The spanish electrical system

2018

COMMITTED TO INTELLIGENT ENERGY

RED ELÉCTRICA DE ESPAÑA

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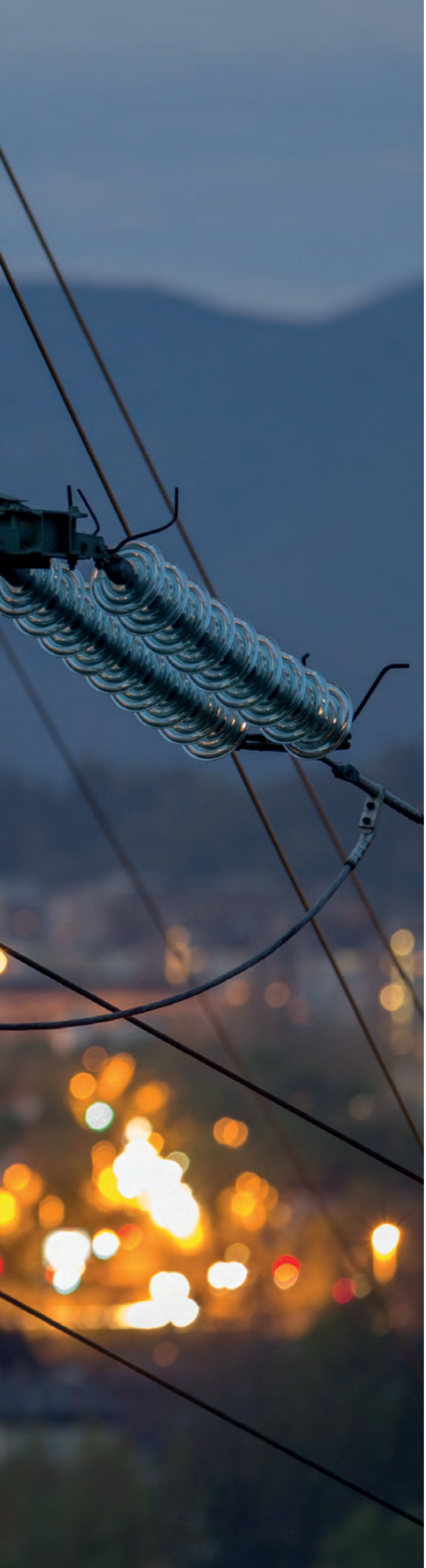
PRESENTATION



Red Eléctrica de España (REE), as the sole Transmission Agent and Operator (TSO) of the Spanish electricity system, presents its latest edition of the Spanish Electricity System Report, which the company has been publishing annually ever since it was established as TSO in 1985. This publication provides an overview of the main operational performance indicators and statistical ratios in 2018, as well as their evolution over recent years.

The information contained in this report is intended to be used as a management and reference tool in the current context of energy transition, in which the electricity system plays a fundamental role, making REE an agent to facilitate this transition.

The report is supplemented by Excel files that expand the information and allow the visualization and downloading of data, as well as with the publication "Renewable energies in the Spanish Electricity System", which provides greater depth on the generation and consumption of renewable energies, one of the central elements for achieving decarbonization targets. This information is available in the new statistical information section REData of the corporate website: www.ree.es, along with other publications and statistical series that Red Eléctrica periodically makes available to all stakeholders for consultation and use.

As part of its continued effort to improve, Red Eléctrica's aim is to offer a quality service for all users. To this end the following e-mail address redelectrica@ree.es is made available to the public, as a channel through which suggestions and observations may be submitted.

EXECUTIVE SUMMARY

The demand for electricity in Spain has maintained the growth trend that began in 2015, although at a lower rate than the previous year.

268,877
GWh
ELECTRICAL ENERGY DEMAND IN SPAIN

+0.4 %
COMPARED TO 2017

253,563 GWh

PENINSULAR ELECTRICITY DEMAND

+ 0.4 %

COMPARED TO 2017

The **demand for electricity in Spain** has continued the growth that began in 2015, after the successive drops in the previous four years, although it is still below the maximum level reached in 2008. Specifically, in 2018 demand grew 0.4% over the previous year, with a lower growth rate than in 2017 (1.2%)

In the peninsular system, which represents just over 94% of total spanish demand, the annual electricity consumption was also 0.4% higher than in 2017. Corrected for the effects of temperature and employment factors, the growth of electricity demand that can be attributed mainly to economic activity increased to 0.3% with respect to 2017.

By **large** sectors of activity, according to the Red Eléctrica Index (IRE), which collates demand data from large electricity consumers, Industryl electricity consumption, which represents approximately 30% of the demand, decreased 2.3% (2.2% after having factored in the effects of seasonal and working patterns). The services sector, which accounts for around 13% of demand, also fell by 0.6% (+0.4% after having factored in the effects of seasonal and working patterns). On the contrary, the aggregate of other sectors of activity, which represents 5% of the demand, experienced an increase with respect to the previous year of 0.4% (2.4% after having factored in the effects of seasonal and working patterns). As a result, the decrease in the overall IRE was 1.7% (-1.2% after having factored in the effects of seasonal and working patterns).

40.1 %

RENEWABLE ENERGY GENERATION IN THE PENINSULAR SYSTEM

+6.4 P.P.

COMPARED TO 2017

+84.9 %

HYDROELECTRIC GENERATION COMPARED TO 2017

By **geographical area**, the electricity demand grew with respect to the previous year in most autonomous communities, with increases in Ceuta (+2.2%), Castilla-La Mancha and Castilla y León (+1.8%).

In relation to the **maximum demand**, the peak of instantaneous power in the peninsular system was registered on 8 February at 8.24 pm with 40,947 MW, 1% lower than the previous year's peak registered in January, and far from the all-time high of 45,450 MW registered in December 2007.

Regarding the **demand coverage**, 95.6% of the demand of the peninsular electricity system was covered by with domestic production, while the rest of the generation required to supply the demand was imported from other countries. It should be noted that this situation regarding the net import of electricity generation has occurred for the third consecutive year, following a long trend of more than ten years of net export balance.

Installed power capacity of the entire set of generating facilities in Spain was practically unchanged with respect to the previous year. In the peninsular system it fell for the third consecutive year, ending the year with 98,643 MW installed, 0.2% less than at the end of 2017. Of all the installed power capacity nationally, 46.7% corresponds to renewable energy facilities and 53.3% to non-renewable technologies (+0.9% and -0.8% with respect to 2017).

With regard to **electricity generation**, renewable energies consolidated their large contribution to peninsular generation, increasing their share by 40.1% compared to 33.7% in 2017, largely due to the significant increase in the contribution of hydroelectric throughout the year (+84.9%).

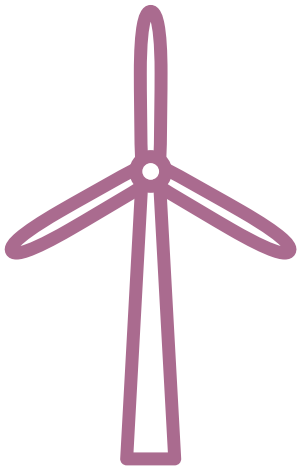
By technology, electricity production on the peninsula in 2018 as primarily generated by nuclear with 21.5% (22.4% in 2017), followed by wind with 19.8% (19.1% in 2017). Coal's share dropped to 14.1% (17.1% in 2017) and hydro became the fourth largest generation source with a 13.8% share (7.4% in 2017). It is followed by cogeneration, with 11.9% (11.3% in 2017) and combined cycle, with 10.7% (13.6% in 2017). The remaining generation was shared between solar technologies (4.8%) and others (3.4%).

104,094 MW

INSTALLED POWER CAPACITY IN SPAIN

46.7 %

CORRESPONDS TO RENEWABLE ENERGY



ELECTRICITY PRODUCTION IN SPAIN

19.8 %

WIND ENERGY

SECOND

SOURCE OF PENINSULAR ELECTRICITY GENERATION

MAXIMUM INSTANTANEOUS POWER IN THE PENINSULAR SYSTEM

8 FEBRUARY 2018

40,947

MW

-1.0 %

LOWER THAN THE PREVIOUS YEAR'S MAXIMUM FIGURE REGISTERED IN JANUARY.

CO_2 EMISSIONS FROM ELECTRICITY GENERATION IN 2018

64.2
MILLION TONNES

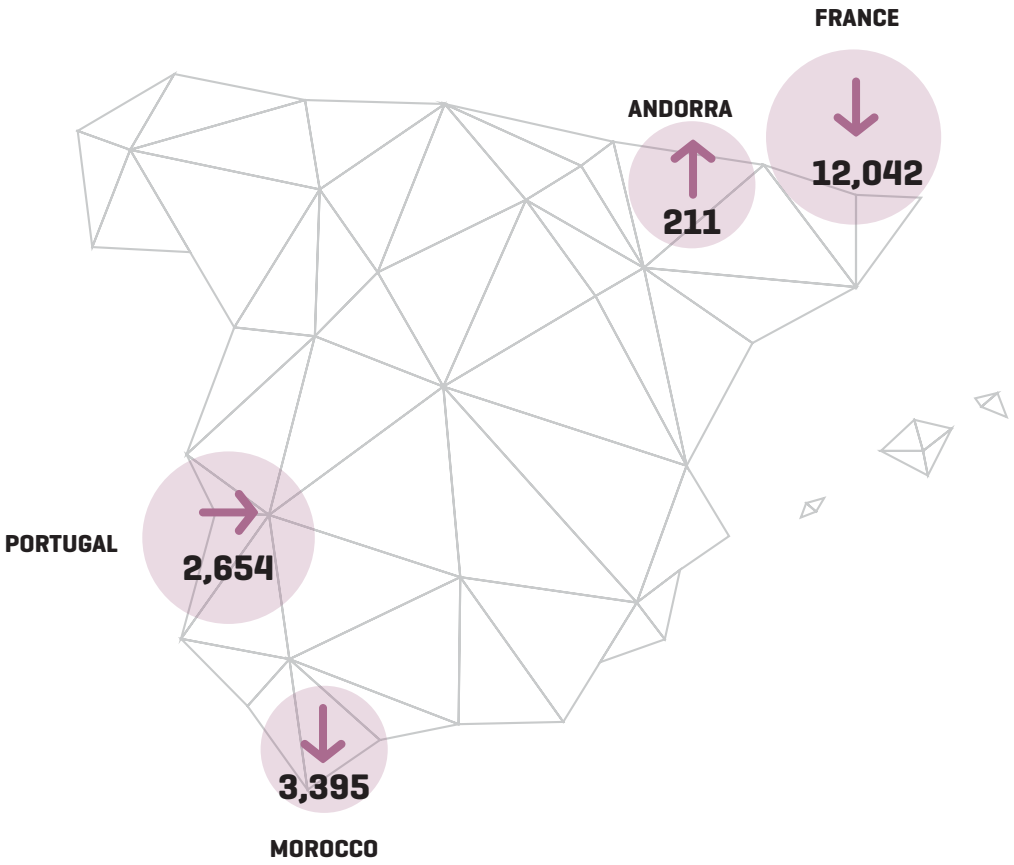
-13.8 %
COMPARED TO 2017

The **CO_2 emissions from electricity generation** in Spain have decreased, mainly due to a larger share of renewable energies, with an estimated total of 64.2 million tonnes in 2018, 13.8% lower than in 2017. As a result of this increase in renewables, CO_2-free generation, which includes renewables, pumped storage and nuclear, grew to a share of 59.7% compared to 54.3% in 2017.

Spain's **energy exchange** programmes with other countries fell by 12% compared to the previous year. Exports fell by 23.1% to 10,499 GWh, as did imports, which fell to 21,590 GWh (-5.4%). The net balance is once again as an importer, with a value of 11,090 GWh, 20.9% higher than in 2017.

In terms of interconnections, Spain was once again a net importer of energy from France and for the third consecutive year running from Portugal. The interconnection with France registered an import balance of 12,042 GWh (12,465 in 2017) and in the interconnection with Portugal, the import balance was 2,654 GWh (2,685 GWh in 2017). With Andorra and Morocco, the balance was once again as a net exporter with values of 211 GWh and 3,395 GWh, respectively.

Balances of scheduled international, energy exchanges 2018 (GWh)



In 2018, strengthening of the **electricity transmission grid** continued with 277 kilometres of new line, 144 new substation bays and 2,592 MVA of transformer capacity put into service. As a result, the infrastructure of the Spanish transmission grid stood at 44,207 kilometres of circuit and 5,865 substation bays at the end of the year, bringing the transformer capacity of 88,846 MVA.

In 2018, the double circuit San Miguel Salinas-Torrevieja (220 kV) in Alicante, the Gran Tarajal-Matas Blancas axis (132 kV) in Fuerteventura and the La Farga substation (220/400 kV) in Gerona were commissioned.

The **service quality indicators** once again show the high level of security of supply and quality of the transmission grid, as all systems are far below the reference values stipulated in the regulations in force. However, due to the increase in incidents, Energy Not Supplied (ENS) increased with respect to the previous year. With provisional data (pending audit), the Energy Not Supplied (ENS) for 2018 corresponding to the peninsular system was 250 MWh (60 MWh in 2017) and the Average Interruption Time (AIT) was 0.52 minutes (0.13 minutes in 2017).

As in the case of the peninsula, in the Balearic Islands ENS was 38 MWh (33 MWh in 2017) and an AIT of 3.27 minutes (2.88 minutes in 2017). The Canary Islands electricity system recorded an ENS of 63 MWh (47 MWh in 2017) and an AIT of 3.77 minutes (2.75 minutes in 2017).

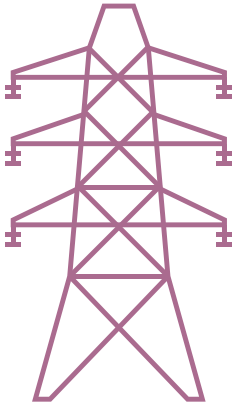
The availability rate (which measures the capacity or possibility of use by the system of the different elements of the transmission grid) corresponding to the peninsular system was 98.14%, and in the Balearic and Canary Islands electricity systems it was 96.82% and 98.79% respectively.

For the spanish electricity system as a whole, the availability rate reached 98.13%.

The **average final price of energy** on the electricity market was 64.4 €/MWh, 6.3% higher than the price in 2017, exceeding the all-time high of 2008. The final energy contracted in the electricity market (reference supply companies plus free market) was 0.4% higher than the previous year.

The combined price of the day-ahead and intraday markets accounted for 90.2% of the final price, the system ancillary services 3.7%, capacity payments 4.2% and interruptibility service the remaining 1.9%.

Comparing the impact of the price on final energy (unserved demand) with that of last year, there are increases of 8.8% in the day-ahead and intraday markets and decreases of 40% in interruptibility service, 1.3% in ancillary services and 0.7% in capacity payments.



THE SPANISTH ELECTRICITY TRANSMISSION GRID

277

KILOMETRES OF CIRCUIT COMISSIONED IN 2018

KILOMETRES OF TOTAL LINE AT THE END OF 2018

44,207

1

ELECTRICITY DEMAND

Demand for electricity in Spain in 2018 maintained the growth trend that started in 2015.

268,877
GWh
ELECTRICITY DEMAND IN SPAIN

+0.4 %
COMPARED TO 2017

253,563 GWh

PENINSULAR ELECTRICITY DEMAND

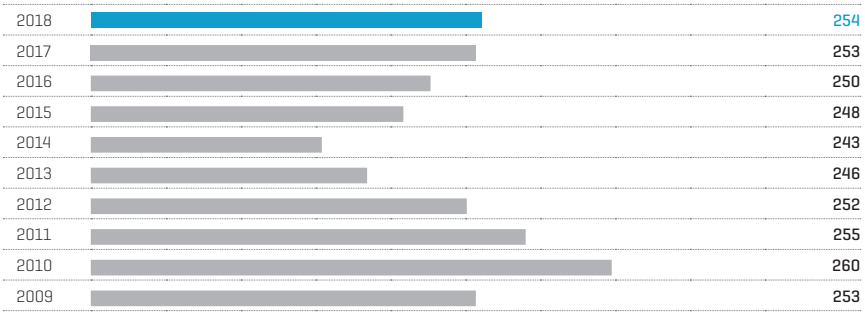
+0.4 %

COMPARED TO 2017

Demand for electricity in Spain in 2018 grew by 0.4% with respect to the previous year, reaching a total of 268,877 GWh demanded. This growth is significantly lower than the value reached in 2017 in comparison with 2016, when there was a variation of 1.2%

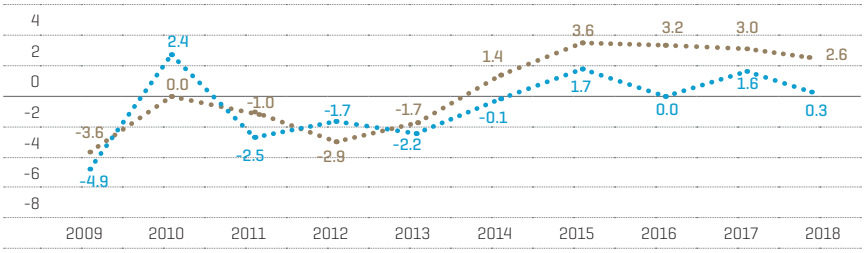
268,877 GWh demanded. The evolution of the peninsular electricity system, which represents just over 94% of total Spanish demand, also grew by 0.4% over the previous year, totalling 253,563 GWh, 4.1% lower than the maximum demand reached in 2008 (264,523 GWh), and reaching levels of demand somewhat lower than those recorded in 2006.

Evolution of peninsular demand at power station busbars in the last 10 years (TWh)



From an economic activity point of view, Gross Domestic Product (GDP) increased 2.6% with respect to the previous year, with trends indicating a slowing in the growth rate of the activity.

Annual variation of peninsular electricity demand and Spanish GDP (%)



GDP [1] ADJUSTED DEMAND

(1) Source: INE

From the point of view of electricity demand, this slower growth in activity, compared with its evolution in previous years, translated into low growth of demand, giving rise to an elasticity of 0.2 between the two magnitudes. This relationship is in line with the low elasticity values that have been obtained since the beginning of the economic recovery.

After having factored in the effects of seasonal and working patterns, there was a positive variation in peninsular electricity demand with respect to the previous year of 0.3%, a value 1.3 percentage points lower than the growth registered in 2017, showing a much more pronounced slowdown in growth of demand than the slow-down experienced by the Spanish economy.

VARIATION OF ADJUSTED PENINSULAR DEMAND

+0.3 %

AFTER HAVING FACTORED IN THE EFFECTS OF SEASONAL AND WORKING PATTERNS

Components of the variation in the yearly peninsular electricity demand (%)

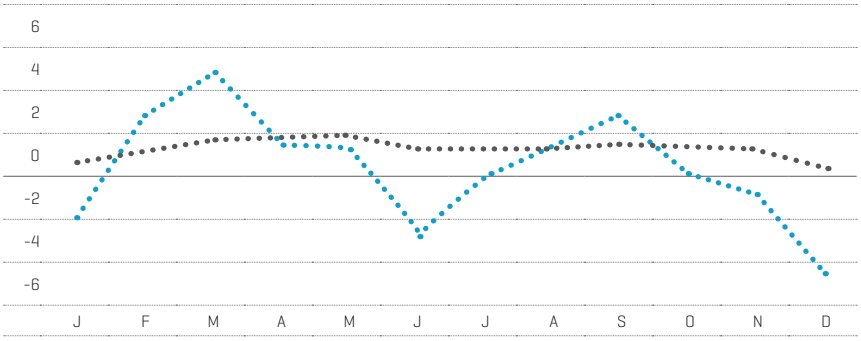
	Δ Demand at busbars	Working patterns	Temperature	Adjusted
2009	-4.4	-0.7	1.1	-4.9
2010	3.0	0.2	0.4	2.4
2011	-2.0	1.4	-0.9	-2.5
2012	-1.3	-0.3	0.7	-1.7
2013	-2.3	0.2	-0.3	-2.2
2014	-1.1	0.0	-1.0	-0.1
2015	2.0	-0.1	0.4	1.7
2016	0.7	0.6	0.1	0.0
2017	1.1	-0.3	-0.2	1.6
2018	**0.4**	**-0.1**	**0.2**	**0.3**

The electricity demand in the peninsular electricity system maintained the growth trend that began in 2015, although this growth has slowed.

With regard to the evolution of the trend of the adjusted demand, the year as a whole behaved unevenly, with alternating periods of acceleration and slowing of growth rates. After the impact of lower demand in January on the trend, growth rates began to recover, reaching their high point with a year-on-year variation of 1.9%.

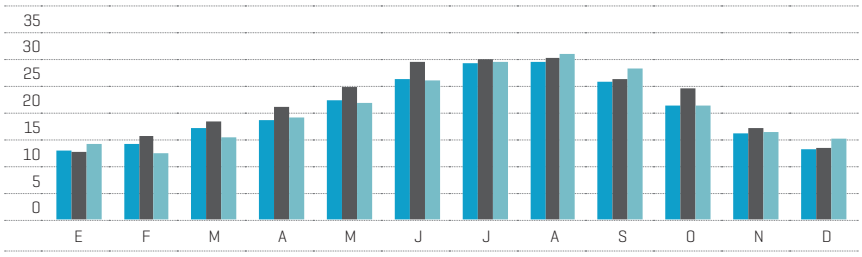
At the end of the second quarter and during most of the third quarter, the variation in demand fell and, although there is a certain rebound during the month of September, in the remaining months to end the year, growth fell until end 2018 with a positive variation of 0.3%. This was the lowest growth experienced by the trend since December 2016.

Monthly variation in adjusted peninsular demand in 2018 (%)



Monthly evolution of temperatures

Monthly average of maximum temperatures (ºC)



(1) Average monthly temperature for the period 1989-2013.

Source: Prepared by REE using data from the Spanish State Meteorological Agency (AEMET) data.

From the point of view of the influence of temperatures on the demand, unlike previous years, in 2018, on the whole, temperatures were hotter in summer and colder in winter than those corresponding to the historical average[1]. Cooling degree days[2] were 8.3% higher than the average values and heating degree days were 23.8% higher than the average values for the period considered.

This means that over the course of 2018, 20.8% of the days had temperatures well above the historical average temperature. These days were more concentrated in the months of August and September for the summer months, and in January and December for the winter months. On the other hand, days with temperatures below the historical average occurred on just 12.3% of the days of the year, with these days concentrated mainly between February and the first half of April.

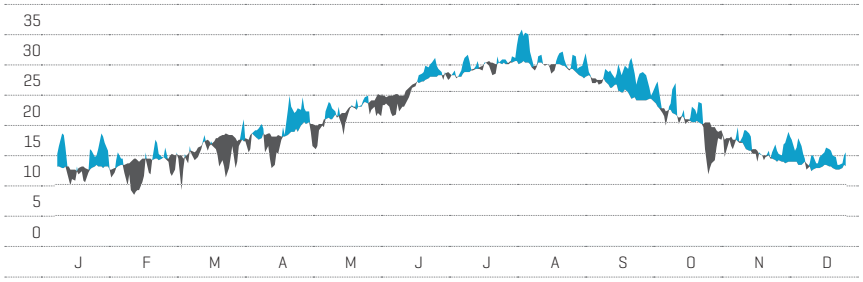
INFLUENCE OF TEMPERATURE ON THE DEMAND

20.8 %

OF THE DAYS REGISTERED TEMPERATURES MUCH HIGHER THAN THE HISTORICAL AVERAGE

[1] Average of maximum daily temperatures in the period 1989-2013.
[2] Cooling degree-days are defined as those days registering temperatures below 19ºC, while heating degree-days are those above 23ºC.

Evolution of temperatures compared to historical average (ºC)



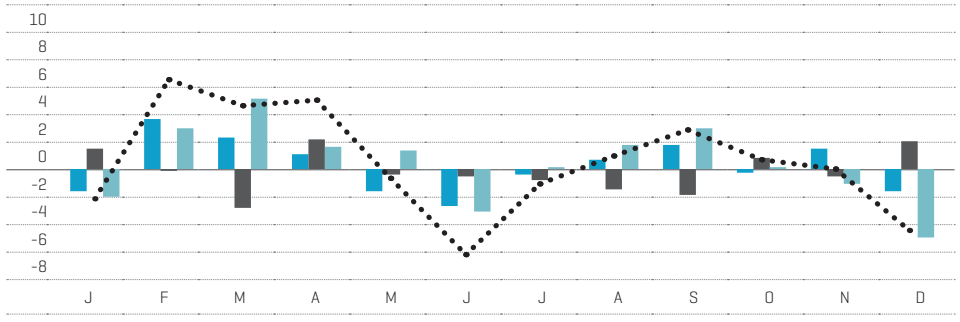
ABOVE AVERAGE BELOW AVERAGE

Compared to the previous year, 2018 was colder than 2017, with 24.4% more cooling degree days and 14.0% less heating degree days. The combined impact of these effects, with greater influence on the consumption of cooling degree days, results in a positive contribution of temperatures of 0.2 percentage points to the growth in demand.

INFLUENCE OF TEMPERATURE ON THE DEMAND

+0.2 P.P.

Components associated to growth in monthly demand on the peninsula 2018 (%)



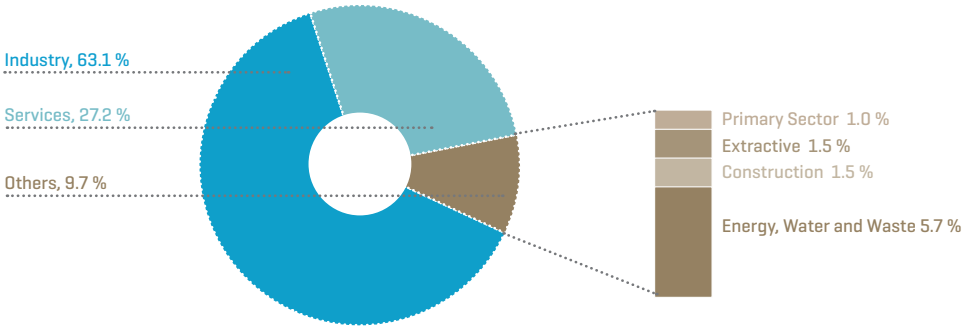
WORKING PATTERNS TEMPERATURE ECONOMIC ACTIVITY INCREASE IN DEMAND

104.3
RED ELÉCTRICA INDEX

-1.7 %
COMPARED TO 2017

Decrease in the consumption of large consumers

Composition of the General IRE (%)



In 2018, the IRE as a whole was 1.7% lower than the previous year, bringing the index to 104.3, 4.3% higher than the reference year (2010=100), thus erasing the gain in the previous year. The decline recorded this year is the first negative figure in the index since 2013.

By major branches of activity, the principal sectors presented a negative variation rate, while only the "other sectors" group, with low weight in the index, grew with respect to the previous year:

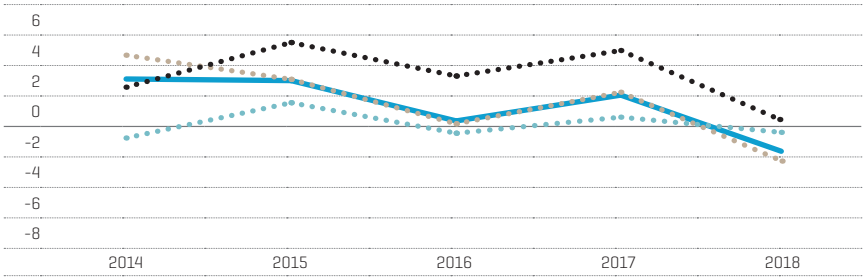
— Industrial activities fell by 2.3%, the first negative change in the industrial index since 2012, when it dropped 4.1%.

— The services sector had a negative variation of 0.6% after the previous year's value of virtually zero (0.1%), bringing the index to levels similar to the values four years ago.

— The grouping of other activity sectors[3] was the only one that has showed a certain degree dynamism, growing 0.4% with respect to the previous year, which makes 5 consecutive years of positive variations, despite the fact that this year's growth was lower than that of previous years.

[3] Primary sector, extractive, energy-water-waste, construction.

Annual evolution of the IRE [% year-on-year]

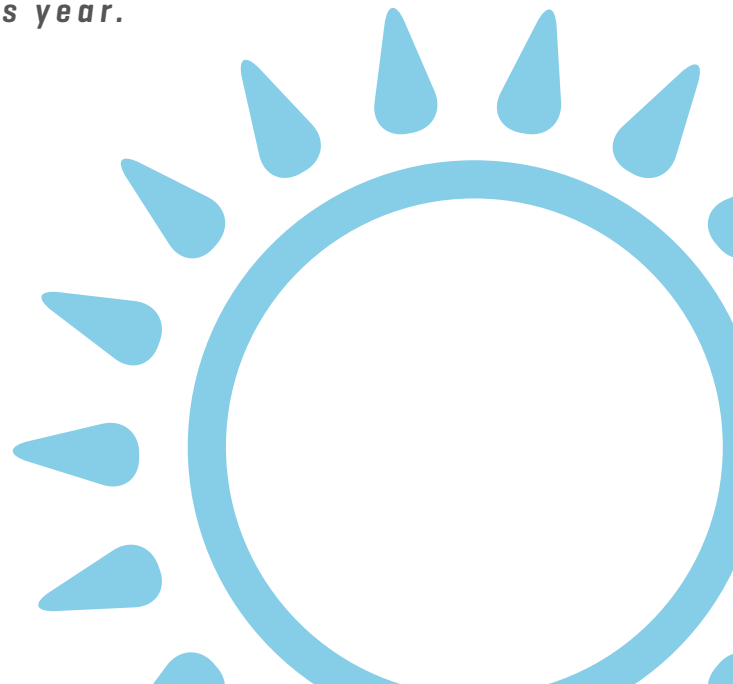


In 2018 the composition of the calendar had no influence on the evolution of the index. Temperatures, on the contrary, had a negative contribution of 0.5 percentage points mainly due to the fact that temperatures in the summer months were milder than those recorded the previous year.

IRE: Variation Breakdown in 2018 [%]

	Gross	Working patterns	Temperature	Adjusted
General	**-1.7**	**0.0**	**-0.5**	**-1.2**
Industry	-2.3	0.0	-0.2	-2.2
Services	-0.6	0.1	-1.1	0.4
Others	0.4	0.0	-2.0	2.4

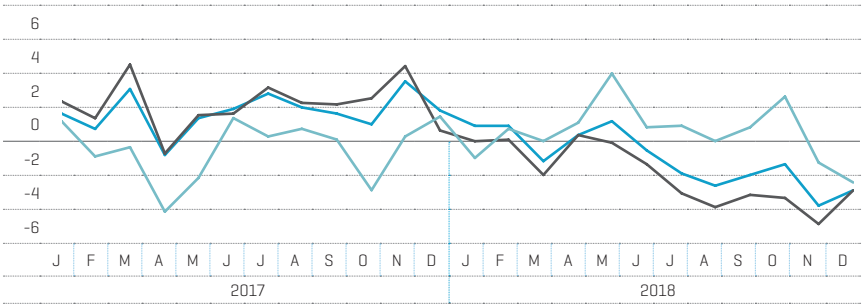
Temperatures had a negative contribution of 0.5 percentage points, mainly due to the fact that temperatures in the summer months were milder than those recorded the previous year.



With regard to the monthly evolution of the corrected index corresponding to the two large sector groups (industry and services), industry, with negative variations during most of the year, conditioned the evolution of the general index. The evolution of services, on the other hand, showed strong oscillations, alternating periods of negative and positive variations that meant that in certain months, services maintained the evolution of the general index despite accounting for less weight in its composition (27.2%).

In 2017, the evolution of the industry was very dynamic, registering high levels of growth, although in the last month of the year there was a strong deceleration in the growth rates. This situation, far from being sporadic, was maintained throughout 2018, with negative rates of variation starting in February, with an accelerated decrease that peaked in November with a drop of 5.1% over the previous year.
As mentioned above, the evolution of services varied significantly, alternating periods of decline with periods of growth, with growth predominating during the year as a whole. The period from March to June was especially positive, and together with the October figure, kept the evolution of the index positive, while on the negative side, the evolution of the index was conditioned by the summer months and the last two months of the year.

Monthly trend of the adjusted IRE (% rolling year)



GENERAL INDUSTRY SERVICES

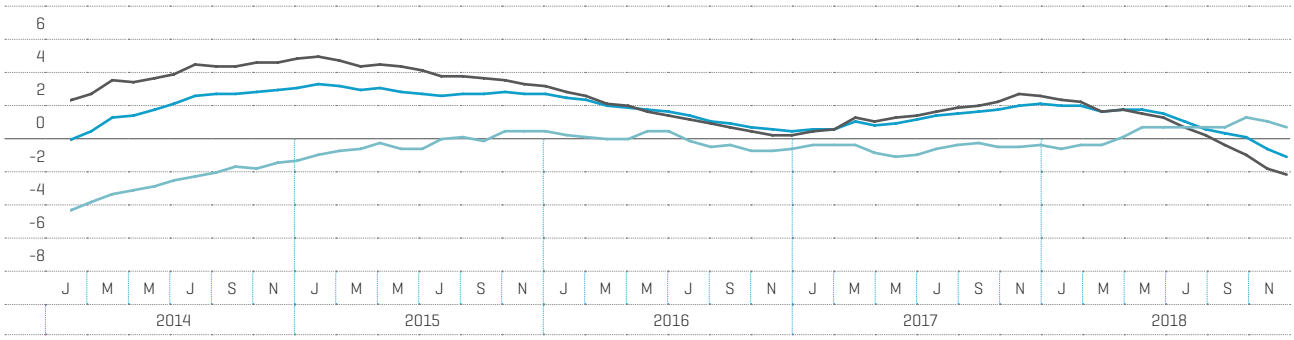
-2.2 %
ADJUSTED ANNUAL INDEX INDUSTRY

+0.4 %
ADJUSTED ANNUAL INDEX SERVICES

In terms of the trend, the accelerated growth shown by the evolution of the index during 2017 slowed somewhat but maintained the growth rates during the first half of 2018 thanks to the positive evolution of the service sectors. In the second half of the year, and very much conditioned by the negative evolution of the industrial sectors, the general index took a downturn that translated into negative variations from September onwards.

The accelerated growth of the corrected trend of the industrial sectors of 2017 was cut off in 2018, with the index taking a downturn that accelerated in the second half of the year. Negative rates of variation were recorded from August to the end of the year with a decrease of 2.2% as mentioned above. It should be noted that negative rates of variation of this magnitude had not occurred since 2013. Unlike industry, the service sectors began 2018 with the same trend as at the end of 2017, that is, maintaining the rate of decline of the index. However, the positive performance of the index from March onwards resulted in the trend hitting positive values that were more or less sustained, with an average growth of 0.5% between the months of May and December 2018.

Monthly trend of the adjusted IRE (% rolling year)

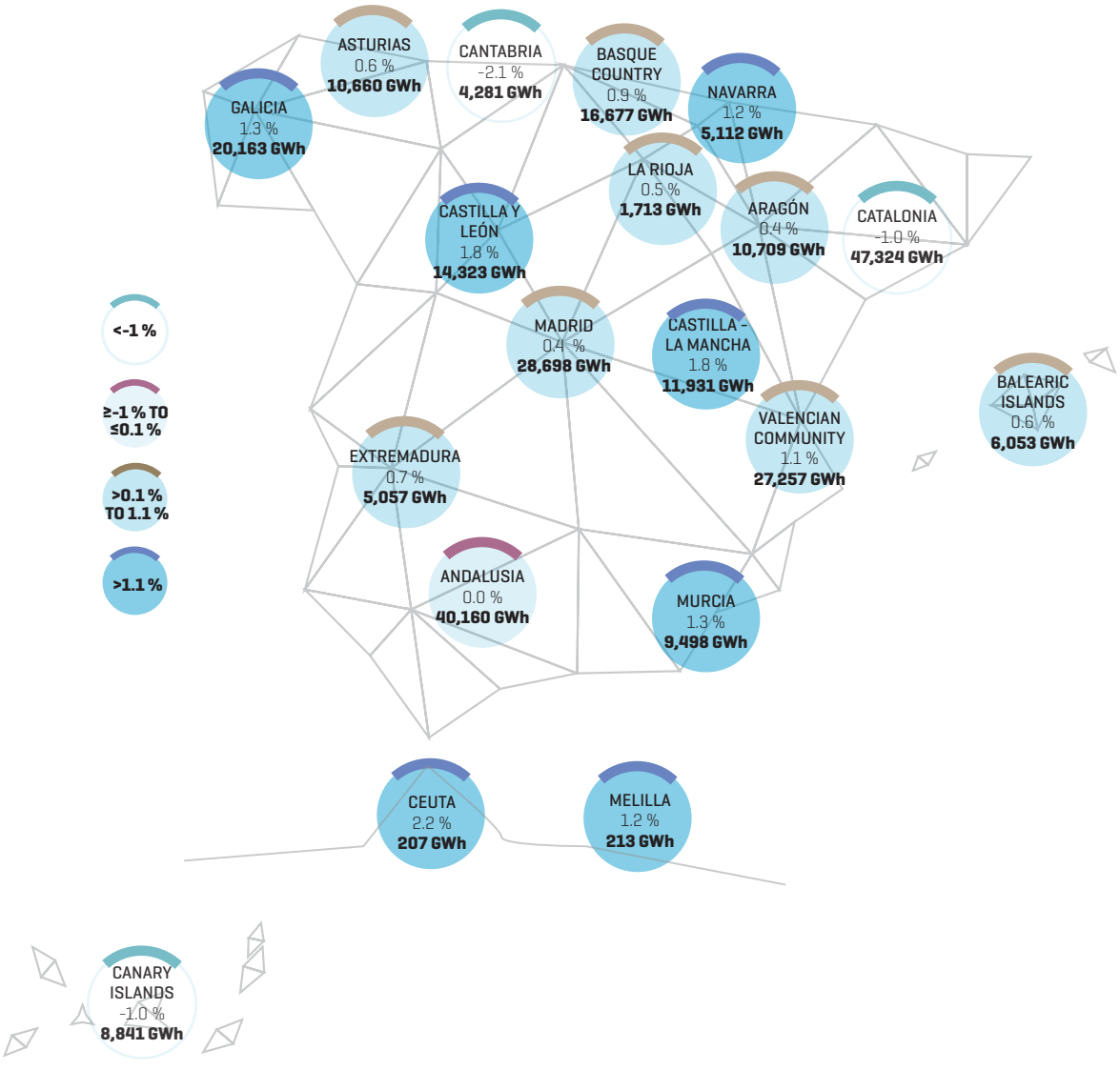


The trend of the IRE was downward during 2018, conditioned by the negative evolution of the industrial sector.

The highest growth was recorded in Ceuta, Valencia, Murcia, Castilla-La Mancha, Castilla y León, Navarra and Galicia

The geographical detail of the evolution of Catalonia and the Canary Islands. The geographical breakdown of the evolution of demand in 2018 oscillated between maximum growth in Ceuta of 2.2% and a decrease of 2.1% in Cantabria. In addition, there were decreases in demand in regions as geographically dispersed as Catalonia and the Canary Islands. The rest of the Autonomous Communities experienced positive variation in demand, with the highest growth recorded in Galicia and Navarra, as well as in the east-southeast with the Valencian Community and Murcia.

Demand per autonomous community and variation compared to the previous year (GWh and %)



Annual maximum slightly lower than 2017

In 2018, the behaviour of the hourly demand peaks corresponding to cold and hot periods was different, because while the winter all-time high was 0.9% lower than in 2017, the summer all-time high was 1.0% higher than the previous year. This year, the difference between the winter and summer all-time high was smaller, with the winter all-time high being 2.4% higher than the summer all-time high, whereas in 2017 this difference was 4.2%.

Nonetheless, the annual maximum value is far from the all-time high for demand registered in 2007, with the winter all-time high being 4,265 MWh lower and the summer all-time high being 1,249 MWh lower than their corresponding all-time high values.

MAXIMUM HOURLY DEMAND WINTER

40,611

MWh

-0.9 %

COMPARED TO 2017

MAXIMUM HOURLY DEMAND SUMMER

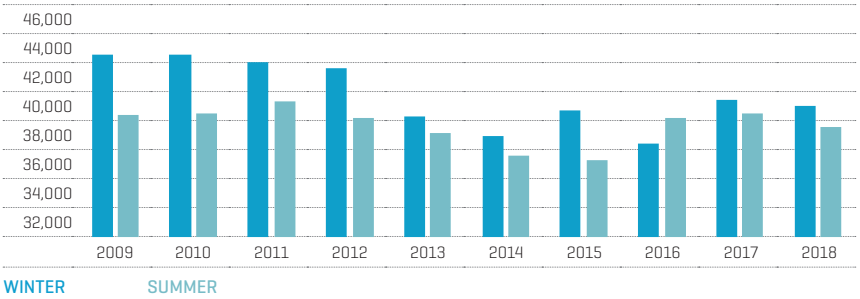
39,689

MWh

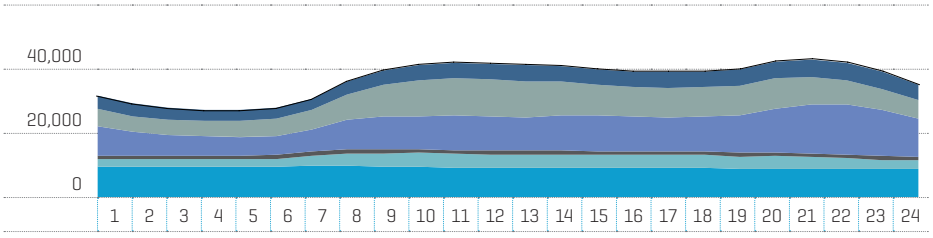
+1.0 %

COMPARED TO 2017

Maximum annual values for instantaneous demand on the Spanish peninsula (MW)



Breakdown of the maximum hourly demand in 2018-8 February (MWh)



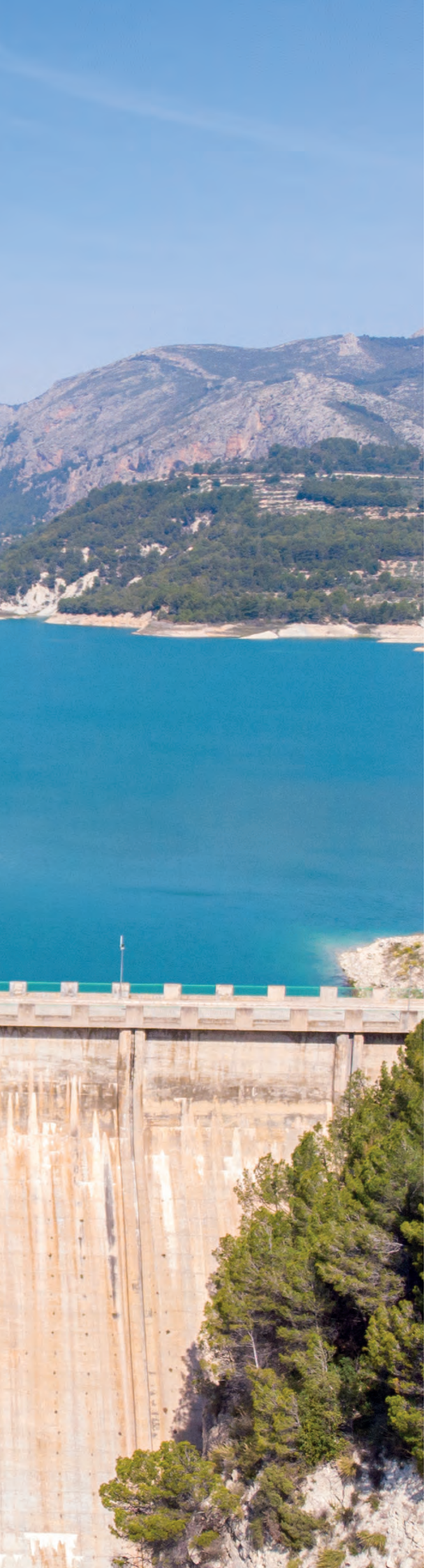
During the peak hour of the day of maximum hourly demand[4] of the year, the residential sector[5] accounted for 35.4% of consumption, while the industrial consumption of the IRE accounted for 20.5%, large services 8.8% and small businesses and services 19.8%. Throughout the peak day, the greatest weight of the industrial sectors occurred during the early morning, between 4 and 5 o'clock in the morning, when it reached a total weight on the demand measured at busbars of 35.1%, while for large services, the period with the greatest weight was between 7 am and 7 pm, with consumption shares of between 9.9% and 10.6%.

[4] Including losses.

[5] Hourly profiles applied to the general low voltage electricity tariff with a contracted power equal or less than 10 kW.

2

ELECTRICITY GENERATION



Renewable generation grew thanks to increased production of hydroelectric power stations.

246,893
GWh
ELECTRICITY GENERATION IN THE PENINSULAR SYSTEM

-0.5 %
COMPARED TO 2017

+84.9 %
HYDROELECTRIC GENERATION

-21.5 %
COMBINED CYCLE

-17.8 %
COAL

Electricity generation in the peninsular system, which represents almost 95% of the total generation nationwide, dropped by 0.5% in 2018, standing at 246,893 GWh. The most significant variations with respect to the previous year were recorded by hydroelectric generation, which increased by 84.9%, while combined cycle and coal-fired generation decreased by 21.5% and 17.8%, respectively.

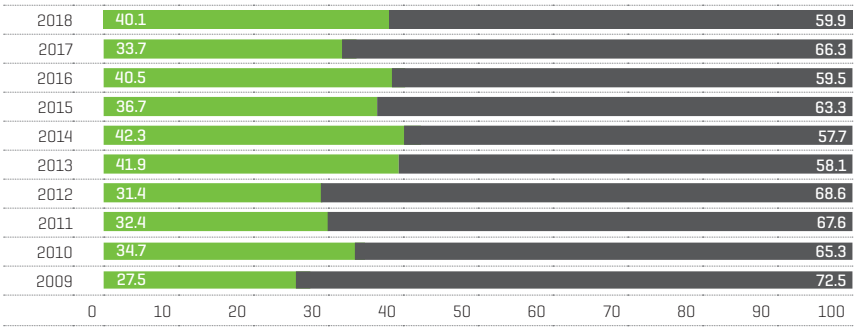
Electricity generation in non-peninsular systems (14,081 GWh) fell by 0.7% with respect to the previous year, with a significant decrease of 7.9% for coal and 4.5% for fuel/gas. In the opposite direction, there was an increase in wind power generation, which was 56.6% higher than the previous year.
Regarding the balance of generation by type of energy, unlike in 2017, renewable energy recovered their share in the peninsular electricity generation mix to 40.1% compared to 33.7% in 2017, as a result of increased hydroelectric generation. The share of non-renewable energies decreased to 59.9% (66.3% in 2017).

ELECTRICITY GENERATION IN NON-PENINSULAR SYSTEMS

14,081
GWh

-0.7 %
COMPARED TO 2017

Evolution of renewable and non-renewable generation on the Spanish peninsula (%)



RENEWABLES: HYDRO, WIND, SOLAR PHOTOVOLTAIC, SOLAR THERMAL, RENEWABLE WASTE AND OTHER RENEWABLES
NON-RENEWABLES: NUCLEAR, COAL, FUEL/GAS, COMBINED CYCLE, COGENERATION, PUMPED STORAGE AND NON-RENEWABLE WASTE

Renewable energies recovered their share in the peninsular electricity generation mix to 40.1% compared to 33.7% in 2017, as a result of increased hydroelectric generation.

National electrical energy balance [1]

	Peninsular system		Non-peninsular systems		National total	
	GWh	**%18/17**	**GWh**	**%18/17**	**GWh**	**%18/17**
Hydro	34,103	84.9	3	0.1	34,106	84.9
Pumped storage [2]	2,009	-10.7	-	-	2,009	-10.7
Nuclear	53,198	-4.2	-	-	53,198	-4.2
Coal	34,882	-17.8	2,392	-7.9	37,274	-17.2
Fuel/gas [3]	-	-	6,683	-4.5	6,683	-4.5
Combined cycle [4]	26,403	-21.5	3,642	6.5	30,044	-18.9
Hydro-wind	-	-	24	16.9	24	16.9
Wind	48,946	3.0	625	56.6	49,570	3.5
Solar photovoltaic	7,374	-7.8	385	-3.1	7,759	-7.6
Solar thermal	4,424	-17.3	-	-	4,424	-17.3
Other renewables [5]	3,547	-1.5	10	-8.3	3,557	-1.5
Cogeneration	28,981	2.9	35	-3.5	29,016	2.8
Non-renewable waste	2,294	-6.7	141	-5.2	2,435	-6.6
Renewable waste	733	0.7	141	-5.2	874	-0.3
Generation	**246,893**	**-0.5**	**14,081**	**-0.7**	**260,974**	**-0.5**
Pumped storage consumption	-3,198	-11.3	-	-	-3,198	-11.3
Peninsula-Balearic Islands link [6]	-1,233	4.6	1,233	4.6	0	-
International exchange balance [7]	11,102	21.1	-	-	11,102	21.1
Demand (b.c.-at power station busbars)	**253,563**	**0.4**	**15,314**	**-0.3**	**268,877**	**0.4**

(1) Allocation of generation units based on primary fuel
(2) Pure pumped storage + estimate of mixed pumped storage.
(3) Generation from auxiliary generation units is included in the Balearic Islands' electricity system
(4) Includes operation in open-cycle mode. The Canary Islands' electricity system uses gas-oil as primary fuel
(5) Includes biogas, biomass, marine energy and geothermal
(6) Positive value: importer balance; negative value: exporter balance.
(7) Positive value: importer balance; negative value: exporter balance. Increment values are not calculated when exchange balances have different signs.

Breakdown of installed power capacity as at 31.12.2018. National Electricity System

	Peninsular system		Non-peninsular systems		National total	
	MW	**%18/17**	**MW**	**%18/17**	**MW**	**%18/17**
Hydro	17,047	0.1	2	0.0	17,049	0.1
Bombeo puro	3,329	0.0	-	-	3,329	0.0
Nuclear	7,117	0.0	-	-	7,117	0.0
COAL	9,562	0.3	468	0.0	10,030	0.3
Fuel/gas	0	-	2,490	0.0	2,490	0.0
Combined cycle	24,562	-1.5	1,722	0.0	26,284	-1.4
Hydro-wind	-	-	11	0.0	11	0.0
Wind	23,091	0.7	416	97.7	23,507	1.6
Solar photovoltaic	4,466	0.6	248	0.2	4,714	0.5
Solar thermal	2,304	0.0	-	-	2,304	0.0
Other renewables [1]	859	0.6	6	0.0	865	0.6
Cogeneration	5,730	-1.3	10	0.0	5,741	-1.3
Non-renewable waste	452	-1.4	38	0.0	491	-1.3
Renewable waste	123	0.0	38	0.0	162	0.0
Total	**98,643**	**-0.2**	**5,452**	**3.9**	**104,094**	**0.0**

(1) Includes biogas, biomass, marine energy and geothermal.

Increase in renewable installed power capacity and decrease in non-renewable capacity.

INSTALLED POWER CAPACITY IN THE PENINSULAR ELECTRICITY SYSTEM

98,643

MW

+0.5 %

RENEWABLE POWER PENINSULA

+3.9 %

RENEWABLE POWER NON-PENINSULAR SYSTEMS

As at 31 December 2018, the complete set of generation facilities of the peninsular system decreased slightly compared to the previous year, registering an installed power capacity of 98,643 MW, 0.2% less than at the end of 2017.

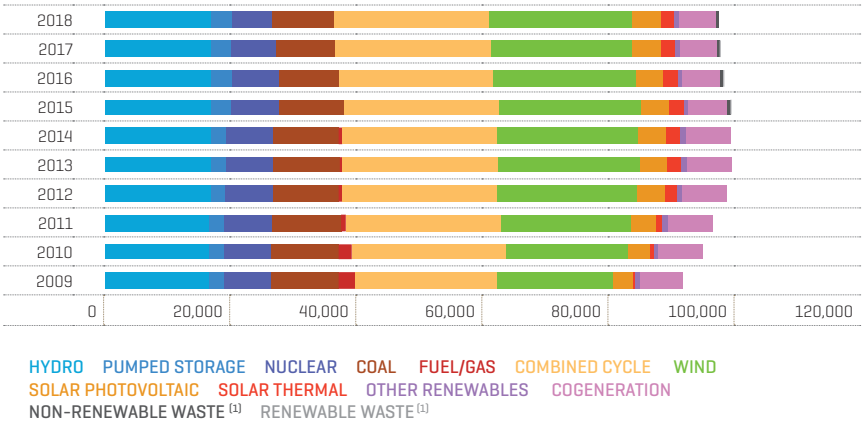
These electricity generation facilities are increasingly renewable and less dependent on polluting technologies; peninsular renewable power has experienced an increase of 0.5%, while non-renewable decreased by 0.9%. In 2018, combined cycle dropped by 1.5% compared to the previous year, due to the final closure of the combined cycle thermal power station Tarragona I. Cogeneration power also decreased by 1.3%, as well as non-renewable waste generation, by 1.4%.

On the other hand, more wind, solar photovoltaic and other renewable energy facilities were commissioned, increasing their installed power capacity by 0.7%, 0.6% and 0.6%, respectively. Variations in the rest of the technologies were null or insignificant.

In non-peninsular systems there was a 3.9% increase in installed power capacity by the end of 2018. This increase is mainly explained by the doubling of installed wind power capacity in the Canary Islands.

In the national territory on the whole, which includes the peninsular and non-peninsular systems, the installed power capacity was unchanged, ending 2018 at 104,094 MW. Of the total installed power capacity, 46.7% corresponds to renewable energy installations and 53.3% to non-renewable technologies.

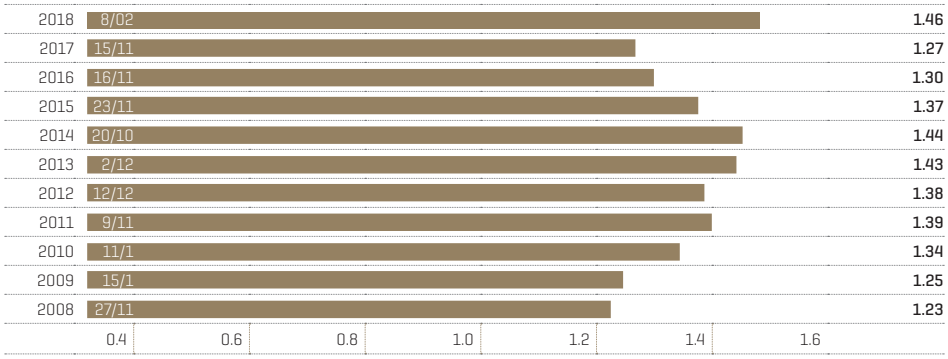
Evolution of installed power capacity on the Spanish peninsula (MW)



(1) Power included in other renewables and cogeneration until 31/12/2014.
Source: National Commission for Markets and Competition (CNMC) until 2014 on: non-Hydro Management Unit (UGH), wind, solar photovoltaic, solar thermoelectric, other renewables, cogeneration and waste.

The minimum coverage index for the peninsula, defined as the minimum value of the ratio between the power available in the system and the peak power demanded from the system, stood at 1.46 in 2018, the highest value in the last ten years.

Evolution of the minimum coverage index (ICMIN) for the Spanish peninsula



ICmin = Min [Pd/Ps]
ICmin: Minimum Coverage Index.
Pd: Power available in the system.
Ps: Peak power demanded to the system.

MINIMUM COVERAGE INDEX FOR THE PENINSULA

1.46

THE HIGHEST VALUE IN THE LAST TEN YEARS RENEWABLE ELECTRICITY GENERATION IN THE PENINSULAR SYSTEM

RENEWABLE ENERGY GENERATION IN THE PENINSULAR SYSTEM

40.1 %

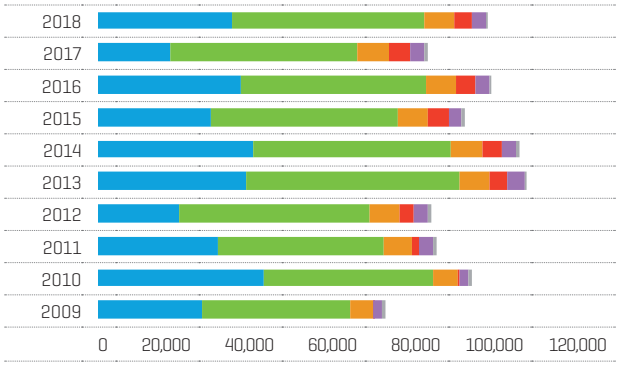
Higher renewable generation in the peninsular system due to the high contribution of hydroelectric energy.

In 2018, **the contribution of renewable energy** to peninsular electricity generation has registered the fourth highest value in the entire historical series, increasing its share in the electricity generation mix to 40.1%, compared to 33.7% in 2017. 2018 was a year with a good contribution from hydroelectric production, almost double that of 2017, a year marked by drought, which helped renewables energies consolidate their large share of the peninsular electricity generation mix.

This increased production of hydroelectric energy once again produced a change in the peninsular generation mix, leading to an decrease in the need to use of power stations that use fossil fuels as a primary source of energy. These non-renewable facilities were replaced by the increase in the production of hydroelectric energy, which resulted above all in lower production from combined-cycle and coal power stations.

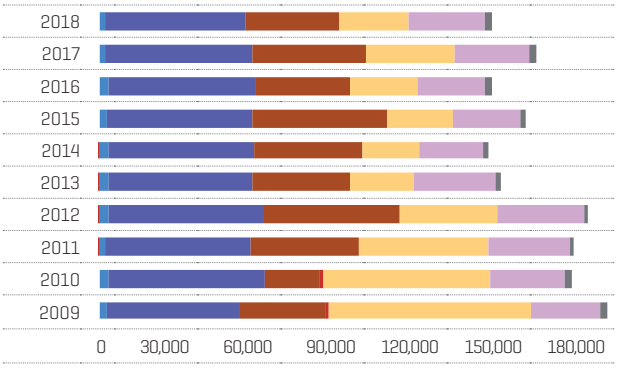
Evolution of renewable and non-renewable electricity generation in the peninsular system (GWh)

RENEWABLES



HYDRO WIND SOLAR PHOTOVOLTAIC SOLAR THERMAL
OTHER RENEWABLES RENEWABLE WASTE

NON-RENEWABLES



PUMPED STORAGE [1] NUCLEAR COAL FUEL/GAS COMBINED CYCLE
COGENERATION NON-RENEWABLE WASTE

(1) Pure pumped storage + estimation of mixed pumped storage.

Wind energy is once again the second largest source of electricity generation for the third year in a row.

Renewable generation in the peninsular system in 2018 grew by 18.5% with respect to the previous year, reaching 99,127 GWh, a value similar to 2016. This growth in renewable energy occurred mainly during the first half of the year, especially in March 2018, when renewable generation was 51.1% higher than in the same month of the previous year, with a record monthly renewable generation of 13,204 GWh.

In addition, on March 20, 2018, the all-time record of daily renewable production was reached with 540 GWh, representing 63.0% of the total peninsular generation for that day.

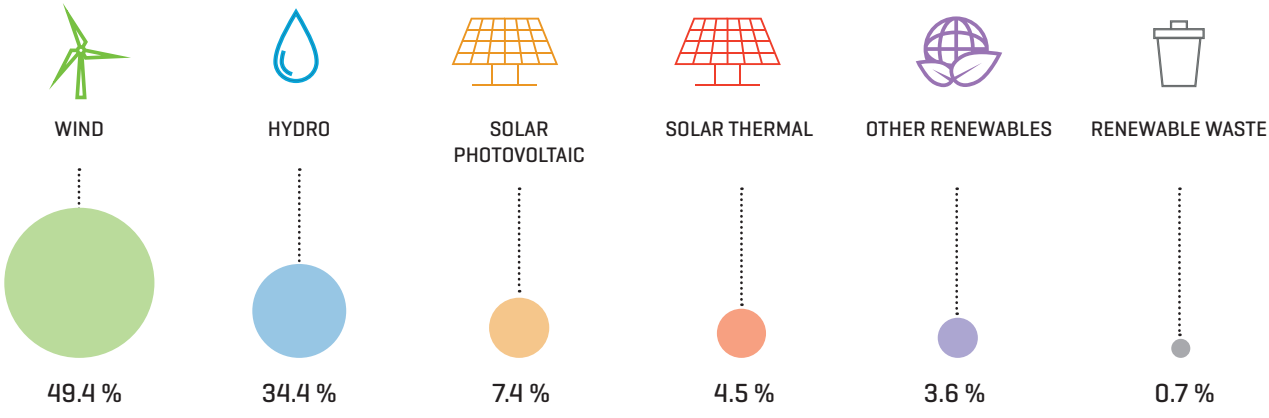
In order to operate an electrical system with such a high penetration of renewable energies under safe conditions, the control and supervision work carried out from Red Eléctrica's Renewable Energy Control Centre (CECRE) is vital. In this direction, the CECRE continues to be a pioneer and one of the world's leading centres for the integration of renewable energies. Thanks to its work, in March 2018 a new all-time high was recorded for monthly wind production, reaching 7,676 GWh, as well as a new record share in the energy mix, reaching 33.1%.

In 2018, peninsular wind production stood at 48,946 GWh, 3.0% higher than the previous year. This increase resulted from a greater availability of primary resources and occurred mainly in the first quarter of the year, when this technology generated 22.3% more than in the same quarter of 2017. In addition, wind continues to be the most important renewable technology in the peninsular system, accounting for almost half (49.4%) of all renewables in 2018.

In line with previous years, wind energy production contributed significantly to the generation mix, with a share of 19.8% of the total production, ranking second behind nuclear power in the technologies of the complete set of generation facilities in the peninsular system.

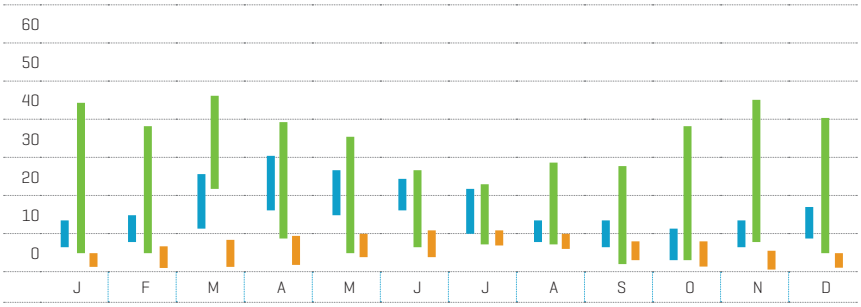
In addition, wind power was the technology that contributed the most to the peninsular production in January (24.3%), February (22.3%), March (33.1%), November (21.4%) and December (21.0%).

Annual generation mix of renewable energy in the peninsular system in 2018 (%)



The high degree of variability of **wind generation** can be seen in the graph of maximum and minimum daily coverage of hydro, wind and solar renewable technologies. During 2018, daily wind production had a share in the generation mix that ranged from a minimum of 2.4% on 19 September and 17 October, to a maximum of 45.3% on 11 March.

Maximum and minimum daily coverage on the peninsular in 2018 using hydro, wind and solar (%)



DAILY MAXIMUM AND MINIMUM DAILY VALUES OF WIND POWER IN THE GENERATION MIX

MAXIMUM

45.3 %

11 MARCH

MINIMUM

2.4 %

19 SEPTEMBER

In 2018, the peninsular hydroelectric power stations almost doubled their production with respect to the previous year.

During 2018, the rains made the increase in hydro possible, increasing 84.9% in annual generation compared to 2017, which was a particularly dry year. From January to December, this technology produced 34,103 GWh, which represents 13.8% of the peninsula's generation mix. In 2018 the total generated by the hydroelectric power stations placed this technology as the fourth largest generation source, while the previous year it was the sixth, accounting for 7.4% of the total for the peninsula.

As shown in the comparative graph of peninsular hydroelectric generation 2017-2018, during all the months of 2018, hydroelectric generation was higher than the generation in 2017. It showed values that were higher than the historical average, calculated with the generation values of the last twenty years, except in the months of January, February, October and December.

In the months of April, June, July and November, peninsular hydroelectric generation was more than double the value recorded for those same months of the previous year. In addition, in April and June hydro was the main source of production of the peninsular energy mix, with contributions of 24.0% and 19.9%, respectively. This contrasts with the previous year's situation, when in May, July, October and November the hydroelectric contribution to the electricity balance sheet recorded all-time lows for those months since monthly values were first recorded (January 1990), contributing 10.2%, 5.6%, 3.8% and 3.9% respectively.

PENINSULAR HYDROELECTRIC GENERATION

34,103

GWh

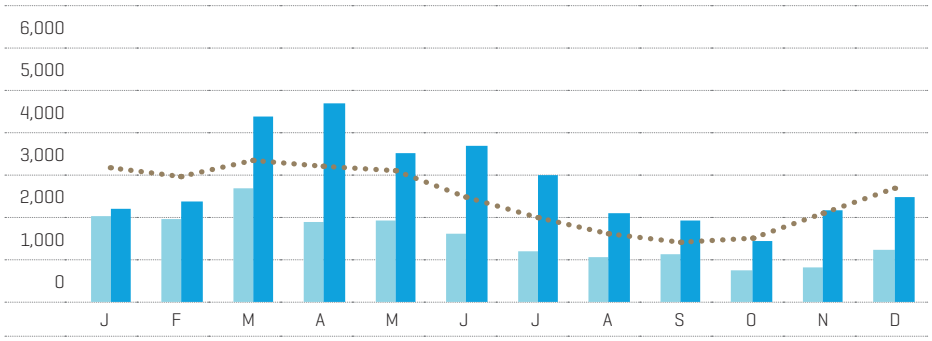
+84.9 %

COMPARED TO 2017

CONTRIBUTION TO THE PENINSULAR GENERATION MIX

13.8 %

Peninsular hydroelectric generation 2017-2018 compared to average generation (GWh)

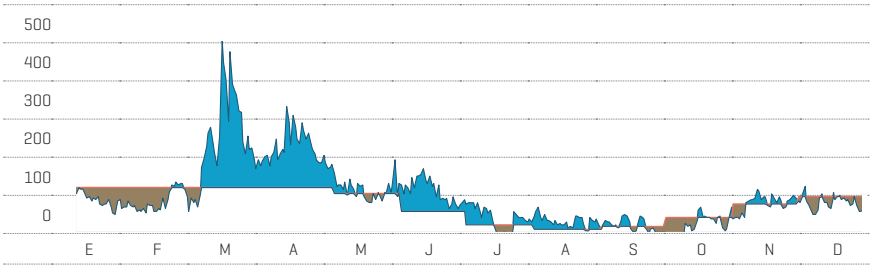


HYDRO GENERATION IN 2017 HYDRO GENERATION IN 2018 HISTORICAL AVERAGE[1]

(1) Average monthly hydroelectric generation over the last 20 years.

The increase in **hydroelectric generation** was in line with the producible hydroelectric values (maximum amount of electricuty that can be produced with the registered contributions), which reached 37,392 GWh in 2018, 134.1% higher than in 2017 and 28.2% higher than the historical average annual value. Therefore, we can consider that 2018, overall, has been a wet year, as the producible hydroelectric index, defined as the quotient between producible energy and average producible energy, registered a value of 1.3.

Daily producible hydroelectric energy during 2017 compared to the historical average producible (GWh)



WET DRY HISTORICAL AVERAGE PRODUCIBLE PRODUCIBLE 2018

Hydroelectric reserves recovered and finished 2018 with values close to the statistical average.

At the beginning of 2018 the starting level of reservoirs was unusually low, marked by the drought of the previous year. However, rainfall during the year increased hydroelectric reserves to bring the volume of water in hydroelectric reservoirs in Spain as of 31 December 2018 to 44.1% of their capacity, 17.7 percentage points above the previous year.

HYDROELECTRIC RESERVES IN THE COMPLETE SET OF RESERVOIRS

44.1 %

OF TOTAL CAPACITY AS AT 31/12/2018

Solar photovoltaic facilities of the peninsular system produced 7,374 GWh, a drop of 7.8% compared to 2017, the year in which the all-time record of annual production was broken, with 8,001 GWh, and a contribution of 3.0% to the peninsular generation mix.
With regard to solar thermal in the peninsular system, in 2018, 4,424 GWh was generated with this technology, 17.3% less than the previous year, when a new annual generation maximum of 5,348 GWh was also registered, and with a contribution of 1.8% to total peninsular production.

The decrease in **solar photovoltaic and solar thermal** is explained by the lower availability of the primary resource, especially in the most important months of spring and summer.
Similarly, production of the rest of the renewables (biogas, biomass, marine and geothermal) was lower, 4.1% compared to the previous year, and its share in the peninsular generation mix was 1.4%.

SOLAR PHOTOVOLTAIC FACILITIES

7,374
GWh

-7.8 %
COMPARED TO 2017

Non-renewable generation decreased due to lower production levels from coal and combined cycle.

Non-renewable energies in the peninsular system generated 147,766 GWh in the 2018, 10.2% lower than in 2017. This decrease contrasts with the 11.2% increase experienced last year and resulted in a 6.4 percentage points drop in its contribution of the total peninsular generation, reaching a share of 59.9% in 2018, compared to 66.3% in 2017.

Within non-renewable energies, nuclear produced a total of 53,198 GWh, 4.2% less than the previous year. This reduction occurred mainly during the first half of 2018, when nuclear production fell by 10.9%. However, from July onwards, nuclear power generation increased, and in the second half of the year produced 2.8% more than in the same period in 2017.

Despite this lower production in the cumulative total for 2018, for the eighth consecutive year, nuclear power stations were the main source of generation on the peninsula (in 2013 they shared the lead with wind power). In 2018, reached a share of 21.5% of peninsular generation (22.4% in 2017).

The utilisation rate of nuclear power stations was 98.3% (ratio between actual production and that which could have been produced if the power stations had operated at their rated power during the whole time they were available).

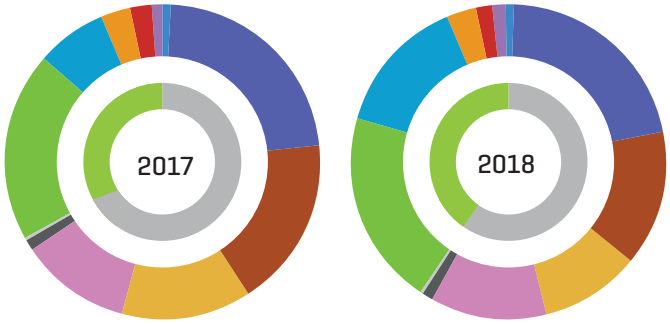
They are the source of generation that operated the largest number of hours, 7,623 hours of the 8,760 hours in the year. And 34.5% of the emission-free electricity generated in 2018 was achieved through nuclear power.

SHARE IN THE PENINSULAR GENERATION MIX

3.0 %

Annual generation structure of the peninsular electricity energy 2017 and 2018 (%)

	2017	2018
PUMPED STORAGE	0.9	0.8
NUCLEAR	22.4	21.5
COAL	17.1	14.1
COMBINED CYCLE	13.6	10.7
COGENERATION	11.3	11.9
NON-RENEWABLE WASTE	1.0	0.9
RENEWABLE WASTE	0.3	0.3
WIND	19.1	19.8
HYDRO	7.4	13.8
SOLAR PHOTOVOLTAIC	3.2	3.0
SOLAR THERMAL	2.2	1.8
OTHER RENEWABLES	1.5	1.4



	2017	2018
RENEWABLES	33.7	40.1
NON-RENEWABLES	66.3	59.9

COAL-FIRED GENERATION IN THE PENINSULAR SYSTEM

34,882

GWh

-17.8 %

COMPARED TO 2017

With regard to **coal-fired power stations** in the peninsular system, in 2017 these generated 34,882 GWh, the third lowest value in the historical series, and 17.8% less than the previous year. This decline was particularly significant in the second quarter of the year, when coal production was 39.1% lower than in the same quarter of 2017. January and June were 41.5% and 46.8% lower than the previous year, respectively.

In the annual calculation, coal-fired power stations were once again the third largest source of production in 2018, despite dropping 3 percentage points in their share of the peninsular generation mix, going from 17.1% in 2017 to 14.1% in 2018.

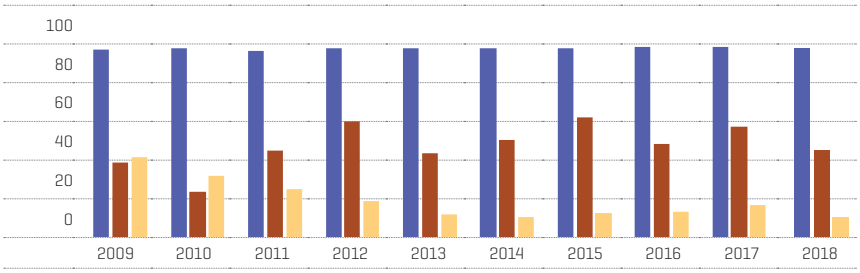
The utilisation rate for coal also dropped, from 57.1% in the previous year to 45.3% in 2018.

SHARE IN THE PENINSULAR GENERATION MIX

14.1 %

Coal-fired power stations were the third source of electricity production in 2018, with a decrease of 3 percentage points in their share in the peninsular generation mix.

Utilisation coefficient of peninsular thermal power stations [1] [%]



[1] The utilisation coefficient is the quotient between actual production and the available production or maximum production that the power station could.

COMBINED CYCLE GENERATION IN THE PENINSULAR SYSTEM

26,403

GWh

-21.5 %

COMPARED TO 2017

SHARE IN THE PENINSULAR GENERATION MIX

10.7 %

In terms of combined cycle production, after three consecutive years of production increases, in 2018, combined cycle generated 21.5% less than the previous year, with an annual total of 26,403 GWh. In the second half of the year, production fell by 28.5% compared to the same period last year, with drops of 40.3% in July and 35.0% in October 2018.

As a result of this lower production, combined cycle generation fell 2.9 points in the overall generation mix,, with a share of 10.7% in 2018 (13.6% in 2017), and becoming the sixth largest generation source.

The utilisation rate of this technology in 2018 reached 13.2% (16.7% in 2017).

In 2018, combined cycle power stations were the sixth largest generation source, dropping 2.9 points in the overall generation mix.

Electricity generation in non-peninsular systems dropped after three consecutive years of growth.

The annual production of electricity in all non-peninsular systems in 2018 reached 14,081 GWh, 0.7% lower than the previous year. This decline followed three consecutive years of growth in non-peninsular generation. By system, in the Balearic and Canary Islands production decreased by 0.4% and 1.0%, respectively, while in Ceuta and Melilla it grew by 2.2% and 1.2%.

The electricity produced in the Balearic Islands system also decreased after three years of growth, reaching 4,820 GWh in 2018, 0.4% less than in the previous year. Coal-fired power stations reduced their production by 7.9%, but are still the technology with the highest share in the generation mix of this system, representing 49.6% of the total generated in 2018 (53.7% in 2017).

In contrast, the combined cycle power stations in the Balearic Islands generated 40.5% more in 2018 than in 2017. This technology reached the share in the generation mix of 12.3%, 3.6 points more than the previous year.

ANNUAL ELECTRICITY PRODUCTION IN NON-PENINSULAR SYSTEMS

14,081

GWh

-0.4 % BALEARIC ISLANDS

-1.0 % CANARY ISLANDS

+1.2 % MELILLA

+2.2 % CEUTA

-0.7 %

COMPARED TO 2017

The energy transferred from the Peninsula in 2018 increased by 4.6%.

The drop in generation in the Balearic Islands was offset by the larger amount of energy from the Peninsula through the Peninsula-Balearic Islands link, which in 2018 increased by 4.6% in comparison with the previous year.

This increase in incoming energy occurred mainly during the first half of the year, recording an increase of 54.9% in February. However, the summer months from June to September were still the months with the highest volume of energy exchange.

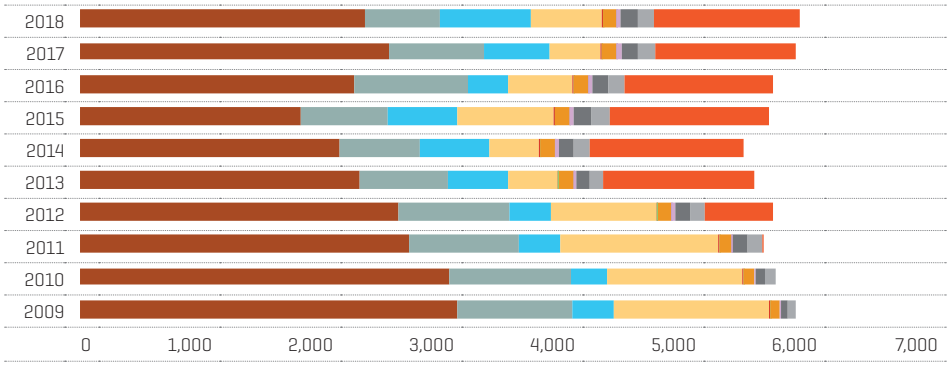
The energy transferred from the peninsula covered 20.4% of the demand of the Balearic Islands, reaching peaks that exceeded 33% of hourly consumption, which led to a 14% reduction in the cost of coverage of the Balearic Islands system and has avoided the emission of around 400,000 tonnes of CO_2 into the atmosphere in the Balearic Islands.

ENERGY EXCHANGE BETWEEN THE SPANISH PENINSULA AND THE BALEARIC ISLANDS

+4.6 %

COMPARED TO 2017

Evolution of demand coverage in the Balearic Islands (GWh)



COAL DIESEL ENGINES GAS TURBINE COMBINED CYCLE [1] GENERATION AUXILIAR[2] WIND
SOLAR PHOTOVOLTAIC OTHER RENEWABLES COGENERATION NON-RENEWABLE WASTE
RENEWABLE WASTE PENINSULA-BALEARIC ISLANDS LINK[3]

(1) Includes operation in open cycle mode.
(2) Emergency generators installed temporarily in specific zones to cover a deficit in generation.
(3) Peninsula-Balearic Islands' link working at minimum technical level until 31/08/2012.

Installed wind power capacity in the Canary Islands doubled in 2018.

ENERGY PRODUCTION IN THE CANARY ISLANDS ELECTRICITY SYSTEM

8,841

GWh

-1.0 %

COMPARED TO 2017

RENEWABLE ELECTRICITY GENERATION IN THE CANARY ISLANDS

+32.2 %

COMPARED TO 2017

As in the Balearic Islands, the production of electricity in the Canary Islands electricity system dropped, after the previous three years of growth, to 8,841 GWh in 2018, 1.0% less than the previous year. The decrease in generation in 2018 was mainly concentrated in fossil fuel technologies, such as diesel engines, gas and steam turbines, whose generation fell by 5.4%, 9.5% and 8.2% respectively compared to the previous year.

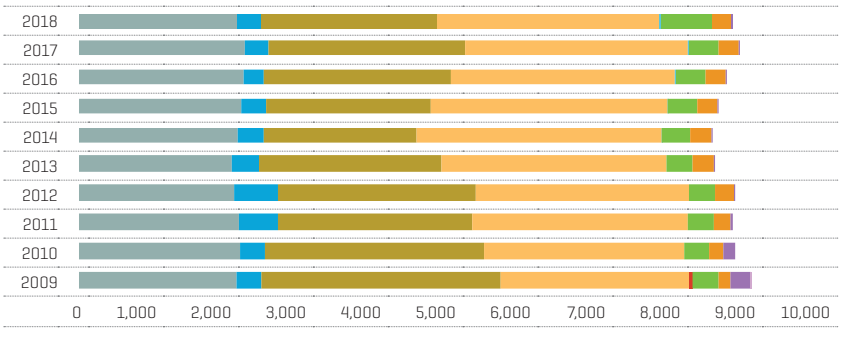
On the other hand, the installed wind power capacity in the Canary Islands increased from 207 MW to 413 MW in the last year, an increase of 99.5%. As of 31 December 2018, this installed wind power capacity accounted for 13.8% of the total installed capacity, compared with 7.4% in 2017.

Generation from renewable sources in 2018 was 32.2% higher than the previous year and accounted for 10.5% in the Canary Islands generation mix, 2.6 percentage points higher than in 2017.

This large increase in installed renewable generation in the Canary Islands, particularly wind power, led to a revision of the operating criteria of its systems, in order to ensure the integration of its energy under safe conditions for the Canary Islands' electrical system.

In addition, Red Eléctrica completed and commissioned the new transmission infrastructure included in the Canary Islands Wind Plan, which are necessary to connect the electricity generated by the new wind and photovoltaic farms to the electricity systems in the Canary Islands.

Evolution of demand coverage in the Canary Islands (GWh)



(1) Includes operation in open cycle mode. Uses gas-oil as primary fuel.
(2) Emergency generators installed temporarily in specific zones to cover a deficit in generation.

The execution of the Canary Islands Wind Plan is a necessary and significant step towards the energy transition in a process of electrification of society that will change the way that electricity is generated, distributed and consumed.

In 2018, the development of transmission and wind generation infrastructure led to new peak wind power records in Tenerife, reaching a value of 113.27 MW on 27 December, compared to 32.45 MW on 29 February 2016, a record set prior to the wind power plan.

On 2 November, the island of Gran Canaria recorded a record high of 127.55 MW of wind power, 64% more than the previous record of 16 February 2016, before the wind plan.

New monthly record of renewable integration on the island of El Hierro.

For the island of El Hierro, which is an electrical system that is especially important because it includes the Gorona del Viento hydroelectric power station, the continuous revision of its operating criteria has made it possible to achieve even higher levels of renewable integration. As a result, 96.2% of the electricity consumed on the island of El Hierro during the month of July 2018 was of renewable origin and it reached the maximum monthly integration of renewables in Spain.

In the cumulative total for 2018, renewable generation on El Hierro covered more than half of its electricity demand, 56.5%, which is 10 percentage points more than in the same period of the previous year.

The favourable wind conditions and recently-introduced operational improvements as a result of collaboration between Red Eléctrica and the Gorona del Viento hydroelectric power station made it possible to integrate renewable generation more fully into the El Hierro system.

ELECTRICITY CONSUMED ON THE ISLAND OF EL HIERRO DURING THE MONTH OF JULY 2018

96.2 %

WAS FROM RENEWABLE SOURCES

The demand for electricity on the island of El Hierro was covered with 100% renewable energy for more than 18 consecutive days.

Consequently, El Hierro's electricity system covered its electricity demand with 100% renewable energy for 18 days and 9 consecutive hours, starting this period of uninterrupted renewable production on 15 July and ending on the morning of 2 August.

The Gorona del Viento hydro-wind power station, operated by Red Eléctrica, began operating at full capacity in July 2015 and since then has become a key element in the integration of renewable generation on the island of El Hierro. Similar positive effects will be produced in the Chira-Soria pumped-storage hydroelectric station for the integration of renewables in Gran Canaria.

The Chira-Soria pumped-storage hydroelectric power station is an essential project for the new Canary Islands energy model.

Red Eléctrica is the company responsible for developing energy storage projects by means of hydroelectric pumping power stations whose main purpose is to guarantee supply, system security and the integration of renewable energies that cannot be managed in isolated electrical systems.

Red Eléctrica's Chira-Soria project on the island of Gran Canaria involves the development of a power station capable of storing renewable generation surpluses that cannot be integrated into the electricity system, which will occur when the production of this type of energy is high, avoiding dumping. This will allow it to be used later at times of lower renewable production. But the Chira-Soria project designed by Red Eléctrica goes even further. The power station, in addition to storing a large amount of energy, through its flexibility and regulatory capacity, will be able to meet the objectives behind its design: the integration of renewables, the security of the system and the guarantee of supply.

With an investment of more than 300 million euros, the Chira-Soria plant will have 200 megawatts of power, which represents around 36% of the current peak demand in Gran Canaria. The project includes the construction of a seawater desalination plant and the associated marine works, as well as the necessary installations for connection to the transmission grid to be able to send this energy to the system. It is estimated that 500 direct jobs and 1,500 indirect jobs will be created during the project.

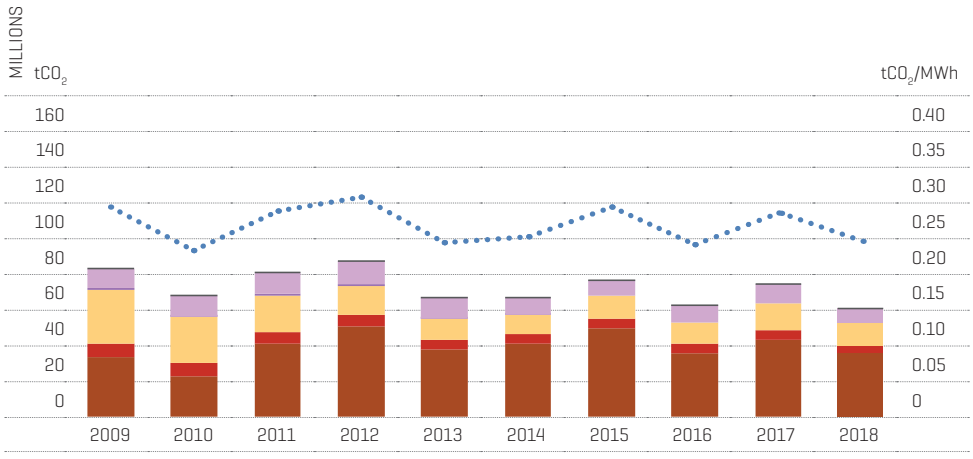
With regard to the progress made in 2018 in the development of the project, it should be noted that in June, the expansion of the geotechnical campaign was completed, with a budget of 1.5 million euros, in order to determine the geological and geotechnical characteristics of the land on which the power station will be built in detail. In addition, the design and engineering of the construction project was awarded, as well as technical assistance and site management, for an approximate amount of 20 million euros, which means the incorporation of a team of more than 70 people over the life of the project.

The increase in the share of renewables has a direct effect on the decrease in CO_2 emissions.

National renewable generation reached 38.5% of the total in 2018, representing a growth of 6.3 percentage points compared to 32.2% to year earlier. This increase in renewables has allowed CO_2-free generation, including renewables, pumped storage and nuclear, to increase its share to 59.7% compared to 54.3% in 2017.

The composition of the generation mix determines the variations in CO_2 emissions associated with the generation of electricity. The increase in national renewable generation in 2018 resulted in a 13.8% decrease in CO_2 emissions with respect to the previous year. CO_2 emissions of the Spanish electricity system in 2018 reached 64.2 million tonnes, of which 55.5% are associated with coal-fired production and 18.4% are related to combined cycle.

CO_2 emissions and emission factor associated to national electricity generation [1]



[1] Includes Peninsula, Balearic Islands, Canary Islands, Ceuta and Melilla.

Extremadura tiene el mix energético con menos emisiones de CO_2,

GREATEST SHARE OF ELECTRICITY GENERATED NATIONWIDE

42,468

GWh

CATALONIA

GREATEST INCREASE IN GENERATION

+19.5 %

COMPARED TO 2017

GALICIA

GREATEST SHARE OF NATIONAL RENEWABLE GENERATION

20.5 %

OF THE NATIONAL TOTAL

CASTILLA Y LEÓN

Some of the most important aspects of electricity generation by autonomous communities in 2018 include the following:

— Catalonia was the region that generated the most energy in 2018, a total of 42,468 GWh, despite the fact that its production fell by 5.2% compared to 2017. Most of this generation (70.4%) was CO_2-free.

— Galicia was the autonomous community with the greatest increase in generation in 2018, 19.5% higher than in 2017. This growth was due to the increase in renewable generation, specifically from hydroelectric power stations and wind farms, which produced 161.2% and 21.4% more than last year, respectively.

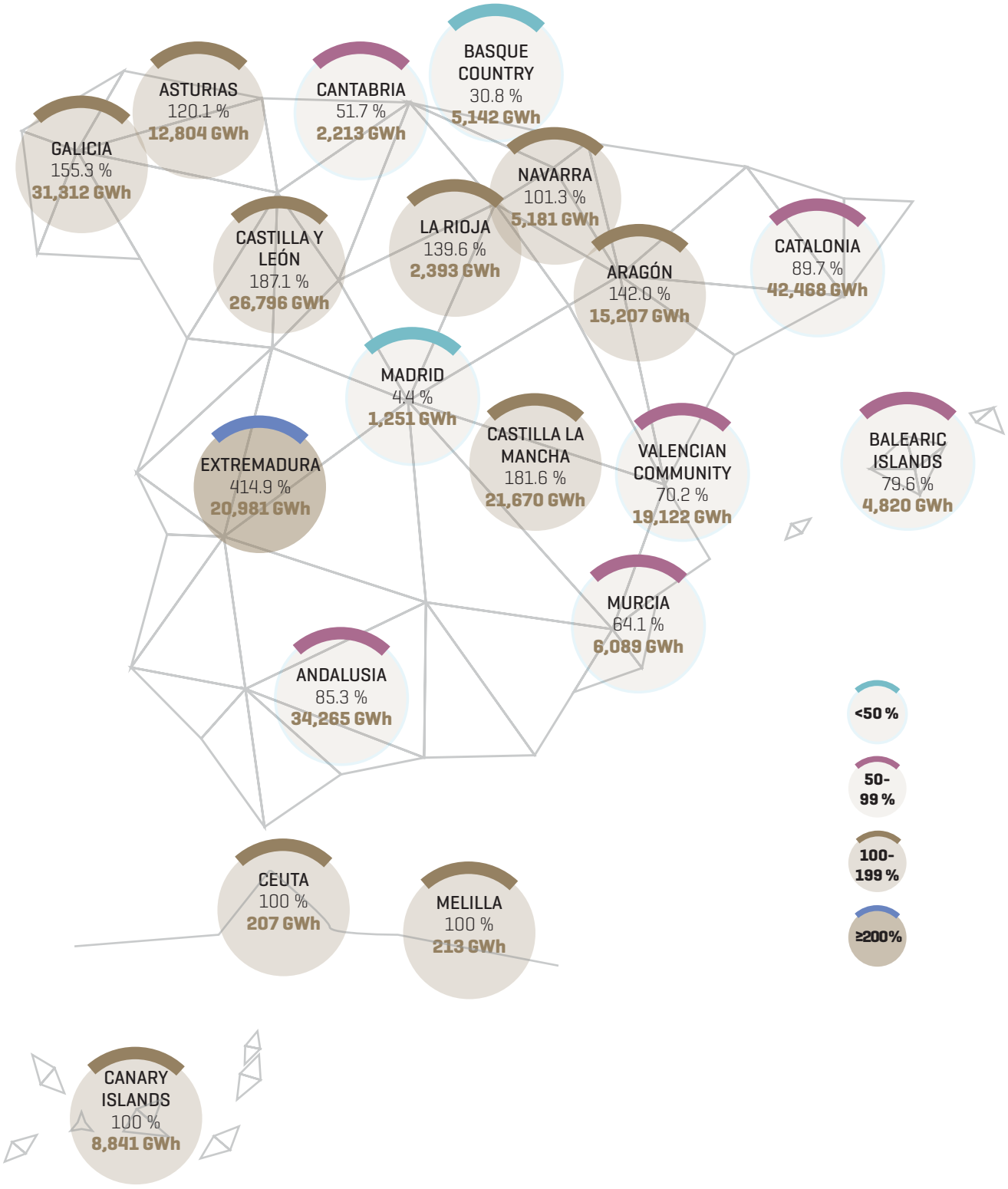
— Castilla y León continues to record the highest production of renewable energy, reaching 20,593 GWh in 2018, representing 20.5% of the national renewable total. It is also the region with the highest share of renewables in its generation mix, 76.8% in 2018. More than half of this renewable generation was wind.

— Extremadura has the energy mix with the highest percentage of generation without emissions, since 99.7 % of its production comes from emissions-free technologies.

— During 2018, eight autonomous communities generated more electricity than they consumed, with Extremadura standing out by generating four times more energy than the demand. It was followed by Castilla y León and Castilla-La Mancha, which produce almost twice as much as they need to meet their demand.

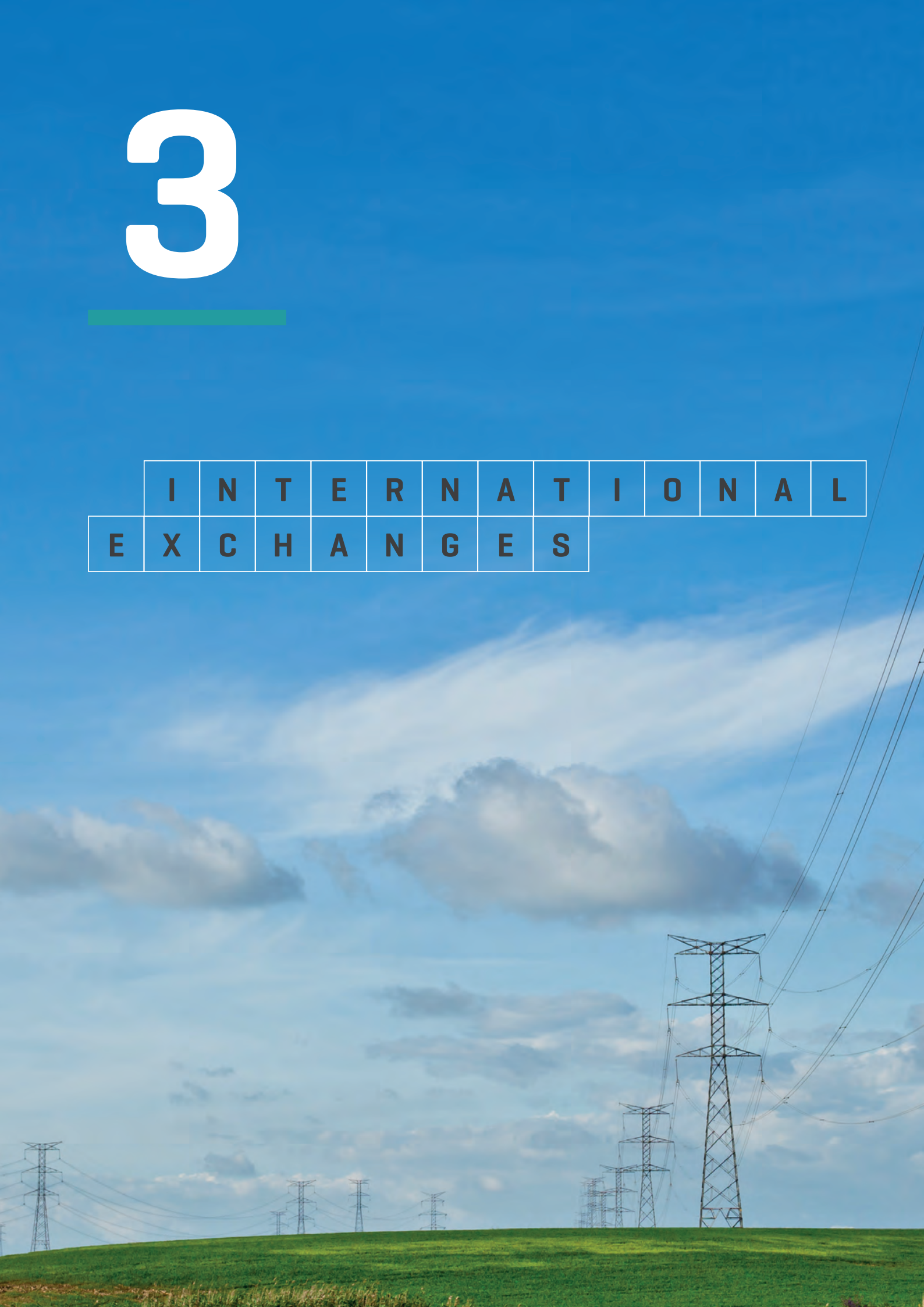
— In relation to installed power capacity, the most significant variations in 2018 were in: Catalonia with a reduction of 3.2% due to the definitive closure of the 386 MW Tarragona I combined-cycle thermal power station, and in the Canary Islands, where wind power doubled from 207 MW installed in 2017 to 413 MW in 2018.

Generation/Demand ratio (%) and generation (GWh) in 2018 by autonomous community



3

INTERNATIONAL EXCHANGES



For the third consecutive year, Spain's electricity exchange programmes with other countries closed 2018 with an import balance.

11,090
GWh
IMPORT BALANCE

+20.9 %
COMPARED TO 2017

10,499 GWh
IN EXPORT PROGRAMMES

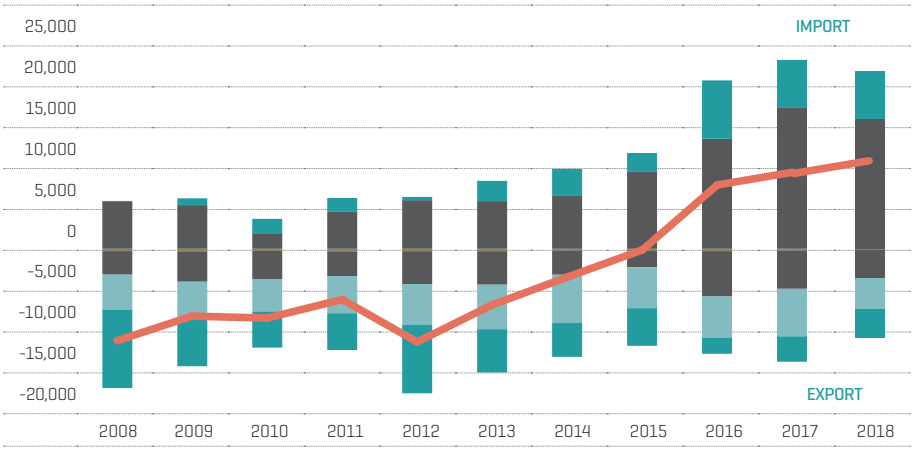
-23.1 %
COMPARED TO 2017

21,590 GWh
IN IMPORT PROGRAMMES

-5.4 %
COMPARED TO 2017

The volume of energy scheduled through interconnections reached 32,089 GWh, a value 12.0% lower than in 2017. 10,499 GWh of exports were scheduled, 23.1% lower than the previous year, and 21,590 GWh of imports, 5.4% less than in 2017. As in the previous year, the net balance is once again as an importer, with a value of 11,090 GWh, 20.9% higher than in 2017.

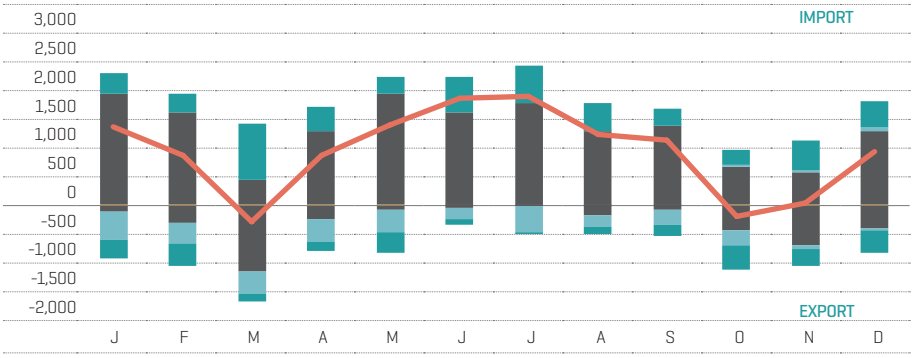
Annual evolution of scheduled international energy exchanges (GWh)



PORTUGAL MOROCCO FRANCE ANDORRA BALANCE

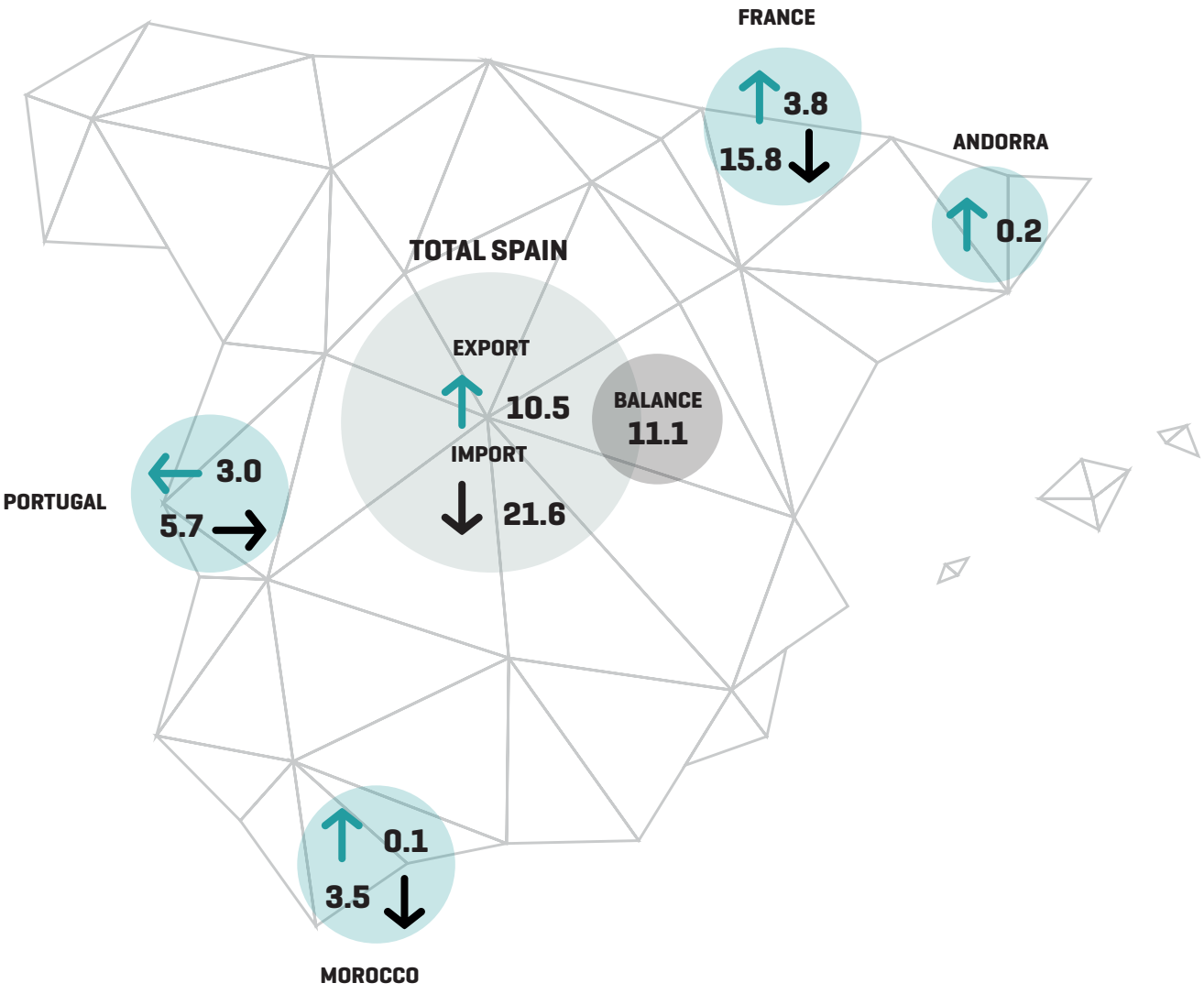
In 2018 there were net monthly import balances of energy scheduled exchanges in the Spanish interconnections, except for the months of March and October. The maximum net import balance was in July (1,895 GWh)

Monthly evolution of scheduled international energy exchanges 2018 (GWh)



PORTUGAL MOROCCO FRANCE ANDORRA BALANCE

Scheduled energy exchanges by interconnection 2018 [TWh]



FRANCE

12,042 GWh

EXCHANGES WITH FRANCE IMPORT BALANCE

-3.4 %

COMPARED TO 2017

The annual balance of electricity exchanges through the interconnection with France was as an importer with a total of 12,042 GWh, 3.4% less than in 2017. Import programmes totalled 15,816 GWh, 7.3% lower than the previous year, while export programmes decreased to 3,775 GWh, 18.0% lower than last year. With the exception of March and November, the monthly net balances were registered with importer values.

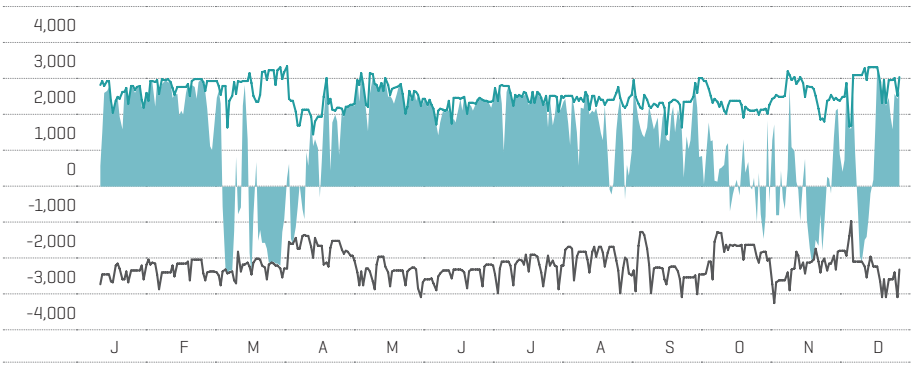
15,816 GWh

IN IMPORT PROGRAMMES

-7.3 %

COMPARED TO 2017

Exchange capacity and net balance of scheduled exchanges at the interconnection with France 2018 (MW/MWh)



3,775 GWh

IN EXPORT PROGRAMMES

-18.0 %

COMPARED TO 2017

During 2018 there was a high level of utilisation of this interconnection with it being congested most of the time in the direction from France to Spain (52% of the hours).

Regarding the use of exchange capacity in the interconnection with France, from May to July the interconnection was mostly congested in the import direction, with use above 90% on 48% of the days. In March, the use in the export direction predominated (78% of the hours) mainly due to the high producible hydroelectric and wind power.

In the last half of November, a situation of tighter coverage was identified in the French electricity system due, among other causes, to the cold spell and the situations of non-availability affecting the French nuclear power stations. The balance of the interconnection during this second half of the month was an export balance (73% of the hours) more than an import balance.

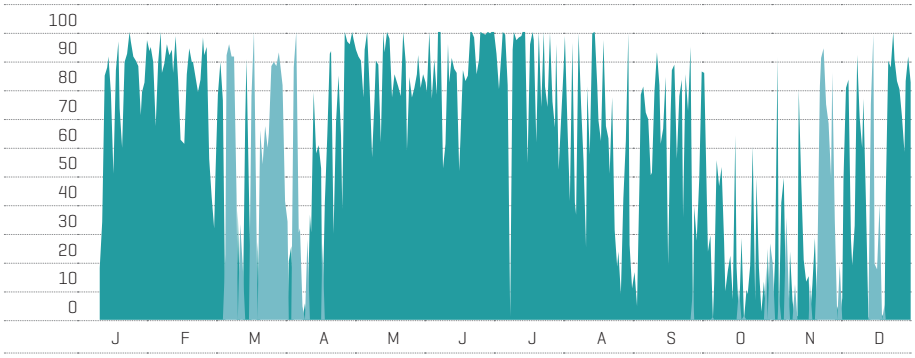
CONGESTION IN THE INTERCONNECTION WITH FRANCE WAS IN THE IMPORT DIRECTION FOR A TOTAL OF THREE MONTHS

48 %

OF THE DAYS WITH A UTILISATION RATE IN EXCESS OF

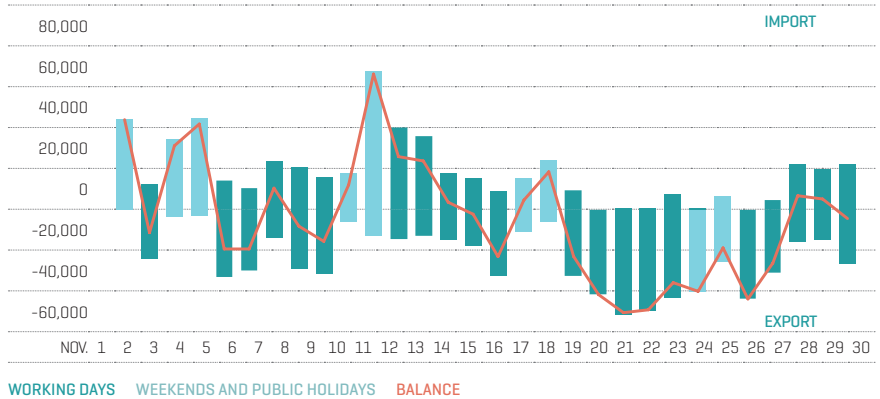
90 %

Utilisation rate of exchange capacity at the interconnection with France 2018 (%)



The cold spell and the non-availability of French nuclear power stations meant that the balance over the interconnection with France was an export balance on 73% of the days in the second half of November.

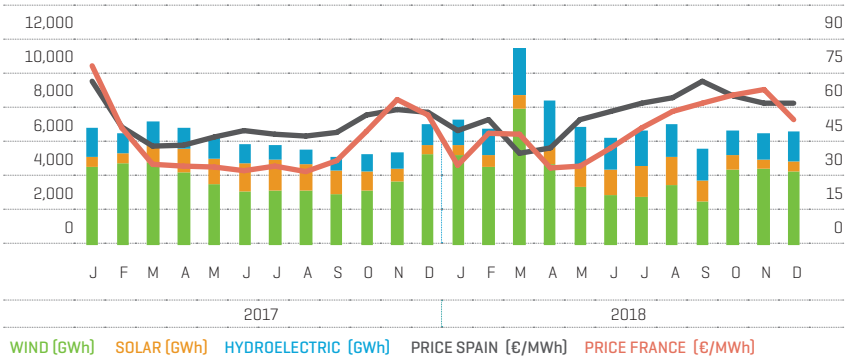
Effect of the cold snap and the french nuclear non-availability at the interconnection with France. November 2018 (GWh)



Comparing the evolution of day-ahead market prices in France and Spain with the behaviour of renewable generation in Spain over the last two years, it can be observed that when renewable generation is high in Spain, the price differentials with the neighbouring country are lower.

In January and November 2017 and November 2018, the french electricity system registered higher day-ahead market prices due to non-availability affecting french nuclear power stations, which led to an increase in energy export programmes from the spanish system and a higher ratio of utilisation of non-renewable generation in Spain.

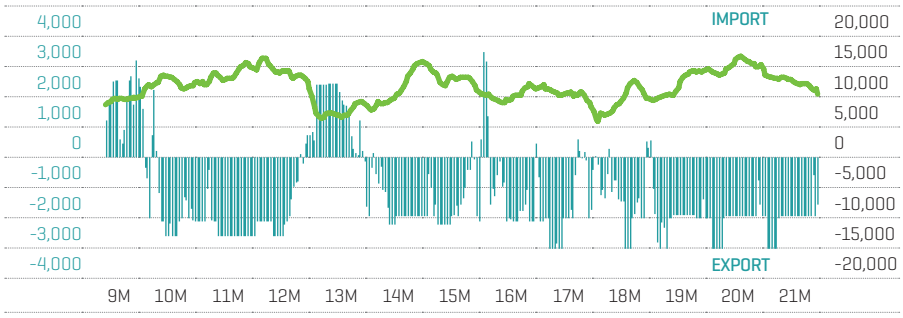
Renewable generation in Spain and day-ahead market prices (GWh/€MWh)



In March 2018, the high hydroelectric and wind production increased the share of renewable energy in the generation mix of the day-ahead market, resulting in lower prices in Spain than in France.

Wind energy production influences prices and conditions the exchange direction. In March, the balance of the exchange programmes with France was as an importer when there were low levels of wind production in Spain, with the balance shifting to mainly an exporter with high levels of wind energy production.

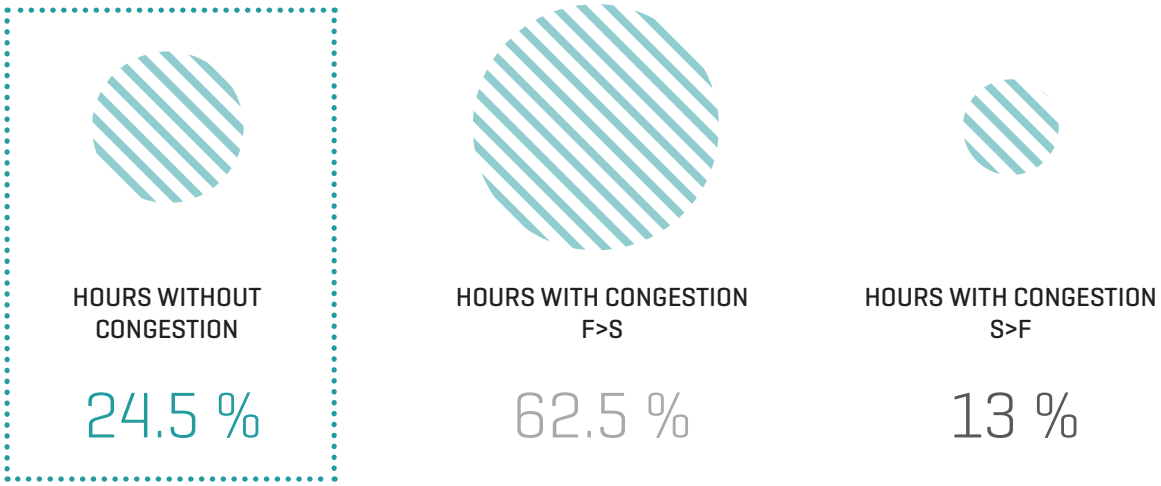
Net balance of scheduled exchanges over the interconnection and wind power generation in Spain (9 to 21 March 2018) (MWh)



Regarding the level of utilisation of exchange capacity in the daily horizon, a high rate of utilisation of this interconnection was registered. Five out of every eight hours (62.5%), the interconnection was congested in the direction France to Spain, with an average price difference of 14.3 €/MWh; in 13% of the hours, Spain to France was congested, with an average price difference also of 14.3 €/MWh, and in the remaining 24.5% of hours, no congestion was observed over this interconnection.

In 2018, there was not a single complete day without congestion in the day-ahead market on the interconnection with France. 78% of the days there were more than 12 hours of congestion.

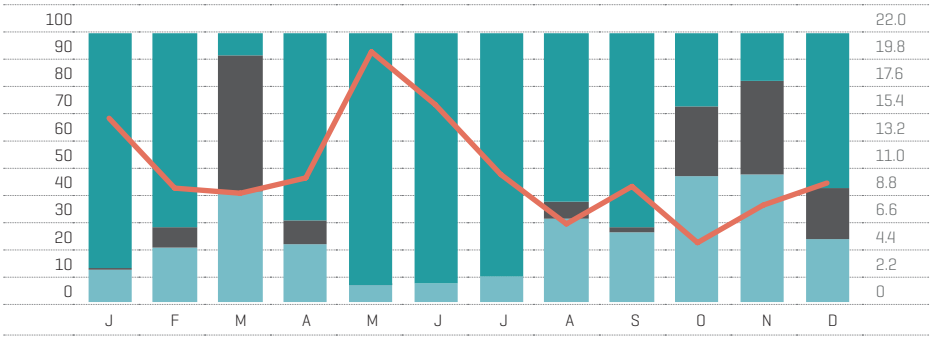
Hours with congestion and without congestion in the interconnection with France in 2018 (%)



Congestion levels for the use of exchange capacity on the day-ahead market were higher in the France to Spain direction every month, except in March and November, when prices in Spain were lower than in France. In October Spain's price was slightly lower than France's, although the percentage of hours of congestion in each direction is balanced.

The average price differential in absolute value was equal to 10.8 €/MWh in 2018.

Hours with and without congestion at the interconnection with france and the difference in prices of the day-ahead market 2018 [% and €/MWh]



Congestion revenues generated in 2018 in this interconnection totalled 225 million euros (188 million in the import direction and 37 million in the export direction), with 50% corresponding to the Spanish electricity system. This value is 2.0% higher than the revenue generated in 2017. With regard to the prices resulting from exchange capacity auctions, the marginal price of the annual capacity auction for the year 2018 in the Spain → France direction was equal to 2.25 €/MW, a value 8.5% lower than the price of capacity in the annual auction for 2017 (2.46 €/ MW). In the French → Spanish direction, the resulting marginal price was equal to €10.25/MW, which represents an increase of almost 27% over that direction of flow in the annual auction for 2017 (€8.10/MW).

The maximum price of allocated capacity in monthly auctions was registered in June, in the France → Spain direction with a value of 24.20 € / MW. In the Spain-France direction, the maximum price was reached in December at 7.11 €/MW.

Cross-border balancing services, managed via the BALIT platform, have enabled 23 GWh of balancing energy to be scheduled for import and 204 GWh for export at this border.

In 2018, less markedly than the previous year, the application of coordinated counter-trading actions (exchange programmes, in the opposite direction, in order to guarantee already established commercial programmes when faced with reductions in capacity) by the electricity system operators in Spain and France was required, for a total value of 195 GWh, much lower than the 406 GWh scheduled for the previous year, although much higher than the years prior to 2017.

225
MILLION EUROS
CONGESTION REVENUES FOR THE INTERCONNECTION SPAIN – FRANCE

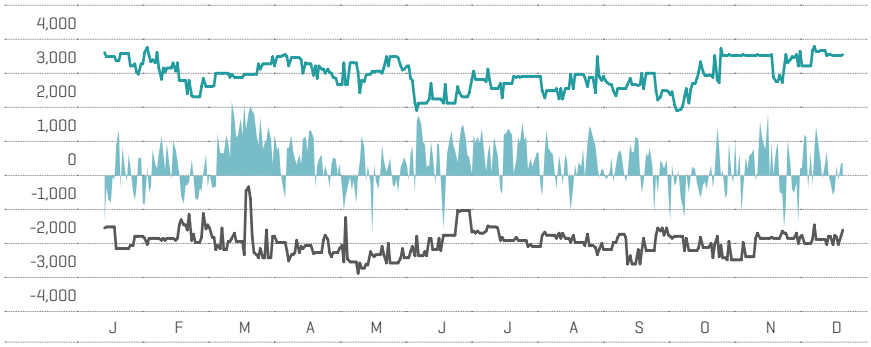
188
MILLION EUROS IN THE IMPORT DIRECTION

37
MILLION EUROS IN THE EXPORT DIRECTION

PORTUGAL

The annual balance of the energy exchanges scheduled over the interconnection with Portugal was once again as an importer, for a value of 2,654 GWh, compared to a value of 2,685 GWh in 2017. The import programmes reached a total of 5,651 GWh, a reduction of 1.8% with respect to the previous year, while export programmes reached 2,997 GWh, 2.4% lower than last year.

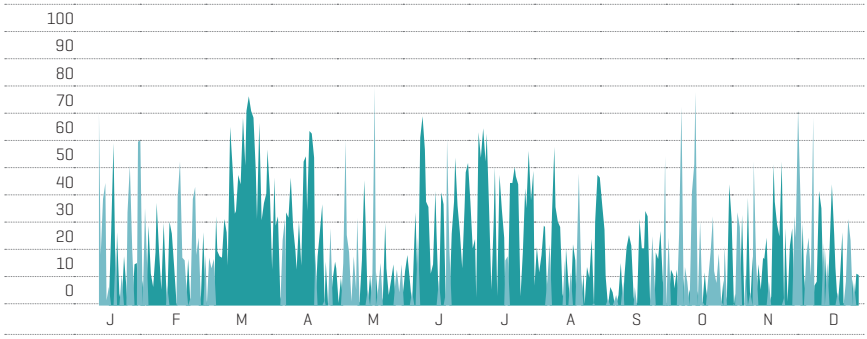
Exchange capacity and net balance of scheduled exchanges over the interconnection with Portugal in 2018 (MW/MWh)



IMPORT CAPACITY (MW) EXPORT CAPACITY (MW) BALANCE PORTUGAL (MWh)

The net balance of programmes was as an importer every month, except in February, May and October. 3,645 hours were recorded in the total for the year with an export balance, with October being the month with the most hours of export balance, 457 hours. Portugal significantly reduced the hours of energy export capacity from Spain (S→P) in order to integrate the maximum amount of wind power production into its system. Regarding the final daily use of exchange capacity, no days with 24-hour congestion were recorded on this interconnection. The maximum use of the exchange capacity in the export direction was 86% and in the import direction, 75%.

Utilization rate of exchange capacity at the interconnection with Portugal 2018 (%)



IMPORT EXPORT

2,654 GWh
ENERGY EXCHANGES WITH PORTUGAL IMPORT BALANCE
-1.2 %
COMPARED TO 2017

5,651 GWh
IMPORT PROGRAMMES
-1.8 %
COMPARED TO 2017

2,997 GWh
EXPORT PROGRAMMES
-2.4 %
COMPARED TO 2017

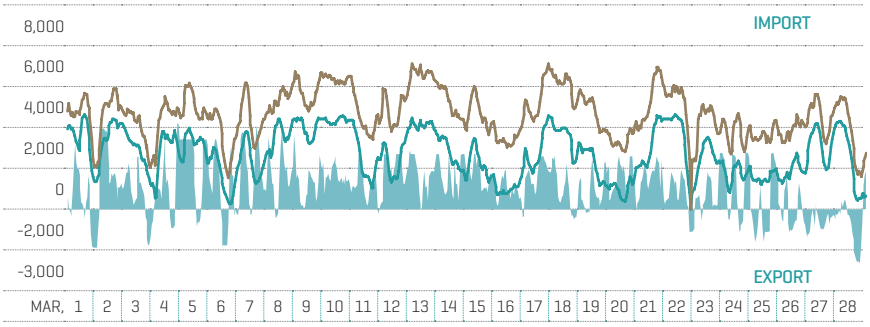
Hydroelectric generation and wind energy have a very important influence on the balances of scheduled exchanges on the interconnection with Portugal.

The import balances are largely due to the high wind and hydro production in Portugal, which ended the year with a producible wind power index of 1.00 and producible hydroelectric power index of 1.051. March was the month with the highest import balance and also the month with the highest producible hydroelectric and wind power indixes (2.22 and 1.52, respectively) recorded in the Portuguese system. July, June and August, in that order, are the months with the next highest import balances and also have a high producible hydroelectric index (over 1.5) in the Portuguese system.

However, the producible hydroelectric index hit minimum values in February, January, October and December, months during which there were more exports.

Both hydroelectric and wind energy production have a significant influence on the scheduled balances on the interconnection with Portugal. As an example, we can see how in a month with high wind and hydroelectric generation in Portugal (such as March), the balance is as an importer, while during low-production months, it is as an exporter or with a low importer balance.

Balance of scheduled exchanges at the interconnection and wind power and hydro generation in Portugal in March 2018 (MWh)



LESS THAN
6 %
OF HOURS WITH CONGESTION

In the daily horizon, the coupling rates registered in the interconnection with Portugal in 2018 were high, resulting in a percentage of hours with congestion in the day-ahead market of less than 6%. Consequently, the prices in both systems were very similar, with an hourly price differential in absolute terms of 0.3 €/MWh.

(1) Source REN (http://www.centrodeinformacao.ren.pt/PT/InformacaoExploracao/Paginas/EstatisticaMensal.aspx)

Hours with and without congestion in the interconnection with Portugal in 2018 [%]

HOURS WITHOUT CONGESTION

94.8 %

HOURS WITH CONGESTION P>S

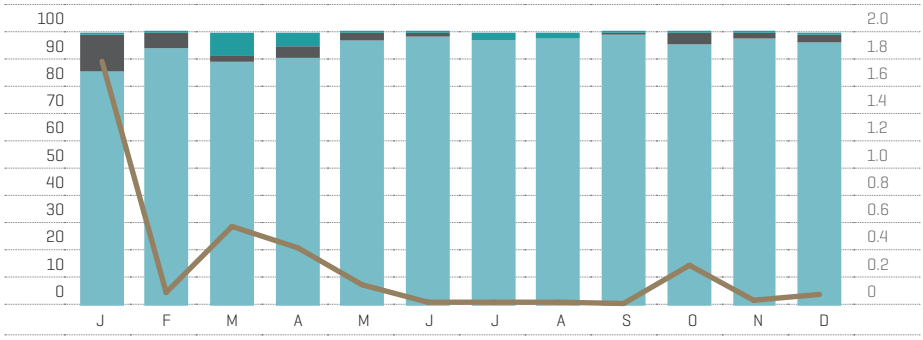
2.0 %

HOURS WITH CONGESTION S>P

3.2 %

In the monthly evolution, we can see how September was the month with the highest coupling rate, while in January the highest percentage of hours with congestion was registered, almost 14% of the total number of hours of the month, and a price difference of 1.8 €/MWh.

Monthly congestion levels at the Spain – Portugal interconnection 2018 [% and €/MWh]



HOURS WITHOUT CONGESTION HOURS WITH CONGESTION S>P HOURS WITH CONGESTION P>S
PRICE DIFFERENCE IN ABSOLUTE VALUE (€/MWh)

5.1
MILLION EUROS
CONGESTION REVENUES IN THE INTERCONNECTION SPAIN - PORTUGAL

98 %
DAY-AHEAD MARKET

Congestion revenues reached 5.1 million euros, with 98% coming from the day-ahead market and the remaining 2% from the intraday market. 50% of this amount corresponds to the Spanish electricity system.

Through the management of cross-border balancing services, have enabled 26 GWh of balancing energy to be scheduled for import and 99 GWh for export at this interconnection.

In 2018 it was necessary to apply coordinated counter-trading actions for a total value of 2,018 MWh, 72% of which were programmed in the import direction and the remaining 28% in the export direction.

MOROCCO

3,395 GWh

ENERGY EXCHANGES WITH MOROCCO EXPORT BALANCE

-40.9 %

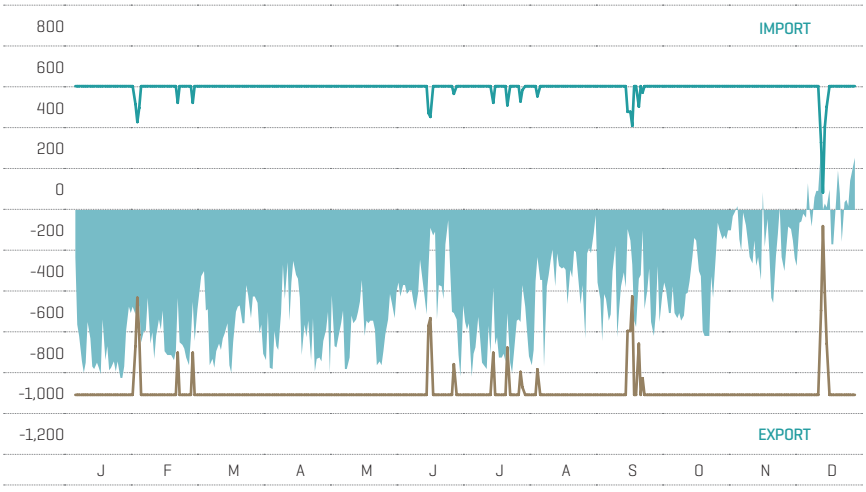
COMPARED TO 2017

The annual balance of the electricity exchanges scheduled in the interconnection with Morocco was as an exporter, with a value of 3,395 GWh, representing a decrease of 40.9% with respect to last year and the lowest since 2006, the year in which the second interconnection was commissioned. The net balance for the month of December was as an importer for the first time in history.

The average use of the capacity of this interconnection in the export direction was 45%, lower than the 77% of use of the previous year.

The reductions in exchange capacity at this interconnection were due to the non-availability of one of the two links that make up this interconnection (from 4 p.m. on 15 December to 6.25 p.m. on 16 December the two interconnections coincided) or a line of influence (as in the case of 31 January).

Exchange capacity and net balance of scheduled exchanges at the interconnection with Morocco in 2018 (MW/MWh)



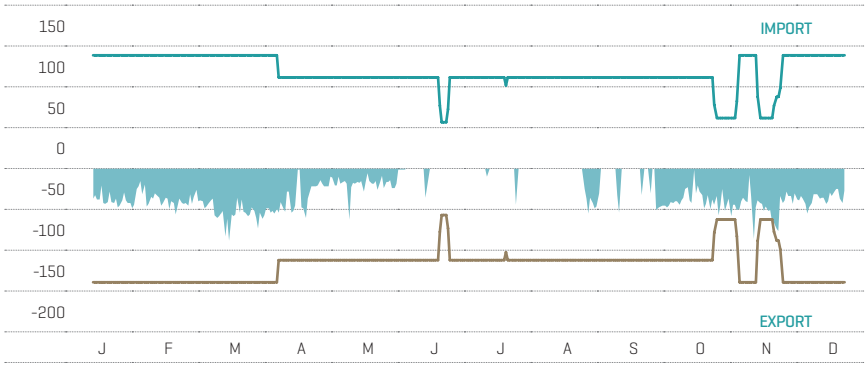
ANDORRA

The annual balance of the electricity exchanges scheduled at the interconnection with Andorra was an exporter, with a value of 211 GWh, which represents a reduction of 9.6% with respect to 2017. The average capacity utilisation in the export direction was 22%.

211
GWh
ENERGY EXCHANGES WITH ANDORRA EXPORT BALANCE

-9.6 %
COMPARED TO 2017

Exchange capacity and net balance of electricity exchanges scheduled at the interconnection with Andorra in 2018 (MW/MWh)



IMPORT CAPACITY (MW) EXPORT CAPACITY (MW) BALANCE ANDORRA (MWh)

4

ELECTRICITY TRANSMISSION

In order to guarantee the security and quality of supply, in 2018 the transmission grid was further strengthened, applying sustainability criteria.

44,207
KM
TOTAL LENGTH OF THE NATIONAL GRID

88,846
INSTALLED NATIONAL TRANSFORMER CAPACITY

TRANSMISSION GRID

277

KM

NEW CIRCUIT COMMISSIONED 2018

INCREASE TRANSFORMER CAPACITY

2,592

MVA

2018

MOVING TOWARDS ENERGY TRANSITION

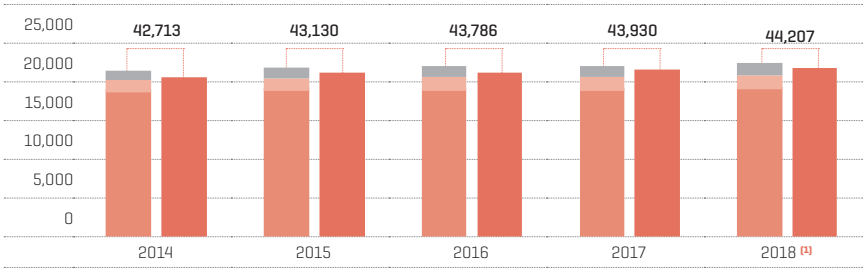
During 2018, the electricity transmission grid in Spain has continued to develop with the commissioning of facilities that strengthen grid reliability , promote the evacuation of renewable energy and support interconnections between electricity systems, with the core objective of guaranteeing security of supply, quality of service and aligning with the energy transition. 277 kilometres of circuit and 144 substation bays were commissioned, which means the total length of the national grid at the end of the year was 44,207 kilometres of circuit and there were 5,865 substation bays. The transformer capacity increased by 2,592 MVA, bringing the total national installed transformer capacity to 88,846 MVA.

Facilities in the electricity transmission grid in Spain

	400 kV	≤220 kV			Total
	Peninsula	Peninsula	Balearic Islands	Canary Islands	
Total lines (km)	**21,730**	**19,133**	**1,854**	**1,491**	**44,207**
Overhead lines (km)	21,613	18,343	1,133	1,187	42,276
Submarine cable (km)	29	236	540	30	835
Underground cable (km)	88	553	181	273	1,096
Transformation (MVA)	**81,490**	**613**	**3,433**	**3,310**	**88,846**

Provisional data pending audit (currently underway).
Accumulated data for kilometres of circuit and on transformer capacity as at 31 December, 2018.

Evolution of the electricity transmission grid in Spain (km of circuit)



(1) Provisional data pending audit (currently underway).

Some of the most notable projects carried out in 2018 included the following, according to their geographical area of development:

ANDALUSIA: work continued to increase the capacity of a sizeable part of this region's 220 kV grid, seeking to reduce the overloads that have been occurring, and therefore the consequent re-dispatching of generation that is necessary to eliminate them. The 220 kV lines affected were: Don Rodrigo-Quintos, Rocío-Torrearenillas and Alcores-Gazules. In addition, two new 400 kV reactors were commissioned: one in Cabra and the other in Guillena.

Aragón: the 220 kV Valdeconejos line and several associated lines were added to the transmission grid. The objective of this development is to improve the possibilities of evacuating generation from renewable sources while increasing the quality, reliability and security of supply.

Balearic Islands: work continued on the interconnections of the transmission grid to improve security and quality of supply. The 132 kV double circuit lines Cala Blava-Llucmajor and Arenal-Cala Blava were commissioned.

Canary Islands: significant efforts were applied to develop the transmission grid to allow connection and evacuation of renewable generation. The main milestones were the commissioning of the double circuit Arinaga-Barranco de Tirajana 66 kV in Gran Canaria, the construction and connection of the 66 kV Abona and 66/220 kV El Porís substations in Tenerife and the 132 kV Matas Blancas-Jares axis in Fuerteventura.

Castilla La Mancha: a new 400 kV reactor was installed in Minglanilla to facilitate the control of electrical voltage.

Castilla y León: construction work continued on the 400 kV Tordesillas-Galapagar-San Sebastián de los Reyes (SUMA) axis for the grid between Castilla y León and Madrid. The 400 kV and 220 kV Arbillera substations were commissioned to provide power for the high-speed train. The 220 kV Moncayo substation was interconnected with the 220 kV Trévago and Magallón substations to improve the area's security of supply. In order to improve control of voltage levels, a reactor was commmissioned in the 400 kV Lomba substation.

Catalonia: work continued on the strengthening the transmission grid around the metropolitan area of Barcelona, with the commissioning of the dual-node 220 kV Begues substation and the expansion of the 220 kV Viladecans substation. In order to improve voltage control in periods of low demand, a reactor was put into service in the 400 kV Begues and Pierola substation. Progress was also made on the reinforcing of the Gerona transmission grid with the commissioning of the 220/400 kV La Farga substation, and the commissioning of the 600 MVA transformer in the aforementioned substation. In addition, the re-powering of 400 kV La Roca-Vic was completed.

Extremadura: work continued on the 220 kV J.M. Oriol-Los Arenales (Cáceres)-Trujillo axis, and the administrative permitting procedures have continued for two new substations: Cañaveral and Carmonita to provide power for the high-speed train. In addition, a new 400 kV Brovales reactor was commissioned.

Levante: the 220 kV double circuit San Miguel Salinas-Torrevieja was commissioned to improve the security of supply to the southern area of Alicante and to the desalination plant.

Central zone: while the SUMA project continues and with the aim of expanding the interconnection of the 400 kV La Cereal substation, this substation was connected to the 400 kV Segovia instead of 400 kV Galapagar until the completion of the aforementioned project. The processing of those actions (distribution support, dual-nodes, bypasses) that allow greater reliability of the zone system, combining support for demand with control of short-circuit power, continues.

Northern zone: security of supply in the Basque Country was reinforced by eliminating the La Jara T-connection. Work continues on the planned 400 kV axis that, will pass through Ichaso to connect the west of the Basque Country (Abanto-Güeñes axis) with the 400 kV grid of Navarra (Muruarte-Castejón axis). This reinforcement will make it possible to increase energy evacuation capacity and improve integration of renewable energies. A reactor was commissioned at the 400 kV Soto de Ribera substation to improve the control of voltage levels in the area.

COMMISSIONING OF THE 220 kV

SAN MIGUEL SALINAS-TORREVIEJA

DOUBLE CIRCUIT IN ALICANTE

COMMISSIONING 132 kV

GRAN TARAJAL-MATAS BLANCAS

AXIS IN FUERTEVENTURA

COMMISSIONING OF THE 220/400 kV

LA FARGA

SUBSTATION IN GERONA

INTERNATIONAL INTERCONNECTIONS

Interconnections are a key part of the energy transition. Their role is vital to achieve greater integration of renewable energies and to progress in decarbonisation, so the strengthening of interconnections was and is a priority for the coming years in the development of the transmission grid.

2018 marked a milestone in the field of interconnections insofar as it has managed to include in the European regulations, through its package "Clean Energy for all Europeans", an interconnection target of 15% by 2030 (Governance Regulation). In this direction, member states will need to establish a strategy developed in cooperation with neighbouring member states to progress in interconnections and achieve the objectives defined in the regulation in their Integrated National Energy and Climate Plans.

Also notable was the signing of a memorandum of understanding (MoU) at the end of the year between the Governments of Morocco, Spain, Portugal, France and Germany to promote renewable energies, international cooperation and interconnections between the European Union and Morocco.

15 % 2030

INTERCONNECTION CAPACITY

Member states will need to define a strategy developed in cooperation with neighbouring member states to make progress on interconnections in their Integrated National Energy and Climate Plans.

SERVICE QUALITY

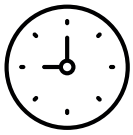
PENINSULAR ELECTRICITY SYSTEM

16.7 %

INCREASE IN INTERRUPTIONS OF POWER SUPPLY IN 2018

0.52 MINUTES

AIT VALUE IN 2018



The quality of service indicators for 2018 continue to reflect very good performance of the transmission grid in Spain, in relation to the indicators established as a reference in Royal Decree 1955/2000, Average Interruption Time [AIT] and Energy Not Supplied [ENS].

However, there were specific incidents that caused ENS increase in comparison with the immediately preceding years.

In the peninsular electricity system, 14 supply interruptions were registered in 2018, 16.7% more than in 2017. This increase was reflected in the ENS, which increased with respect to the previous year (250 MWh in 2018 versus 60 MWh in 2017). Likewise, AIT with a value of 0.52 minutes (0.13 minutes in 2017), was well below the reference value of 15 minutes established by article 26.2 of Royal Decree 1955/2000. The most significant incident occurred in 220 kV Tabiella, with an ENS of 175 MWh (70% of the total in 2018).

Energy not supplied (ENS) and average interruption time (AIT) of the transmission grid

	ENS (MWh)			AIT (minutes)		
	Peninsula	Balearic Islands	Canary Islands	Peninsula	Balearic Islands	Canary Islands
2014	204	13	148	0.44	1.21	9.04
2015	53	29	150	0.11	2.66	9.08
2016	78	0.3	457	0.16	0.03	27.45
2017	60	33	47	0.13	2.88	2.75
2018[1]	**250**	**38**	**63**	**0.52**	**3.27**	**3.77**

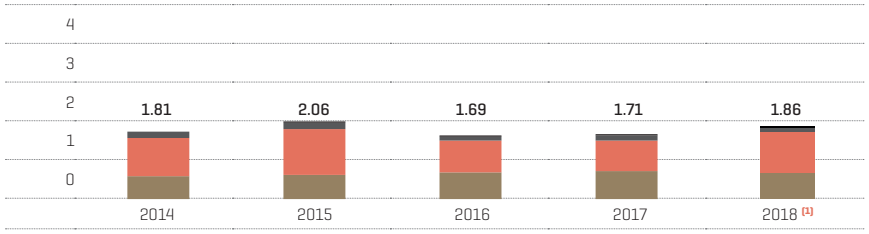
ENS: Energy not supplied. AIT: Average interruption time.
Average Interruption Time [AIT] = Energy Not Supplied [ENS] / Average System Power
(1) Provisional data pending audit (currently underway).

In the Balearic Islands electricity system, the indicators of continuity for 2018 showed a slight increase in comparison with the previous year. Four supply interruptions were recorded, which together produced an ENS of 38 MWh (33 MWh in 2017) and an AIT of 3.27 minutes (2.88 minutes in 2017). A similar interruption occurred in the Canary Islands electricity system, with the ENS at 63 MWh (also corresponding to 4 supply interruptions) and the AIT at 3.77 minutes, both above the 2017 values.

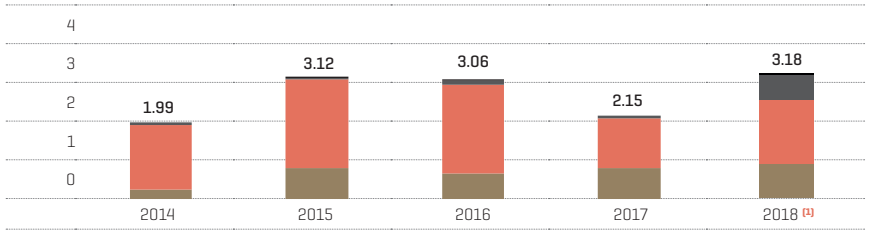
The quality of the transmission grid is also evaluated based on the availability of the facilities that it is made up of. he availability measures the capacity or ability of the system to use the various elements of the transmission grid, these being the electricity line circuits, transformers and active or reactive power control elements (reactors and capacitors). The availability rate is calculated as the difference between 100 and the non-availability rate of the transmission grid.

The annual evolution of this indicator in the last five years is shown in the non-availability rate graphs below.
The availability rate of the peninsular transmission grid in 2018 reached a value of 98.14%, a value slightly lower than the 98.29% of 2017. In the Balearic and Canary Islands systems, the availability rate of the grid was 96.82 % (97.85 % in 2017) and 98.79 % (98.12 % in 2017) respectively.
The most notable decrease occurred in the cumulative availability rate of the Balearic Islands system with respect to the previous year, mainly due to the non-availability of the Mallorca-Menorca link and the scheduled non-availability as a result of the increased number of commissionings of the investment plan and improvements of grid assets.

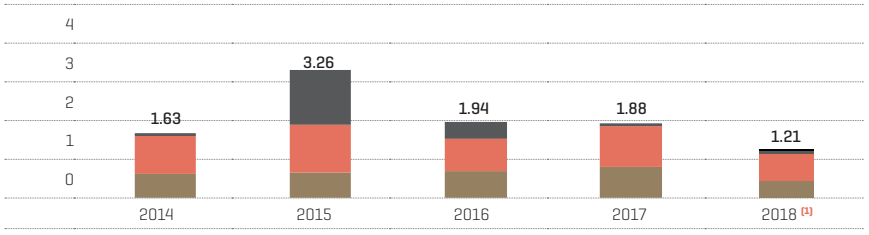
Annual evolution of the non-availability rate of the peninsular transmission grid (%)



Annual evolution of the non-availability rate of the Balearic Islands transmission grid (%)



Annual evolution of the non-availability rate of the Canary Islands transmission grid (%)



PROGRAMMED FOR PREDICTIVE AND PREVENTATIVE MAINTENANCE
PROGRAMMED FOR CAUSES NOT DUE TO MAINTENANCE
NON-PROGRAMMED DUE TO CORRECTIVE MAINTENANCE
NON-PROGRAMMED DUE TO FORTUITOUS CIRCUMSTANCES

Note: Classification according to RD 1955/2000.
The total non-availability rate of the transmission grid does not include non-availabilities due to force-majeure or third party actions.
(1) Provisional data pending audit (currently underway).

TRANSMISSION GRID AVAILABILITY RATE IN 2018

PENINSULA

98.14 %

BALEARIC ISLANDS

96.82 %

CANARY ISLANDS

98.79 %

INNOVATION APPLIED TO THE TRANSMISSION GRID

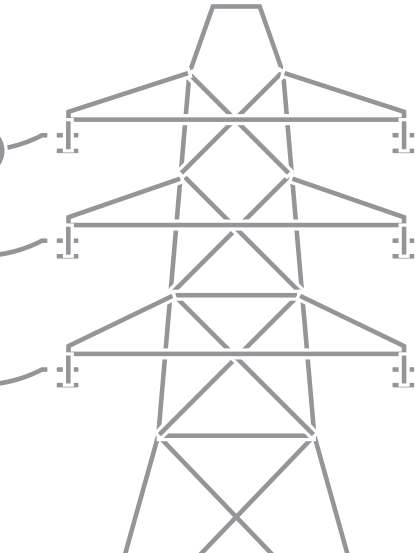
In 2018 work continued on the implementation and deployment of the Innovation Strategy, with the aim of promoting innovation as a lever for growth, cultural change and sustainability in the Red Eléctrica Group. This initiative aims to extend innovation to all areas of business activity, focusing on four main vectors: technology, digitalization, sustainability and people.

Over the course of the year, 10.2 million euros were allocated to 86 innovation projects. The following were some of the notable projects completed in 2018 in the area of transmission:

Geoventilation for armoured installations and cable galleries: work continued on the 220 kV Fuencarral armoured substation to take advantage of geothermal energy from the ground for HVAC, exchanging heat with a forced air current. The final report presented by the partner in this project was reviewed, which includes technical-economic and executive conclusions from the pilot project that was implemented, as well as advantages and disadvantages. The system works, but requires a case-by-case study.

Stability FACTS (Flexible AC Transmission Systems) for isolated systems: a laboratory prototype was developed to validate the design and control of a device that makes it possible to monitor the main parameters that provide stability to isolated systems (66-132 kV): frequency control, continuous voltage monitoring and damping of power fluctuations.

Best Paths: five demonstration sub-projects were carried out aimed at overcoming or mitigating a series of technical barriers in order to maximise the integration of renewable energy (mainly off-shore wind) into the European system. The project activities concluded with very significant results and technical achievements in the different fields of action. In addition, a high-performance, low-cost sensor for monitoring overhead lines was validated in the field.



Rapid capture of geographic information with RPAS (Remotely Piloted Aircraft System): this makes it possible to collect geographic data using photogrammetry done with RPAS with very good results.

Back-to-back General Cable: Back-To-Back Connector was designed, manufactured and tested for connection of 2 armoured terminals of provisional 245 kV mobile links.

LFH (Low Frequency Heating) technology for transformer drying: a comparison of different techniques in the drying of armoured transformers and reactors in the field with LFH technology was carried out in order to reduce drying time. The drying capacity was demonstrated by applying low-frequency current to the windings, increasing extraction of moisture and the efficiency of the drying process. This was a comparative study of three different drying methods on three identical single-phase transformers.

SAS field validation: A complete digital process bus (SAS) 61850 solution was deployed and commissioned in the reactor bay of the Rocamora substation. All of the requirements for closing were resolved.

DEVIFO V2 - Vibration detection by optical fibre for underground cables: a unit was developed that is capable of using optical fibre as a vibration sensor to detect threats along the routes of underground lines. The results of the tests carried out on the demonstration unit installed at the intake/outlet of the Plaza substation showed successful performance of the system. As a result, it was decided to install three units at specific points of the grid with a high density of underground lines (Madrid, Barcelona and Palma de Mallorca).

Model for the estimation of the life span of metal structures: models of ageing of metal structures (supports) were identified, based on environmental parameters, or on inspection data. In addition, economic optimization models were developed for the maintenance actions required for each support, for a given level of degradation. This will be useful when the databases and calculation engines that will manage condition-based maintenance are operational.

Interconnection of armoured GIS (Gas Insulated Switchgear) bays for different manufacturers: a process was developed and implemented that allows the interconnection of armoured equipment from different manufacturers. With this technology, the 400 kV Narcea GIS substation was renovated and put service, renovating the bays owned by Red Eléctrica de España by connecting equipment from different suppliers.

Optical-recycling of electromagnetic losses on high voltage lines with optical-electrical technologies: the aim was to obtain energy at the support base using optical-electrical techniques. A demonstration was carried out on a support on the Loeches-Coslada 1 line. Although the system worked, the results obtained were lower than expected. The experience provided valuable lessons learned and identified areas for improvement.

Tool for the optimum use of cable transmission capacity: a computer tool was developed that optimises the transmission capacity of insulated cable, with advantages for the operation, planning and maintenance of lines.

ATAC - Temperature monitoring of underground cables in areas of congestion and specific points of existing circuits: a valid technical solution was found to obtain thermal data from the cable sheath without the need for sensors inside, by placing elements (PT100 probes) on their surface and interconnecting the entire set. This data will serve as a basis for modelling the temperature of the conductor.

Predictive indicators for decision making: a pilot tool was put into operation to forecast the cost and duration of transmission grid development projects for overhead lines and substations.

Analysis of generator damping, FACTS and HVDC (High Voltage Direct Current): a simulation platform was developed capable of carrying out small signal studies and designing power stabilisers for conventional synchronous generators, facilitating research into the implementation of devices for damping oscillation in the electronic power converters used in wind generators and photovoltaic power stations, FACTS devices and in HVDC.

5

ELECTRICITY MARKETS

The average price of energy in the electricity market increased 6.3% compared to the previous year, the highest value since the all-time high reached in 2008.

TOTAL ENERGY MANAGED IN THE ELECTRICITY MARKET

+0.4 %

COMPARED TO 2017

THE DAY-AHEAD AND INTRADAY MARKET COMPONENT IN THE COMPOSITION OF FINAL PRICE OF ENERGY WITH RESPECT TO 2017

+8.8 %

FINAL AVERAGE PRICE OF ENERGY IN THE ELECTRICITY MARKET

64.4
€/MWh

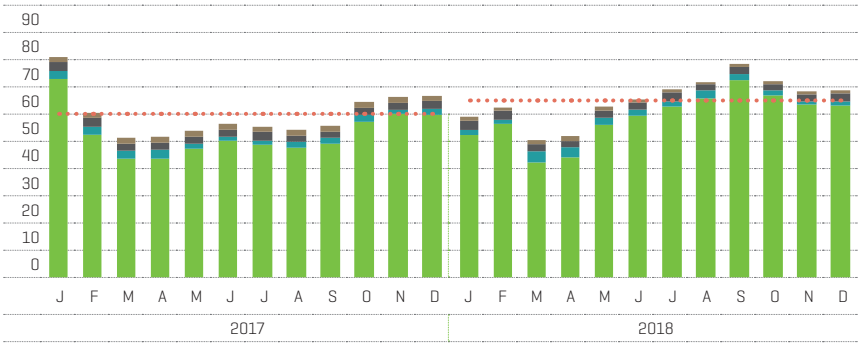
+6.3 %

COMPARED TO 2017

In 2018, final energy in the electricity market (reference supply plus free contracting) was 0.4% higher than the previous year.

The final average price of energy in the electricity market was 64.4 €/MWh in 2018, 6.3% higher than the price in 2017 and the highest since 2008, when the all-time maximum price was registered, and the third highest value since the liberalisation of the market in 1998. Comparing month to month, from May to October final prices were higher than in those same months of the previous year, lower in January and the similar for the rest.

Components of the average final price of energy (€/MWh)



DAY-AHEAD AND INTRADAY MARKET
ANCILLARY SERVICES
CAPACITY PAYMENTS
INTERRUPTIBILITY SERVICE
AVERAGE FINAL PRICE

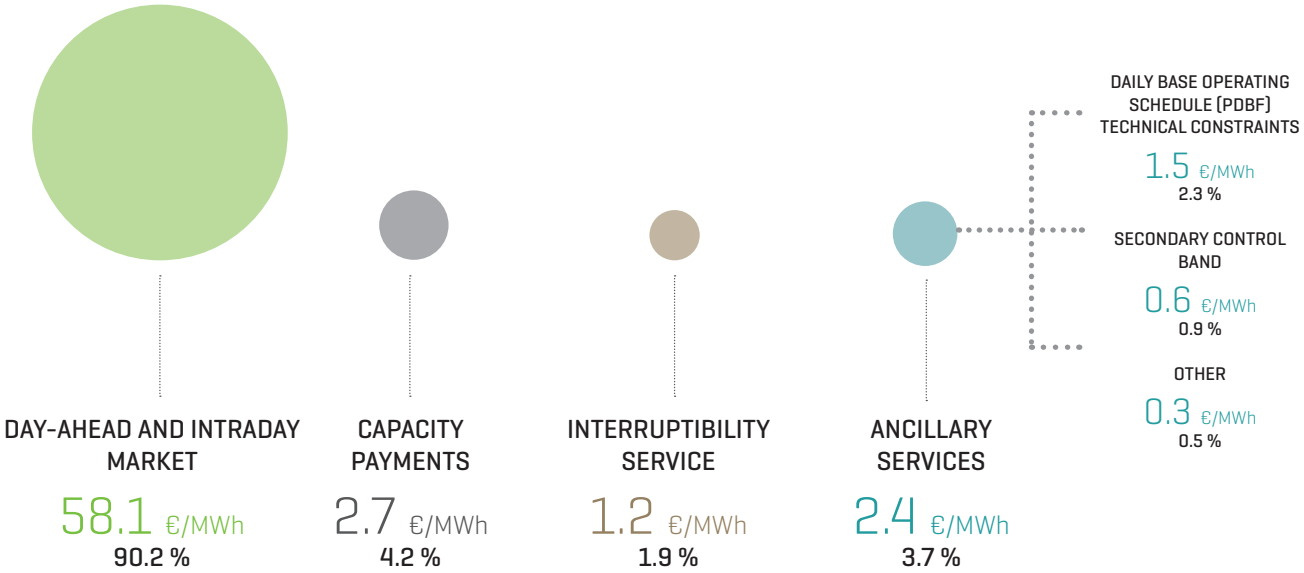
From May to October, final prices were higher than in those same months of the previous year, much lower in January and similar for the rest.

During 2018, the day-ahead and intraday market price component accounted for 90.2%, ancillary services 3.7%, capacity payments 4.2%, and the remaining 1.9%, interruptibility service.

Comparing the impact of price on the unserved demand with last year's, we see an increase of 8.8% in the day-ahead and intraday markets and decreases of 40% in interruptibility service, 1.3% in ancillary services and 0.7% in capacity payments.

The only component that increased during 2018 was that of the day-ahead and intraday markets, which is also the most important component of the final price. The sharp drop in interruptibility was due to price reductions following the two annual auctions. The capacity payment service [1] remained unchanged, since the amount that consumers pay for capacity mechanisms is fixed in the Official State Gazette (BOE) and was not changed after eliminating the availability service.

Components of the final average price of the electricity market 2018



During 2018, the price component of the day-ahead and intraday markets accounted for 90.2%, ancillary services 3.7%, capacity payments 4.2% and the remaining 1.9%, interruptibility service.

[1] The capacity payment service is structured into an investment incentive and an availability incentive

DAY-AHEAD MARKET

ENERGY IN THE DAY-AHEAD MARKET

248

TWh

-1.8 %

RESPECTO A 2017

Energy on the day-ahead market stood at 248 TWh in 2018 (183 TWh in the spot market without bilateral contracts), down 1.8% with respect to 2017. 73.6% of energy was traded on the spot market (76.0% in 2017) and the remaining 26.4% through bilateral contracts, compared to 24.0% in the previous year. These percentages have remained quite similar since 2010, with an average value of 73.0% for the spot market and 27.0% for bilateral contracts, although in the last three years, there the percentage of bilateral contracts has decreased.

The energy supplied by market traders, who are not classified as reference traders, continued to increase reaching a market share of 88.5% in 2018, compared to 88.2% in the previous year.

Percentage of energy purchased on the day-ahead market and through bilateral contracts

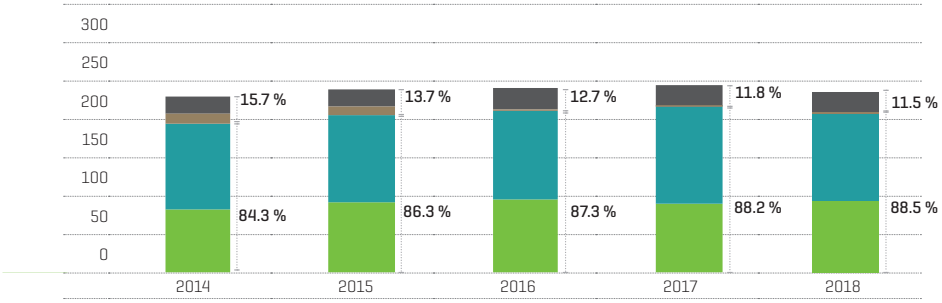
SPOT MARKET

73.6 %

BILATERAL CONTRACTS

26.4 %

Evolution of purchases in PDBF from Reference Suppliers (RS) and other suppliers (TWh)



The arithmetic average price of the day-ahead market in Spain was 57.29 €/MWh, 9.7% higher than the previous year and slightly lower than that of Portugal (57.45 €/MWh). This is the second highest price since the creation of the market, surpassed only by the value of 64.43 €/MWh in 2008. Prices for February and for May to November recorded the highest average values in the last decade for those months.

A key factor in the increase in the day-ahead market price was the sharp increase in the price of CO_2 auctions during the year, which began the year with values of around 8 €/tonne and reached 25 €/tonne in September, ending the year with a value higher than 23 €/tonne of CO_2.

Taking into account the generation mix in the day-ahead market, an important factor in price formation, we can see that in the month with the highest annual arithmetic average price, September, coal is the technology with the highest percentage in the mix, while in the months of March and April, in which minimum prices are recorded, coal's share is small, with wind and hydroelectric technologies accounting for the highest percentage.

November is the month with the highest combined share of coal and combined cycle. However, its price was not the highest when the measures adopted by the Government in Royal Decree-Law 15/2018 of 5 October entered into force.

In annual terms, hydroelectric energy increased its share by 6 percentage points with respect to the previous year and wind power by just over 4 percentage points, while coal reduced its share by just over 6 percentage points and combined cycle by 5.5 percentage points.

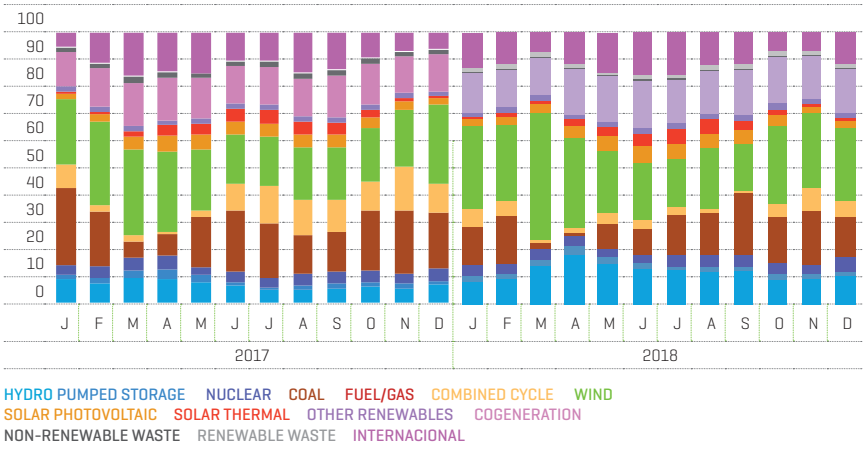
ARITHMETIC AVERAGE PRICE IN THE DAY-AHEAD MARKET

57.29 €/MWh

+9.7 %

COMPARED TO 2017

Percentage of energy sales on the spot market by technology



MINIMUM PRICE IN THE DAY-AHEAD MARKET

70 %

RENEWABLE GENERATION

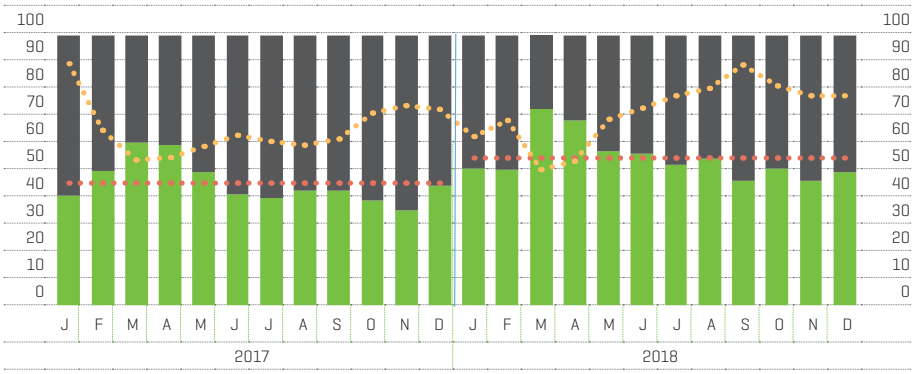
MAXIMUM PRICE IN THE DAY-AHEAD MARKET

58 %

NON-RENEWABLE GENERATION

It can be observed that the renewable energy matched on the daily market in 2018 was 20% higher on average than the previous year. In addition, there is an inverse correlation between the day-ahead market price and the share of renewable energy, which means that the lower the share of renewable energy, the higher the day-ahead market price.

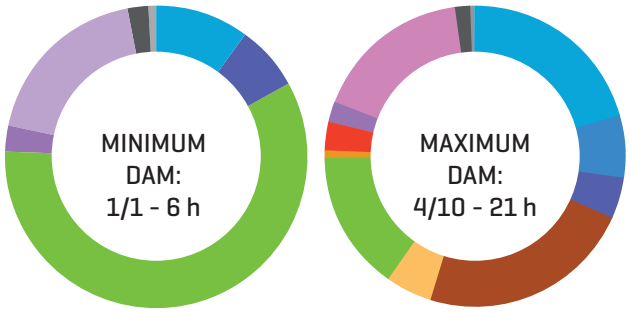
Generation in Spain and prices (% and €/MWh)



If the matching process of the generation structures is represented in a graph showing the times of the day when the day-ahead price sets the annual minimum and maximum values, we can see how these are very different. At the time at which the minimum price was registered, we can see how wind was the one technology that has an impact on the marginal price, with renewable energy matched in that hour being above 70%. Looking at the time when the maximum price was reached, hydro and the rest (cogeneration, wind and solar) determined the marginal price, although coal had the highest percentage in the mix (23%). On that day, the greatest energy matched with prices close to the marginal price was coal, followed by hydroelectric energy and combined cycle.

Minimum and maximum price structure of the day-ahead market 2018 [%]

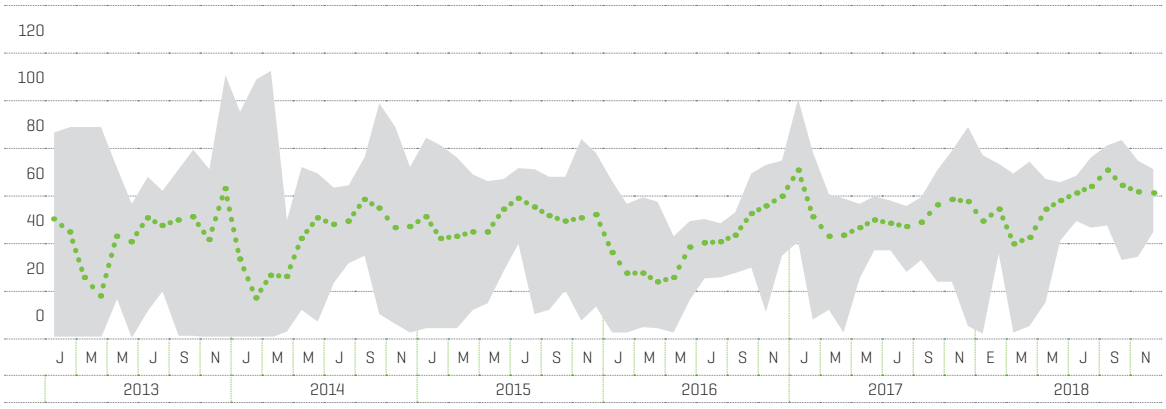
	Minimum price	Maximum price
	1 January	**4 October**
HYDROELECTRIC	10.5 %	20.5 % **(1)**
PUMPED STORAGE	0 %	6.9 %
NUCLEAR	7.1 %	4.3 %
COAL	0 %	23.0 %
COMBINED CYCLE	0 %	5.2 %
WIND	58.2 **(1)**	15.2 %
SOLAR PHOTOVOLTAIC	0.1 %	0.8 %
SOLAR THERMAL	0 %	3.1 %
OTHER RENEWABLES	2.8 %	2.2 %
COGENERATION	18.5 %	16.9 %
NON-RENEWABLE WASTE	2.1 %	1.6 %
RENEWABLE WASTE	0.7 %	0.4 %



(1) Technology that sets the marginal price

In 2018, the months with the highest hydroelectric and wind energy production were the only ones that registered prices below 6 €/MWh. Once again there were no hours with zero price registered during the year.

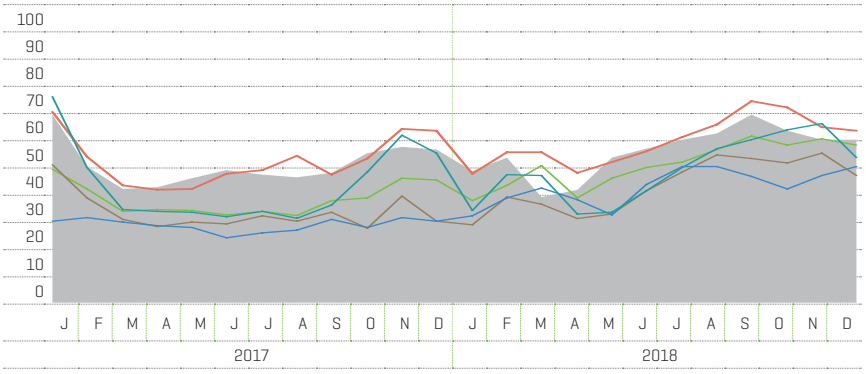
Maximum, minimum and average price of the day-ahead market [€/MWh]



PRICE RANGE DAY-AHEAD MARKET PRICE

Comparing the price of the Spanish day-ahead market with the prices of the European markets you can see that the prices in Italy (National Single Price) and Spain are, in general, the highest in Europe, but are increasingly similar to those in other countries.

Precios de mercados europeos (€/MWh)



INTRADAY MARKET

The arithmetic average price of the intraday market through auctions in 2018 was 58.03 €/MWh, higher than the 57.29 €/MWh of the day-ahead market.

Energy sales on the intraday market through auctions stood at 33.4 TWh, 5.7% higher than in 2017, with 37.3% of sales corresponding to a net increase in demand and/or pumped-storage consumption.

The arithmetic average price of the intraday market through auctions in 2018 was 58.03 €/MWh, higher than the 57.29 €/MWh of the day-ahead market.

On 12 June, the Nominated Electricity Market Operator (NEMO) and Transmission and System Operators (TSO), including Red Eléctrica de España, launched the European Cross Border Intraday Market (XBID), which allows a total of 14 European countries to market electricity continuously on the intraday market.

Energy sales in the intraday or continuous market totalled 1.0 TWh. The weighted average price in Spain ranged from 58.37 €/MWh in June to 74.34 €/MWh in September.

ANCILLARY SERVICES[2]

The volume of energy managed through the ancillary services(1) of the system in 2018 was 19,785 GWh, 4.6% lower than the previous year, as a result of a decrease in the volume of energy scheduled for resolving technical constraints through the Daily Base Operating Schedule (PDBF), in real time and using tertiary control energy.

In contrast, secondary control energy and that of deviation management saw their volumes increase slightly. The energy for resolving technical constraints of the Daily Base Operating Schedule (PDBF) fell by almost 4%, representing almost 57.3% of the total volume of energy in this market.

ENERGY MANAGED IN THE SYSTEM ANCILLARY SERVICES

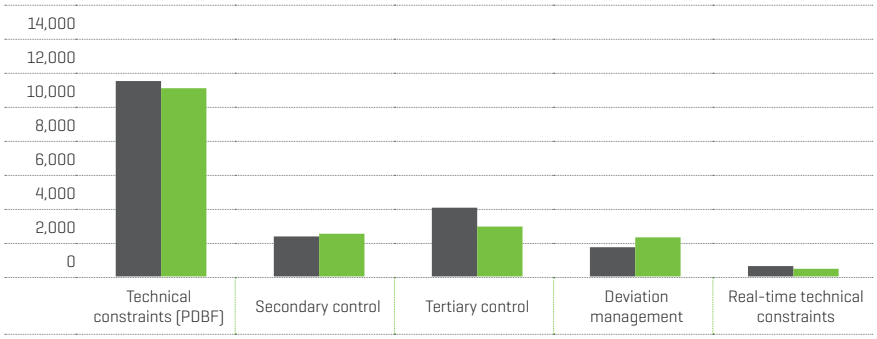
19,785

GWh

-4.6 %

COMPARED TO 2017

Energy managed in the system ancillary services (GWh)



2017 2018

In 2018, the cost of ancillary services was 595 million euros, 0.9% lower than in the previous year.

COST OF THE ANCILLARY SERVICES

595

M€

-0.9 %

COMPARED TO 2017

Cost of ancillary services (M€)

	2017	2018
Daily base operating schedule (PDBF) technical constraints	368	372
Real-time technical constraints	23	18
Technical constraints	391	390
Secondary control band	159	139
Additional upward power reserve	28	58
Deviations	63	41
Deviations surplus *	-25	-18
Power factor control	-15	-15
Total Ancillary services	**600**	**595**
▪2018/2017		-0.9 %

(*) Includes non-fulfilment of balancing energy, deviation balancing and deviations between systems.

(2) Does not include additional upward power reserve, secondary control band, nor energies associated with cross-border balancing services.

The impact of ancillary services on the final average energy price in 2018 was €2.35/MWh, 1.3% lower than in 2017 and the lowest since 2007, with the highest prices registered in March and April, when the day-ahead market price was lowest. This behaviour occurs when renewable technologies represent a much higher percentage compared to conventional thermal technology in the matching result, and consequently, it is necessary to schedule this thermal technology to resolve technical constraints of the PDBF.

IMPACT OF ANCILLARY SERVICES ON THE AVERAGE PRICE OF ENERGY

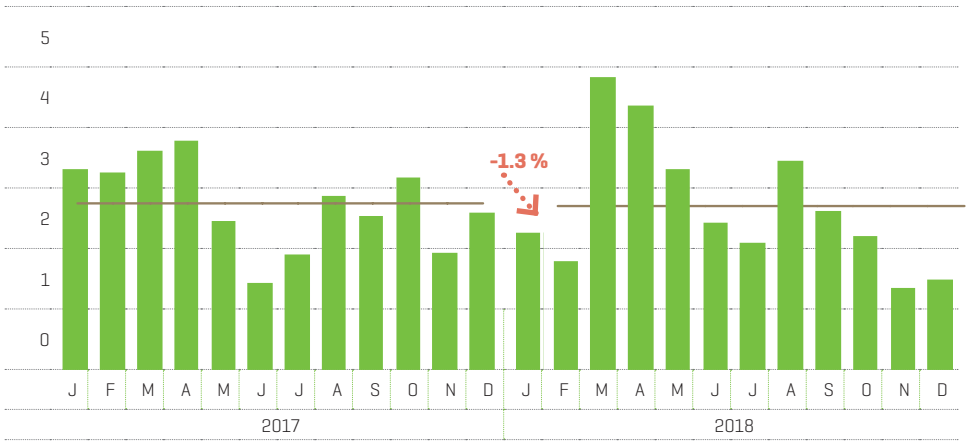
2.35

€/MWh

-1.3 %

COMPARED TO 2017

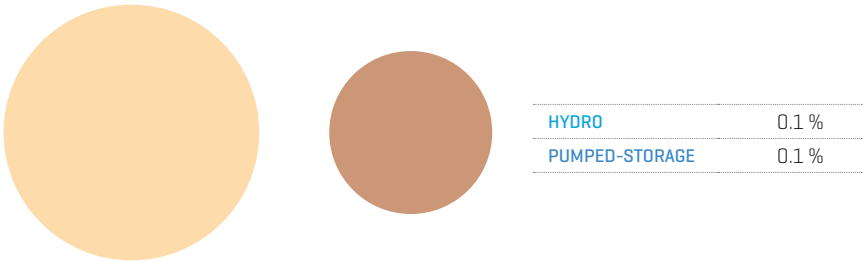
Impact of the ancillary services in the final price (€/MWh)



Constraints of the Daily Base Operating Schedule

The energy scheduled to resolve technical constraints of the base Daily Base Operating Schedule (PDBF) was 10,969 GWh upward (1% lower than the previous year) and 374 GWh of downward energy (half the value of the previous year). The average value of the price of the upward energy was 88.5 €/MWh, 8.5% higher than last year, and that of the price of downward energy was 54.3 €/MWh, 12.8% higher than in 2017. The impact on the final average price of energy was 1.47 €/MWh compared to 1.46 €/MWh the previous year.

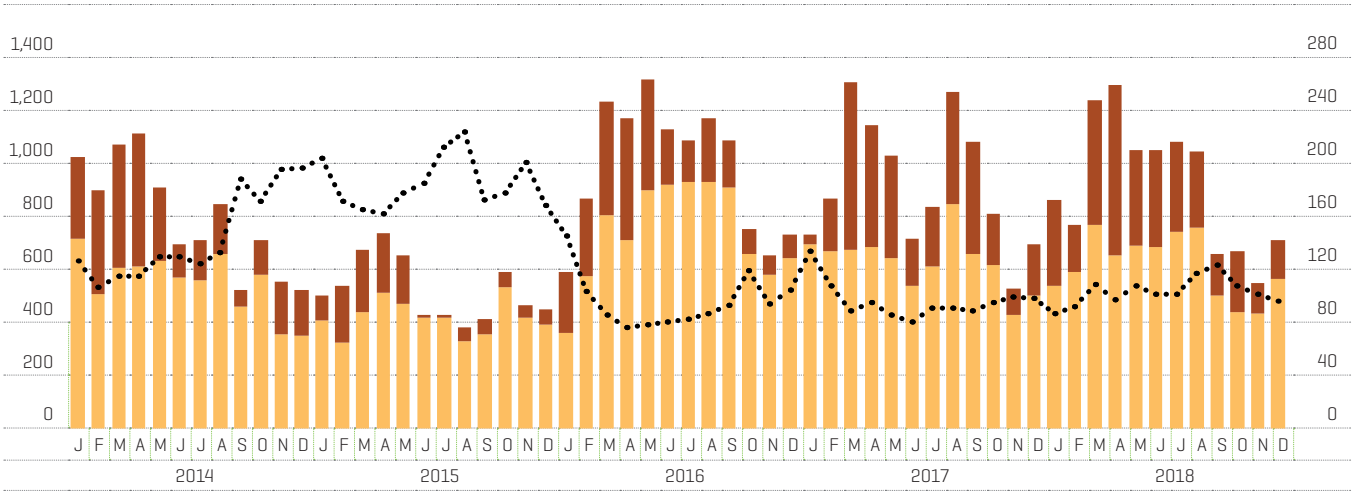
Upward energy in phase I



The energy scheduled in phase I for resolving technical constraints of the Daily Base Operating Schedule corresponded mainly to combined cycle and coal technologies. The downward energy in phase I was all but negligible.

The graph "Upward energy scheduled in phase I from coal and combined cycle and upward energy price" shows the evolution over the last five years of the upward energy scheduled in phase I for resolving technical constraints of the Daily Base Operating Schedule.

Upward energy scheduled in phase I - coal and combined cycle - and upward energy price (GWh and €/MWh)



Other ancillary services

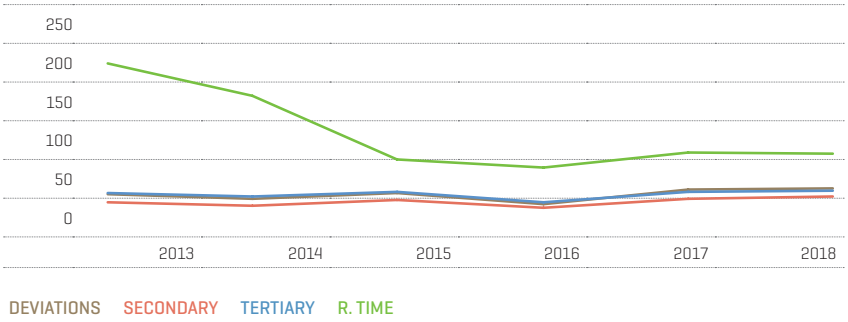
In the markets for secondary control, tertiary control, deviation management and the resolution of technical constraints in real time, 2,592 GWh, 3,031 GWh, 2,358 GWh and 461 GWh were managed, respectively. Of this total, 59.9% corresponded to upward energy managed and the remaining 40.1% to downward energy managed.

Regarding power reserves, the volume of additional upward power reserve that needed to be allocated was 5,333 GW, a value much higher than the previous year (1,559 GW); with an impact of 0.23 €/MWh on the average final price of energy (unserved demand).

The average hourly secondary control band allocated was 1,132 MW, with an impact of 0.55 €/MWh on the average final price of energy (unserved demand), 12.7% lower than the previous year.

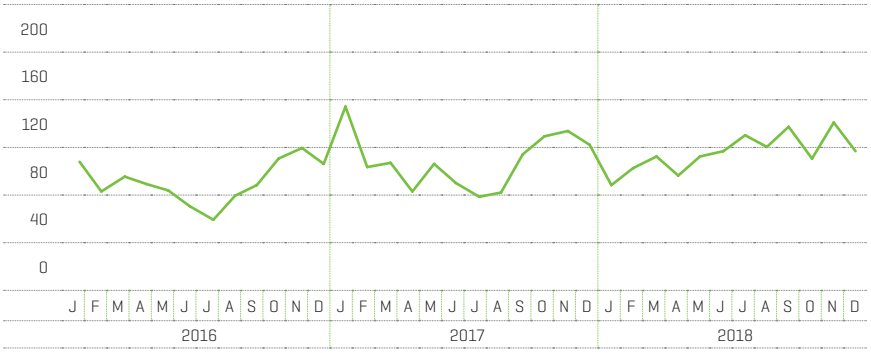
The weighted price of upward energy of secondary and tertiary control remained fairly constant, while the upward energy prices for real-time re-dispatches due to security of supply measures registered high values in 2013 and 2014, the following years registered low values and then increasing slightly, remaining at values of €114/MWh for the last two years.

Annual evolution of the weighted average price of ancillary services (€/MWh)



In the graph below, we can see the monthly evolution of the average weighted prices of upward energy scheduled for the resolution of technical constraints in real time,

Annual evolution of the average weighted price of upward energy for resolution of real-time technical constraints (€/MWh)



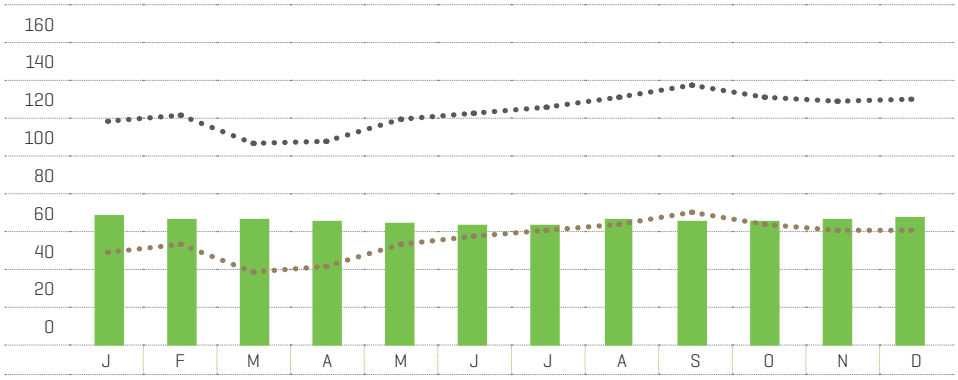
Voluntary price to the small consumer (VPSC)

The voluntary price for the small consumer exceeded that of the previous year by 2.9%.

The VPSC is conditioned by the day-ahead market, and for this reason, the highest VPSC value was registered in September, 138.3 €/MW, while the lowest value was registered in March, 108.0 €/MWh.

The voluntary price to the small consumer was 2.9% higher than in 2017.

Evolution of the VPSC (general tariff 2.0 A) compared with the day-ahead market price (€/MWh)



DAY-AHEAD MARKET VPSC DIFFERENCE VPSC-DAY-AHEAD MARKET

Customers who opt for this tariff pay tolls and charges for regulated costs, which are set by the Government at the beginning of each year and have not increased since 2014, and an amount for energy consumed, which is a function of prices on the electricity market during the billing period.

Therefore, in the case of an average household consumer using the regulated tariff 2.0A with a contracted power of 4.6 kW and a consumption of 3,900 kWh/year, the cost of the bill for all of 2018 would have been 858€, 2.5% higher than they would have paid for the same consumption in 2017, that is to say, 21€ more per year.

Of the €858 that this customer would have paid for their electricity consumption in 2018, €314 would correspond to the purchase of energy on the market (37% of the bill), €361 (42%) to the regulated part of tolls and system charges and the rest, €183 would correspond to taxes (21%). Therefore, even though the cost of energy purchased on the electricity market would have increased by 5.5% compared to 2017 (compared to a 6.3% increase in the final average price of energy), since the rest of the costs had no increase with respect to the previous year, the total bill would only have risen by 2.5%, an increase which in real terms, discounting the inflation forecast for 2018 (1.2 %), would have been 1.3 %.

SEPTEMBER

138.3 VPSC €/MWh

HIGHEST PRICE

MARCH

108 VPSC €/MWh

LOWEST PRICE

6

EUROPEAN SCOPE

Demand for electricity in Europe in 2018 showed a slight decline over the previous year, and broke from the growth trend of the previous three years.

VARIATION IN THE ELECTRICITY DEMAND IN ENTSO-E MEMBER COUNTRIES

-0.3 %

COMPARED TO 2017

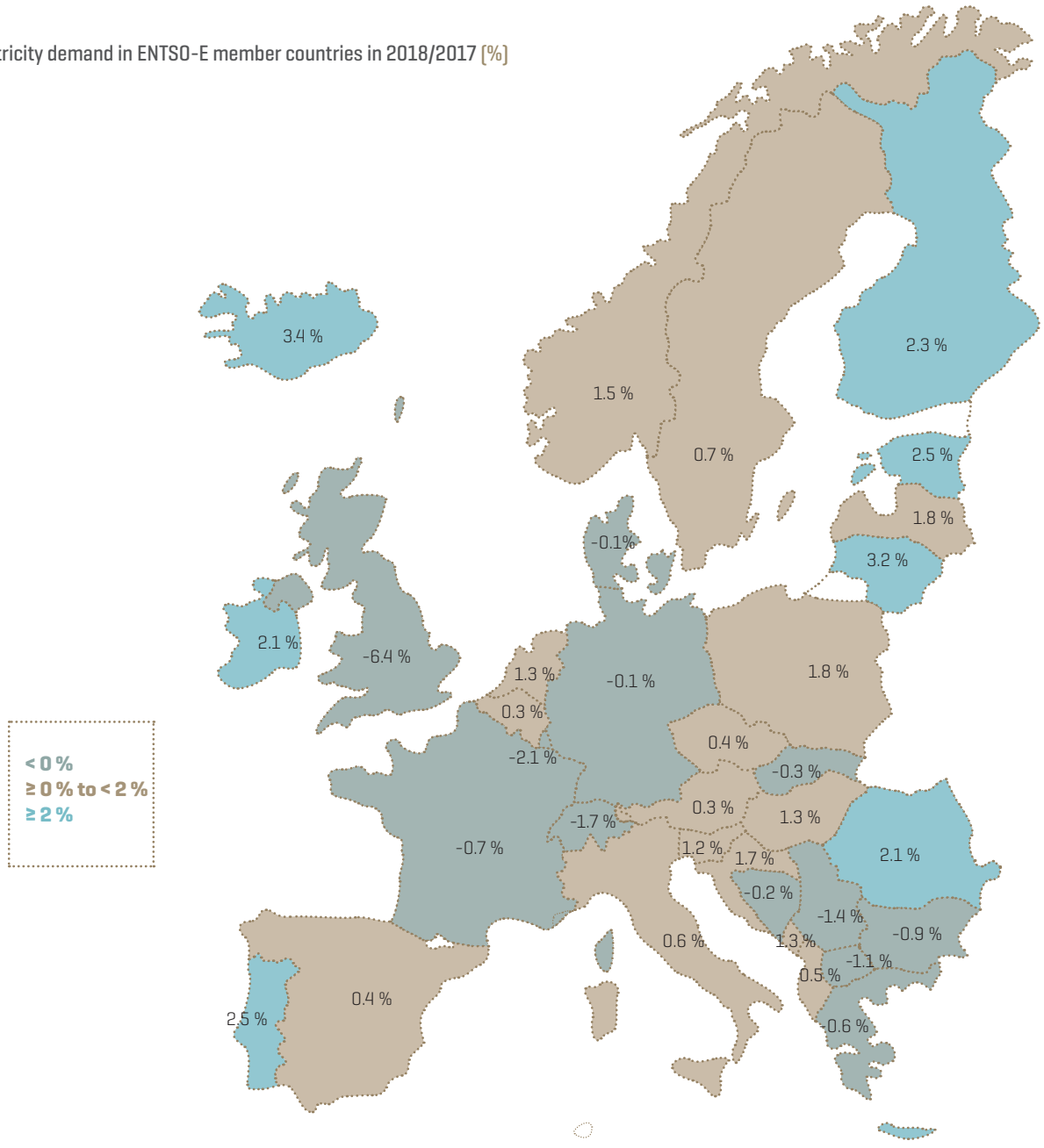
RENEWABLE ENERGY OVER TOTAL GENERATION OF ENTSO-E MEMBER COUNTRIES

35.8%

MOVING TOWARDS A EUROPEAN ENERGY TRANSITION

In all the countries belonging to ENTSO-E, there was a slight decrease in electricity demand in 2018, which was -0.3% with respect to the previous year. Contrasts can be observed in the variation in demand by country, since while in Eastern European countries, there was slight growth, in most of Western Europe widely different situations occurred: growth in the Iberian Peninsula and stabilization in the central part of the continent, with the exception of more significant declines in countries such as Luxembourg, Switzerland and Great Britain.

Variation in electricity demand in ENTSO-E member countries in 2018/2017 (%)



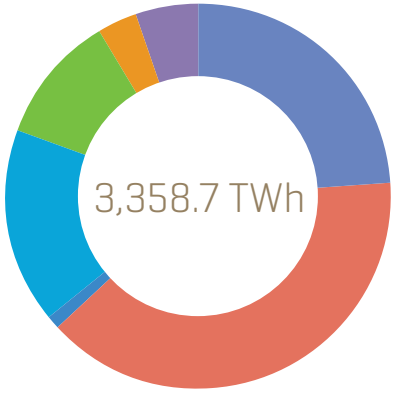
Source: ENTSO-E Data Portal 20/5/2019, Spain REE.

RENEWABLE ENERGY MAINTAIN ITS GROWTH

In terms of generation from renewable sources (excluding pumped-storage generation), it accounted for 35.8% of the energy produced in the ENTSO-E countries as a whole. The energy produced from renewable sources increased 5.7% with respect to the previous year, mainly driven by hydro, which increased 10.3% with respect to 2017. In 2018, Spain was fifteenth in coverage with renewables, and fifth in coverage with wind and solar energy, both calculated based on total electricity production.

Net generation 2018 (TWh)

NUCLEAR	808.8	24.1 %
CLASSIC THERMAL	1,317.3	39.2 %
PUMPED STORAGE	29.2	0.9 %
HYDRO	555.9	16.6 %
WIND	359.7	10.7 %
SOLAR	118.6	3.5 %
OTHER RENEWABLES	169.3	5.0 %
TOTAL	3,358.7	100.0%



Source: ENTSO-E Data Portal 20/5/2019, Spain REE.

ELECTRICITY GENERATION FROM RENEWABLE ENERGIES

35.8 %

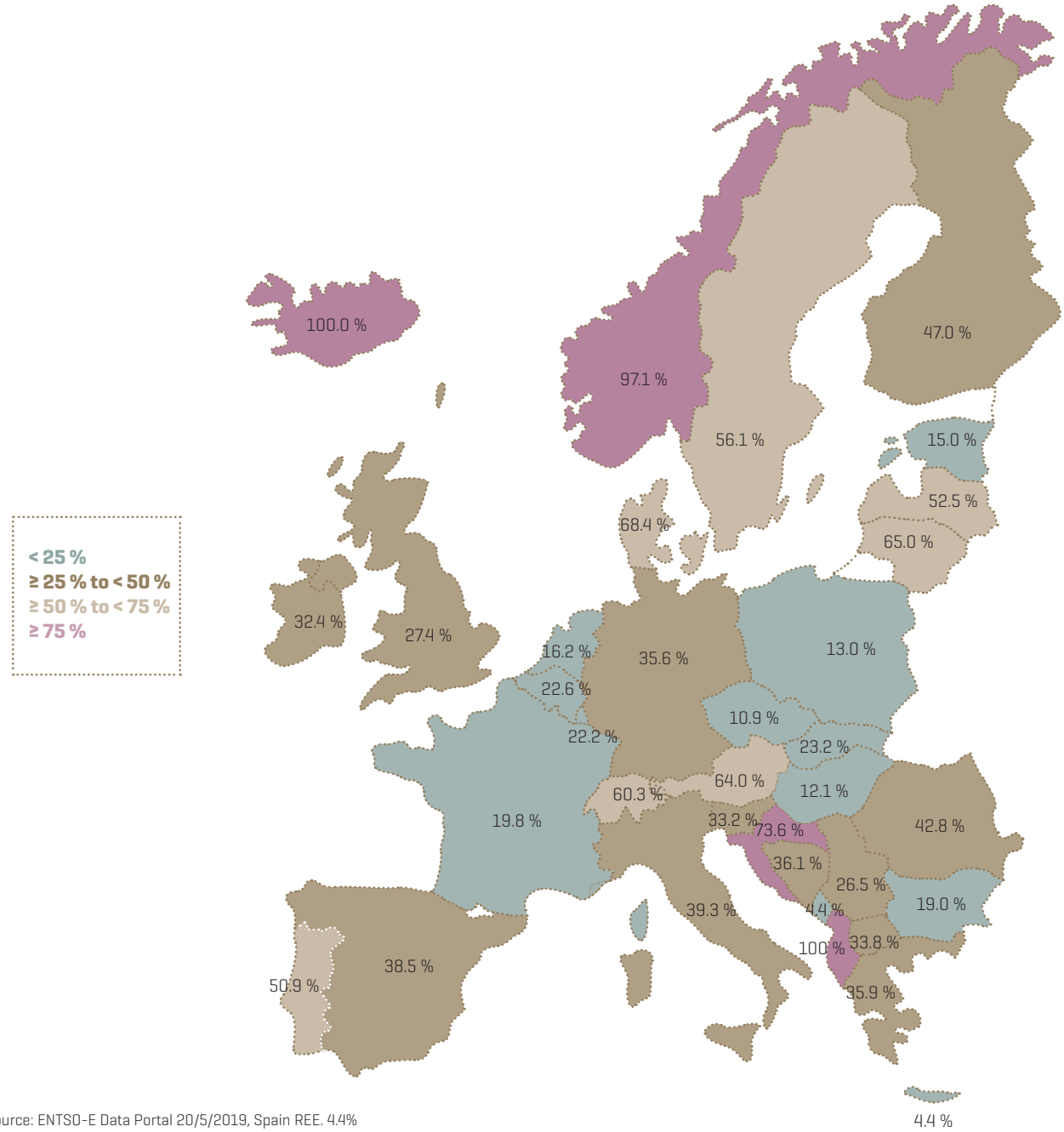
IN THE SET OF ENTSO-E MEMBER COUNTRIES

+5.7 %

COMPARED TO 2017

The following map shows the contribution of renewables to total covering demand in each of the countries. It should be noted that Spain is in the middle in terms of covering demand with renewables, with 38.5% of the total generation.

Renewable energy over total production of ENTSO-E member countries [%]

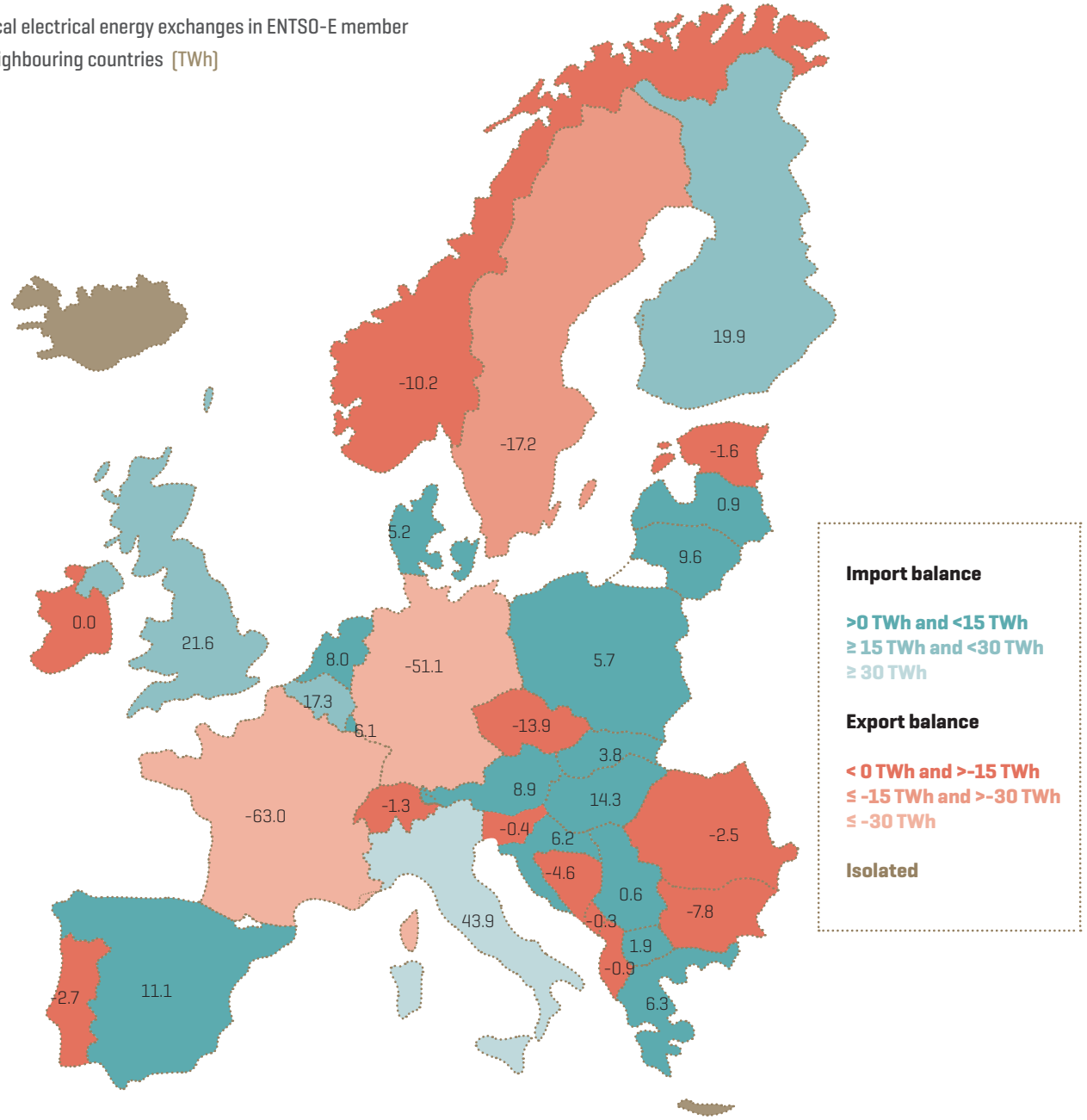


Source: ENTSO-E Data Portal 20/5/2019, Spain REE. 4.4%
[1] The information for Albania included since 2017.
[2] Includes Northern Ireland

ENERGY EXCHANGES SWITCH IN THE DIRECTION OF IMPORTS

The energy exchanges of different countries fluctuate year after year, depending on factors such as exchange capacity, market coupling and price influence. In 2018, the net balance of electricity exchanges between ENTSO-E countries and neighbouring countries was as an importer, with almost 14 TWh. The countries with the highest export of energy included France, Germany, Sweden and the Czech Republic, with export balances of 63 TWh, 51 TWh, 17 TWh and 14 TWh respectively.

Balance of physical electrical energy exchanges in ENTSO-E member countries and neighbouring countries (TWh)



Source: ENTSO-E Data Portal 20/5/2019, Spain REE.
(1) The information for Albania included since 2017.
(2) Includes Northern Ireland

7

REGULATORY FRAMEWORK

In 2018, energy regulation was marked by the change of government that took place in June, following the success of the motion of censure presented by the leading opposition party. Even though Spanish energy policy in recent years, regardless of the ideology of the government in office, has been aligned with the EU's objectives of reducing emissions and fighting climate change, as well the need to undertake a process to transform the energy sector in order to achieve these objectives, the new government clearly indicated its intention to be more ambitious and to change priorities in the implementation of the measures that must be adopted to achieve energy transition.

In line with this objective of promoting progress towards energy transition, Royal Decree-Law 15/2018 of 5 October on urgent measures for energy transition and consumer protection was published in October, the most significant regulatory innovation in 2018. This provision establishes a series of urgent measures to guarantee, in light of the expectations of high final prices sustained over time, that consumers have the information and instruments to manage their demand, optimise consumption and reduce their energy bills, as well as providing specific protection mechanisms for vulnerable consumers with more limited economic capacity to handle the energy supply costs. It also introduces various measures aimed at promoting greater integration of renewable energies and promoting sustainable mobility and energy efficiency, with a view to accelerating the transition to a decarbonized economy.

With the aim of promoting progress towards energy transition, Royal Decree Law 15/2018 of 5 October on urgent measures for energy transition and consumer protection was published in October, the most significant regulatory innovation of 2018.

Five years after the entry into force of the new Act 24/2013 on the electricity sector and the new regulatory framework for the sector established following the reform process begun in 2012, the regulated revenue surpluses recorded during the period indicate that progress is being made towards achieving the medium- and long-term economic and financial sustainability of the electricity system, which is the ultimate goal of the reform. However, the reform process cannot be considered complete, because on the one hand, various aspects of the operational and economic handling of generation overcapacity with conventional technologies have yet to be dealt with in the current context of strong penetration of renewable technologies, such as the review of capacity remuneration mechanisms and the establishment of a procedure for the temporary or permanent closure of plants, and on the other hand, the Spanish electricity regulations will have to adapt over the next two years to the revision of the EU electricity regulations included in the "Clean Energy for All Europeans" legislation package, informally known as the "Winter Package".

In this regard, in 2018, half of the eight proposals for new legislative provisions that make up the "Winter Package" were approved and published, following the approval in June of the Energy Efficiency in Buildings Directive, followed in December by the Renewables Directive, the Energy Efficiency Directive and the Governance Regulation of the Energy Union. These provisions reflect some of the new objectives of the EU's energy policy for 2030, such as achieving 32% of final energy consumption from renewable energy sources, as set out in the Renewables Directive, and the goal of reducing energy consumption by 32.5%, as set out in the Energy Efficiency Directive.

With respect to the four remaining proposals - the Electricity Directive and Regulation, the ACER Regulation (Agency for the Cooperation of Energy Regulators) and the Regulation on Risk Preparedness in the Electricity Sector - by the end of 2018, they were in the final phase of processing and are expected to be adopted before the next European elections, scheduled for May 2019.

During the procedural processing the "Winter Package", the European Union has reinforced the consideration of energy interconnections in the new EU legislation. In particular, the Governance Regulation places great importance on electricity interconnections, expressly establishing the objectives of minimum commercial interconnection capacity for 2020 and 2030 - 10 and 15%, respectively, of the installed power capacity of each member state - and requiring the Integrated National Energy and Climate Plans to define a strategy, drawn up in cooperation with neighbouring member states, to progress in the development of interconnections and achieve the EU's objectives in this area.

A final noteworthy aspect of the EU energy regulation for 2018 was the publication in April of the report by the group of experts on energy transition, required of each member state in the framework of the strategic package of the "Energy Union" as a step prior to the preparation of the Integrated National Energy and Climate Plans. In its report, the Spanish group of experts identified, analysed and assessed different scenarios that are consistent with the strategy and objectives of European energy policy, making it clear that the electrification of society is needed in order to achieve the Community objectives of reducing emissions and combating climate change, and also stressing that energy grids must serve as the backbone of the transition towards a new sustainable and decarbonized energy model.

The report by the Spanish group of experts on the energy transition shows that the electrification of society is needed in order to achieve the EU's objectives of reducing emissions and fighting climate change, and also stresses that energy networks must be the backbone of the transition towards a new decarbonized energy model.

GLOSSARY

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.

AIT (AVERAGE INTERRUPTION TIME)
Time, in minutes, which results from dividing the ENS (energy not supplied to the system due to interruptions of the service occurred in the transmission grid), by the average power of the peninsular 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, supplemental balancing 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.

BALANCE MARKETS
Are those system adjustment services markets which allow the generation and demand to be balanced (deviation management services and tertiary and secondary control energy).

BILATERAL CONTRACTS
The generators, traders, consumers or representatives of any of the aforementioned, as participants in the production market may formalise bilateral contracts regarding physical electricity delivery.

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.

COGENERATION
The process through which electricity and useful thermal and/or mechanical energy is obtained simultaneously.

COMBINED CYCLE
Technology for the generation of electricity in which two thermodynamic cycles coexist within one system: one involves the use of steam, and the other one involves the use of gas. In a power station, the gas cycle generates electrical energy by means of a gas turbine and the steam cycle involves the use of one or more steam turbines. The heat generated by combustion in the gas turbine is passed to a conventional boiler or to a heat-recovery element to produce steam which is then used to move one or more steam turbines, increasing the yield of the process. Electricity generators are coupled to both the gas and steam turbines.

COMMERCIAL EXCHANGE CAPACITY
Technical maximum import and export capacity of the Spanish electricity system with that of a neighbouring country's system and that is both compatible and which complies with the security criteria established for each system.

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

CONGESTION
A situation in which the link which interconnects two neighbouring electricity systems is not able to accept all the resulting physical flows of the international due to an insufficient interconnection capacity of the interconnection elements and/or of the national transmission grids involved.

CONSUMERS
Natural or legal persons who buy energy for their own use. Those consumers who acquire energy directly from the production market are known as Direct Market Consumers.

CONTROL DEVIATIONS
Deviations which occur between two electricity systems and are measured as the difference between the scheduled international exchanges and the international physical energy exchanges.

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 for balancing between two interconnected electricity systems through the coordinated action of the operators of the electricity systems involved, using the unused capacity after the intraday exchange 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.

DAY-AHEAD MARKET
This is the market in which the purchasing and sales transactions of electricty for the following day are carried out.

DEMAND (MEASURED AT POWER STATION BUSBARS)
Energy injected into the transmission grid from the power stations and imports, after deducting the consumption of pumps and exports. In order to transport this energy to the consumption points it would be necessary to subtract the losses originated in the transmission and distribution grid.

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 MANAGEMENT
The mechanism of deviation management is an optional 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.

DISTRIBUTORS
Those mercantile companies (or co-operative societies of consumers and users) have the function of distributing electricity, as well as to construct, maintain and operate the distribution facilities required to transfer and distribute the energy to the consumption points.

ELECTRICITY SUPPLIERS
Those mercantile companies or co-operative societies of consumers and users that, accessing the transmission grid or distribution network, acquire energy to sell to consumers, to other system participants or to carry out international exchange transactions under the terms established in Law 24/2013, of 26 December.

ENERGY NOT SUPPLIED (ENS)
Energy not delivered to the system due to service interruptions that may occur in the transmission network.

GENERATION MARKET
This is comprised of the set of commercial purchase transactions and the sale of energy and other services related to the supply of electricity. It is structured on credit markets, day-ahead market, intraday market, non-organised markets and system adjustment services, understanding as such the resolution of technical restrictions of the system, ancillary services and deviation management.

HYDROELECTRIC RESERVES
The hydroelectric reserve of a reservoir, at any given time, is the quantity of electricity that could be produced in the reservoir's own power station and in all the power stations situated downstream, with the total drainage of its current useable water reserves at that time and providing that drainage occurs without natural contributions. The annual regime reservoirs are those in which the fill and drainage cycle occurs over a one year period. Hyper-annual regime reservoirs are those which allow the variations in rainfall to be offset in cycles in periods of more than one year.

HYDRO MANAGEMENT UNIT (HMU)
Each set of hydropower stations belonging to the same hydroelectric basin and the same individual agent.

HYDRO-WIND
Production of electricity through the integration of a wind farm, a pumping unit and a hydroelectric power station. The operation allows the wind farm to supply electricity directly to the grid and, simultaneously, to feed a pump that moves water from a catchment area to a reservoir upstream, as an energy storage system. The hydroelectric power station harnesses the stored potential energy, guaranteeing the electricity supply and the stability of the grid.

INSTALLED POWER CAPACITY
Electrical energy capacity that a power station can generate and deliver under ideal conditions.

INSTANTANEOUS POWER
Instantaneous power is the energy absorbed by the demand at any given moment of time.

INTERNATIONAL PHYSICAL EXCHANGE
The movements of energy which have taken place across lines of international interconnection during a certain period of time. It includes the loop flow of energy as a consequence of the grid design.

INTERNATIONAL SCHEDULED EXCHANGES
These are the schedules that are established between two electricity systems as a consequence of a set of scheduled individual transactions in the market by Market Participants, or by means of bilateral contracts.

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 (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.

INTRADAY MARKET
The objective is to manage the adjustments occurring in the generation and demand of energy which may be produced after having fixed the day-ahead market.

MARGINAL PRICE
Price of the last bid that has been activated to cover the energy demand in a competitive bidding process of the energy market. This price is the price charged by all generators and the price paid by all consumers who participate in said bidding process.

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.

MARKET OPERATOR
A mercantile company which assumes the management of the bid system for the purchase and sale of electricity in the day-ahead and intraday market under the established regulations.

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 in real time by increasing production or reducing pumped storage consumption through the ancillary markets.

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 in real time by reducing production or increasing pumped storage consumption through the ancillary markets.

MIXED PUMPED STORAGE
Production of electricity generated by power stations capable of generating electrical energy with or without prior pumping from its lower reservoir or catchment area. When there is a water surplus, the power station will function as a conventional power station, also having the possibility of storing energy by pumping water from the lower to the upper reservoir.

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-FULFILMENT OF ENERGY BALANCING
Unfulfilled energy of net allocated tertiary reserves and deviation management.

NON-RENEWABLE ENERGIES
Includes pumped storage, nuclear, fuel/gas, combined cycle, cogeneration and renewable waste.

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.

PRODUCIBLE HYDROELECTRIC INDEX
This is the quotient between the producible energy and the average producible energy, both related to the same period and to the same hydroelectric equipment. A producible hydroelectric index of less than 1 indicates that the period is dry, while if greater than 1 it is a wet period.

PRODUCIBLE HYDROELECTRIC ENERGY
Maximum quantity of electricity that theoretically could be produced considering the water supplies registered during a specific period of time, and once the supplies used for irrigation or uses other than the generation of electricity have been subtracted.

PROGRAMMING UNIT
Minimum element with capacity to bid in a market.

PUMPED STORAGE CONSUMPTION
Electrical energy used by pumped storage hydroelectric power stations for elevating water from the lower to the upper reservoir for the generation of electricity.

PURE PUMPED STORAGE
Production of electricity by hydroelectric power stations whose associated reservoir does not receive any natural water inflows. The water comes from it being pumped up from a lower reservoir or catchment area.

RED ELÉCTRICA INDEX (IRE)
A preliminary electricity indicator that shows the evolution of electricity consumption of companies that have medium/high power consumption (with a contracted power capacity greater than 450 kW). This index is published both at a general level and at a detailed level by sector of activity (CNAE) and is available around 22 days after the end of the month.

REFERENCE SUPPLIER
They replace the Last Resort Suppliers and are those designated to offer the Voluntary Price to the Small Consumer (VPSC).

RENEWABLE ENERGY
Includes hydro, hydro-wind, wind, solar photovoltaic, solar thermal, biogas, biomass, marine-hydro, geothermal and renewable waste.

RENEWABLE WASTE
Non-fossil organic material of biological origin resulting from municipal solid waste and some commercial and non- hazardous industrial waste. 50% of municipal solid waste, also known as Municipal Solid Waste (MSW) is considered renewable.

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.

SECONDARY CAPACITY MARKET
A mechanism which allows the transfer and resale, on behalf of a participant, of acquired physical capacity rights in the annual and monthly auctions, or by means of transfers.

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).

SOLAR PHOTOVOLTAIC
Sunlight converted into electricity through the use of solar cells, generally made of semiconductor material that, when exposed to sunlight, generates electricity.

SOLAR THERMAL
Heat produced by solar radiation that can be taken advantage of for the production of mechanical energy and, subsequently, electricity.

SURPLUS/DEFICIT OF DEVIATIONS
Difference between the number of settlements of the deviations and the energy used to maintain the generation-demand balance.

SYSTEM OPERATOR
A mercantile company whose main function is to guarantee the continuity and security of the electricity supply, as well as the correct coordination of the generation and transmission system. It carries out its functions in coordination with the operators and participants of the Iberian Electricity Market under the principles of transparency, objectivity, independence and economic efficiency. The system operator shall be the manager of the transmission grid.

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
The complete set of lines, facilities, transformers and other electrical elements with voltages greater than or equal to 220 kV, and those other facilities, regardless of their power, which fulfil transmission functions, international interconnections and the interconnections with the Spanish insular and non-peninsular electricity systems.

TRANSMISSION GRID AVAILABILITY RATE
Indicates the percentage of total time in which each element of the transmission grid (line, transformer, control element of active and reactive power) has been available for service. It is calculated based on the nominal power of each facility after having factored in the downtime due to preventive and corrective maintenance, unforeseen unavailability, or other causes (such as the construction of new facilities, renovations and improvements).

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.

UNAVAILABILITY OF THE PRODUCTION UNITS
A production unit is completely available if it can participate in production without any limitation in generation capacity or, when applicable, pumped storage consumption. Otherwise, it is considered unavailable, such unavailability being of a partial or total nature.

VOLTAGE CONTROL

This is an ancillary system service whose aim is to guarantee the suitable voltage control in the nodes of the transmission grid, so that the operation of the system meets the established security and reliability requirements, to ensure that the energy supplied to the final consumers is in compliance with the required quality and that the generators can work in the established conditions for its normal operation.

VOLUNTARY PRICE FOR THE SMALL CONSUMER (VPSC)

A system (known in Spain as 'Precio Voluntario al Pequeño Consumidor' or PVPC), implemented by the Public Administration, by means of which the price of electrical energy is set and which is applied to the electricity bill of those consumers with a contracted power of no more than 10 kW. The VPSC replaces the former Last Resort Tariff (LRT).

WASTE

Combustible materials resulting from a product or by-product of waste which, when processed, produces energy for purposes such as heating and electricity generation.

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