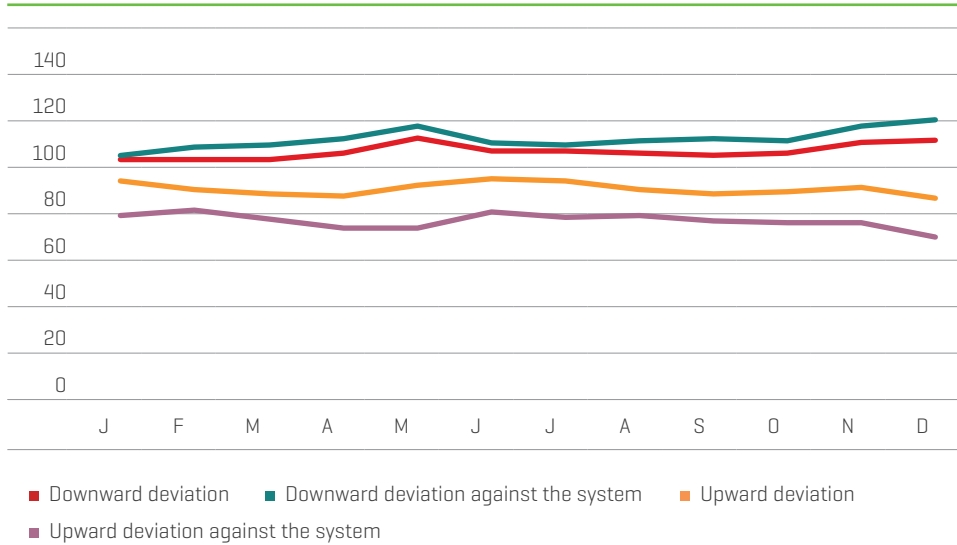
Measured net deviations

GWh



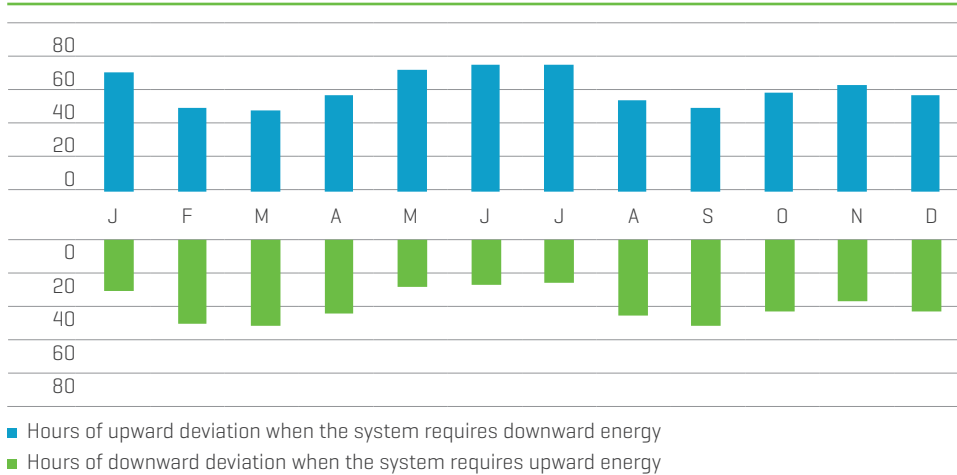
Price deviation in relation to the day-ahead market

%

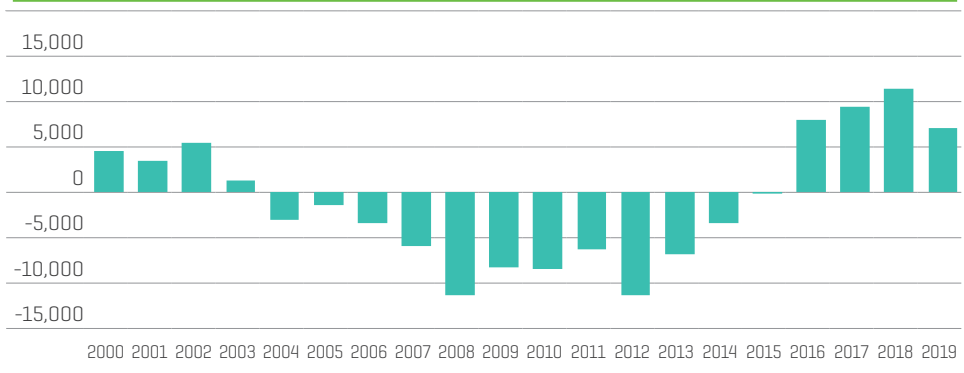


Hours with deviations contrary to system needs/requirements

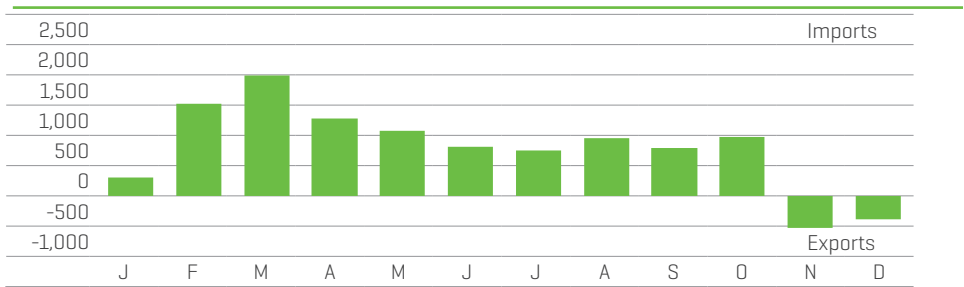
%



**Annual net balance of scheduled energy exchanges via Spain's interconnections** **GWh**



**Monthly net balance of scheduled energy exchanges in 2019 via the interconnection with France (IFE)**  
**GWh**



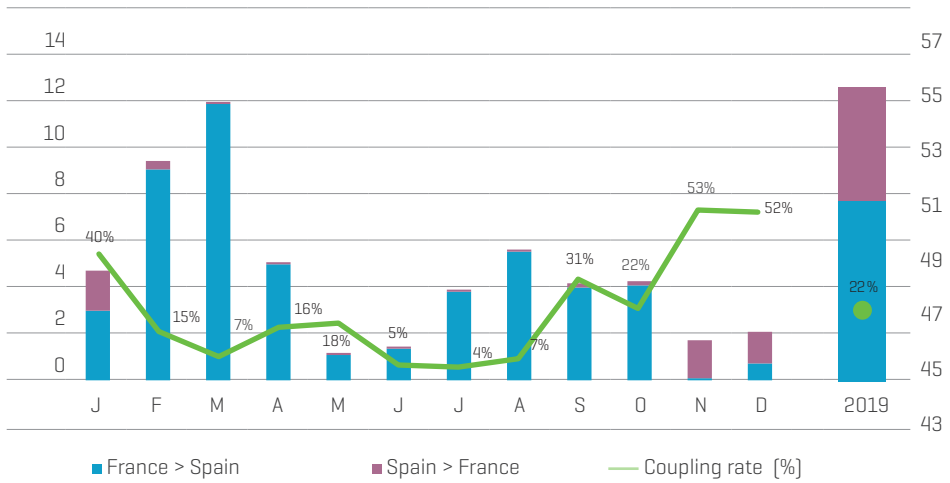
**Capacity acquired via explicit long-term auctions in the interconnection with France (IFE)** **GW**



Annual and monthly capacities



**Congestion rents and coupling rates in the interconnection with France derived from day-ahead market coupling (Multi-Regional Coupling) € Million**



Does not include counter-trading costs nor other costs.

Coupling Rate: % 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) € Thousand and %**

|                   | France -> Spain  |             | Spain -> France |             | Total            |              |
|-------------------|------------------|-------------|-----------------|-------------|------------------|--------------|
|                   | € Thousand       | %           | € Thousand      | %           | € Thousand       | %            |
| Annual Auction    | 52,630.1         | 29.5        | 22,916.2        | 12.9        | 75,546.2         | 42.4         |
| Monthly Auction   | 30,808.2         | 17.3        | 16,151.1        | 9.1         | 46,959.3         | 26.3         |
| Day-ahead Horizon | 50,205.0         | 28.2        | 5,592.3         | 3.1         | 55,797.4         | 31.3         |
| <b>Total</b>      | <b>133,643.3</b> | <b>75.0</b> | <b>44,659.6</b> | <b>25.0</b> | <b>178,302.9</b> | <b>100.0</b> |

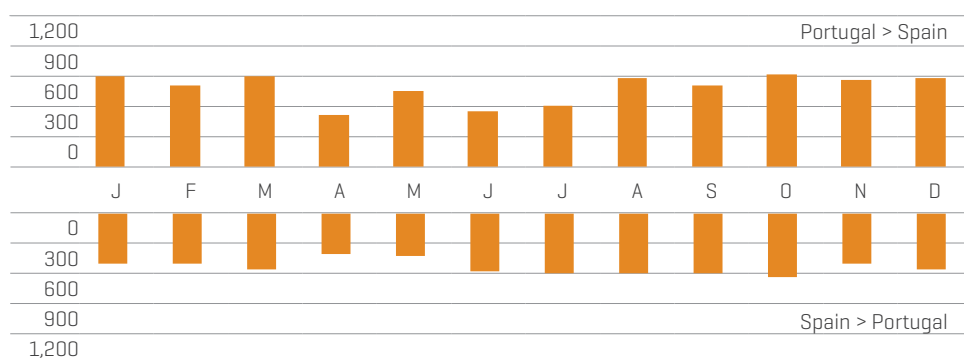
Does not include counter-trading costs nor other costs.

### Monthly net balance of scheduled energy exchanges in 2019 via the interconnection with Portugal (IPE)

GWh



### Capacity acquired via explicit long-term auctions in the interconnection with Portugal (IPE) GWh



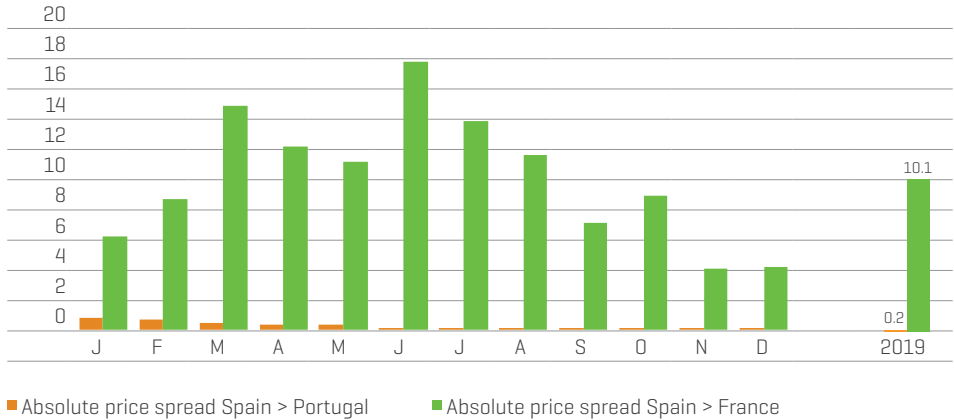
Annual, quarterly and monthly capacities

### Congestion rents in the interconnection with Portugal derived from capacity auctions and the day-ahead & intraday market coupling

|                    | Portugal -> Spain |             | Spain -> Portugal |             | Total          |              |
|--------------------|-------------------|-------------|-------------------|-------------|----------------|--------------|
|                    | € Thousand        | %           | € Thousand        | %           | € Thousand     | %            |
| Annual Auction     | 245.3             | 5.6         | 262.8             | 6.0         | 508.1          | 11.6         |
| Monthly Auction    | 207.9             | 4.7         | 326.6             | 7.4         | 534.5          | 12.2         |
| Quarterly Auction  | 110.3             | 2.5         | 435.3             | 9.9         | 545.6          | 12.4         |
| Day-ahead coupling | 315.4             | 7.2         | 2,370.0           | 53.9        | 2,685.4        | 61.1         |
| Intraday Market    | 37.6              | 0.9         | 82.2              | 1.9         | 119.7          | 2.7          |
| <b>Total</b>       | <b>916.4</b>      | <b>20.9</b> | <b>3,476.8</b>    | <b>79.1</b> | <b>4,393.3</b> | <b>100.0</b> |

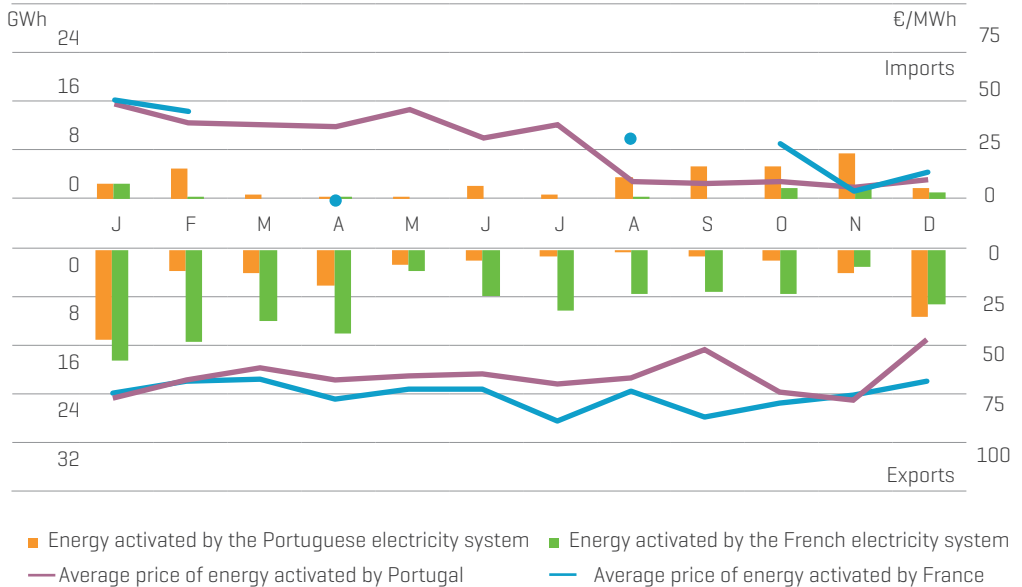
Does not include counter-trading costs nor other costs.

**Absolute price spread of the coupling rates of the day-ahead market in the interconnections with France and Portugal** €/MWh

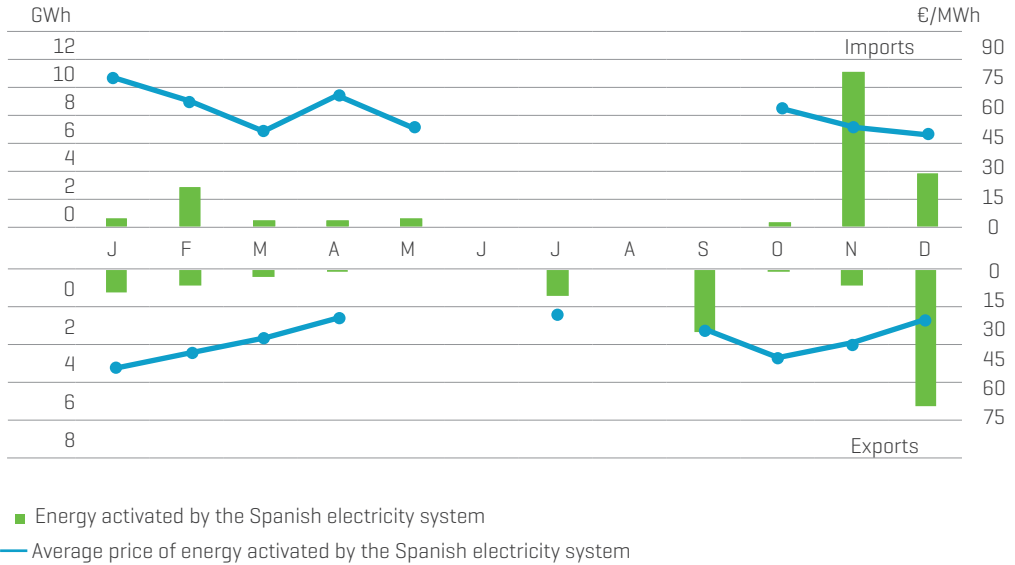


Average arithmetic value of the absolute values of the hourly price differentials resulting from day-ahead market coupling

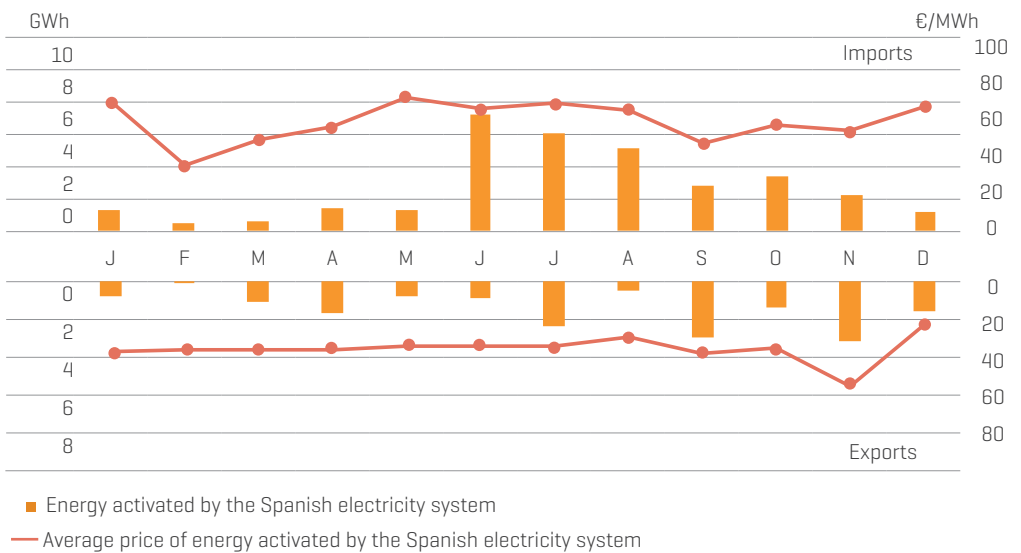
**Energy and average prices of cross-border balancing services activated by external electricity systems**



**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<sup>(1)</sup>

---

## **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 PAYMENT**

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

## **CAPACITY AUCTION**

Process used to efficient allocation of the interconnection capacity based on market mechanisms.

## **CONGESTION RENTS**

Revenues derived from the allocation of interconnection capacity, intended primarily to guarantee the actual availability of the allocated capacity and the remaining will be included in the revenues/costs for the calculation of access tariffs.

## **COORDINATED REDISPATCHING AND 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 relieve a congestion situation identified in real time in the interconnection.

## **CROSS-BORDER BALANCING SERVICES**

Balancing energy between two interconnected electricity systems through the coordinated action of the operators of the electricity systems, using available transmission capacity after the intraday market.

## **DAY-AHEAD MARKET COUPLING**

Market mechanism between several interconnected bidding zones by which the day-ahead market price in each bidding zone, the energy pull and delivery schedules for each interconnection is simultaneously determined by performing implicit auctions.

## **DEMAND IN FREE CONTRACTING MARKET**

Electricity demand of consumers on the Spanish peninsula (measured at power station busbars after subtracting standard losses) who contract energy with a retailer or directly in the market.

## **DEVIATION BALANCE**

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

## DEVIATION MANAGEMENT

Deviation management is an optional service managed and remunerated by market mechanisms. The objective is to resolve the deviations between generation and demand which could appear in the period between the end of one intraday market and the beginning of the next intraday market horizon. It is equivalent to the European product known as RR - Replacement Reserves.

## 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

A demand-side management tool used to provide rapid and efficient response to the needs of the electricity system according to technical (system security) and economic criteria (least cost for the system), that consist 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.

## MEASURED DEVIATIONS

Difference between the energy measured at 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.

## UNFULFILLMENT OF BALANCING ENERGY

Unfulfilled energy of net allocated tertiary reserves and deviation management.

## **CONTROL OF THE POWER CAPACITY FACTOR**

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

## **REFERENCE SUPPLY**

Electricity supply regime established for low voltage consumers and whose contracted power does not exceed 10 kW.

## **RESOLUTION OF REAL-TIME TECHNICAL CONSTRAINTS**

Process carried out by the System Operator consisting of the resolution of the technical constraints identified during real-time operation by curtailing, or if deemed necessary, modifying the power generation schedules of the programming units.

## **SECONDARY CONTROL BAND AND SECONDARY CONTROL**

An optional ancillary service whose purpose is to maintain the balance between generation and demand, correcting the unintentional deviations with respect to the schedules for the Spanish Control Block and frequency deviations. Its temporal working horizon ranges from 30 seconds to 15 minutes. It is remunerated under two concepts: capacity [reserves] and usage [energy]. It is equivalent to the European product known as aFRR - automatic Frequency Restoration Reserves.

## **SYSTEM ANCILLARY SERVICES**

Services managed by the System Operator that are required to ensure the electricity supply under the necessary conditions of quality, reliability and security. Ancillary services can be of an obligatory or optional nature. Resolution of technical constraints of the system, balancing markets [primary regulation, secondary regulation, tertiary regulation] and deviation management.

## **TECHNICAL CONSTRAINTS PDBF SOLUTION**

A mechanism integrated in the electricity production market carried out by the System Operator consisting of the resolution of the technical constraints identified in the Daily Base Operating Schedule by means of 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 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 which has been 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. It is equivalent to the European product known as mFRR - manual Frequency Restoration Reserves

## **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.

---

[1] For further information regarding terms, you can consult the glossary published on our web: <https://www.ree.es/en/glossary>



**Published by**

RED ELÉCTRICA DE Spain  
Paseo del Conde de los Gaitanes. 177  
28109 Alcobendas (Madrid)  
Tel, 91 650 85 00  
Fax, 91 640 45 42  
[www.ree.es](http://www.ree.es)

**Co-ordination of the publication**

Corporate Image and Brand Department

**Technical co-ordination**

Department of Access to Information on the Electricity System

**Design and layout**

**gosban** | reporting

**Other information regarding the publication**

Publication date: January 2020

**English translation by**

Wayman English International  
[www.waymanenglish.com](http://www.waymanenglish.com)



Paseo del Conde  
de los Gaitanes. 177  
28109 Alcobendas [Madrid]  
[www.ree.es](http://www.ree.es)

