
The Spanish Electricity System

Preliminary report
2020



Glossary of terms

<https://www.ree.es/en/glossary>

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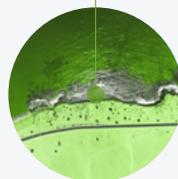
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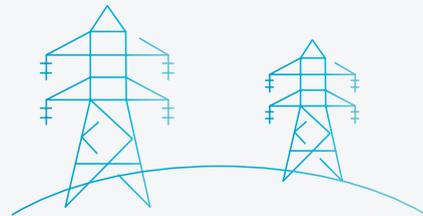
*This preliminary report presents the **provisional** statistical data regarding the behaviour of the Spanish electricity system during 2020. Information prepared using data as at 13 January 2021.*



Electricity balance, installed power capacity and the transmission grid

In 2020, electricity demand in Spain has suffered from the effects of the pandemic and has fallen by 5.6% compared to 2019.

Renewable technologies produced 44% of all electricity generated in Spain in 2020, recording their highest share of the generation mix since records began. For its part, CO₂ eq. emission-free generation also set an all-time record, representing 67.3% of overall electricity production nationwide. These values are extremely positive in helping achieve the decarbonisation targets set out as part of the energy transition.



249,819 GWh

NATIONAL DEMAND 2020

-5.6 %

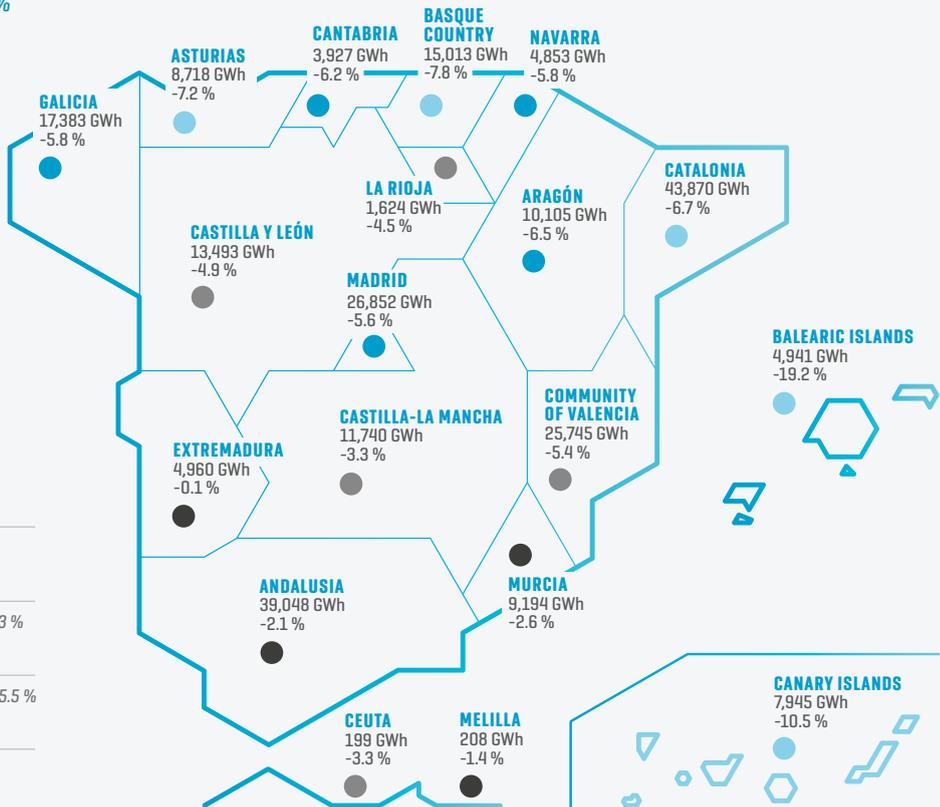
COMPARED TO 2019

The **demand for electricity** in Spain has suffered a decline, particularly due to the presence of the COVID-19 pandemic, which has slowed economic activity. Specifically, in 2020, electricity demand stood at 249,819 GWh, 5.6% lower than the previous year.

In terms of **generation**, renewable production reached an all-time high of 110,450 MWh, a 44% share of the electricity generation mix in 2020 [37.5% in 2019].

In this regard, noteworthy is that wind power generation accounted for more than one fifth [21.9%] of the national generation mix and solar photovoltaic represented 6.1%, this meant that both technologies recorded all-time highs. As for international exchanges, for the fifth consecutive year they closed with an import balance, totalling 3,280 GWh in 2020.

Electricity demand by autonomous community and its variation with respect to the previous year GWh and %



Final data: As at 29/02/2020

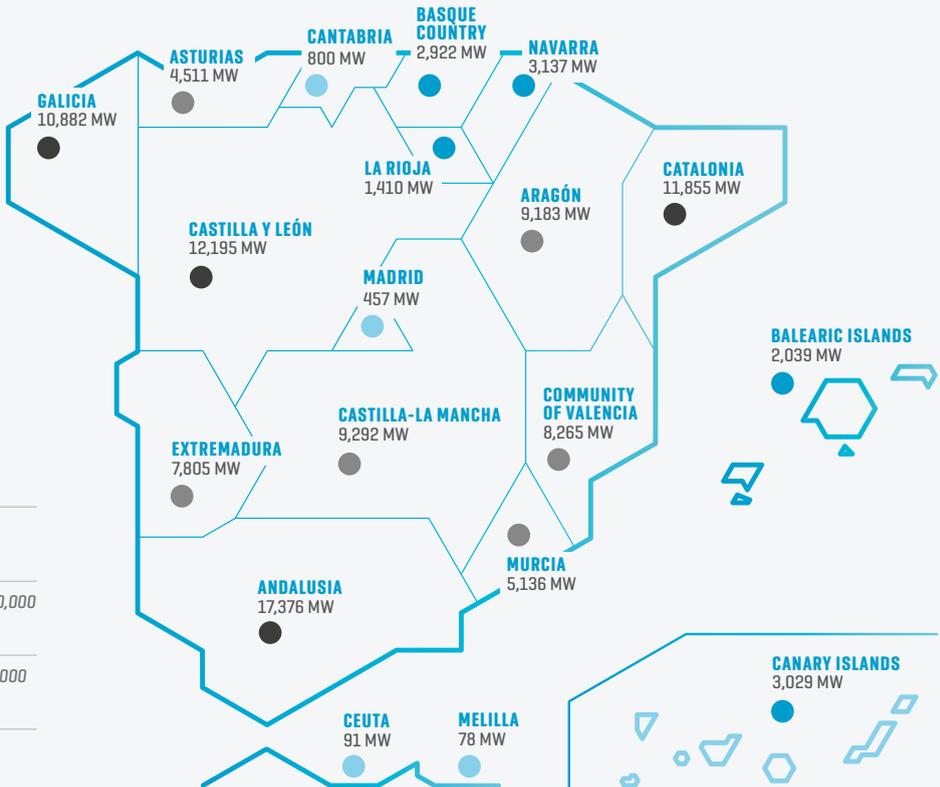
Provisional data: As at 31/10/2020

Estimated data: As at 31/12/2020

In 2020, coal registered its lowest all-time share in the national generation mix [2% of the total].

The complete set of generating facilities in Spain is increasingly renewable in nature. In 2020, installed power capacity stood at 110,462 MW, of which 53.8% belonged to renewable technologies.

Installed power capacity by autonomous community - AS AT 31 DECEMBER 2020
MW

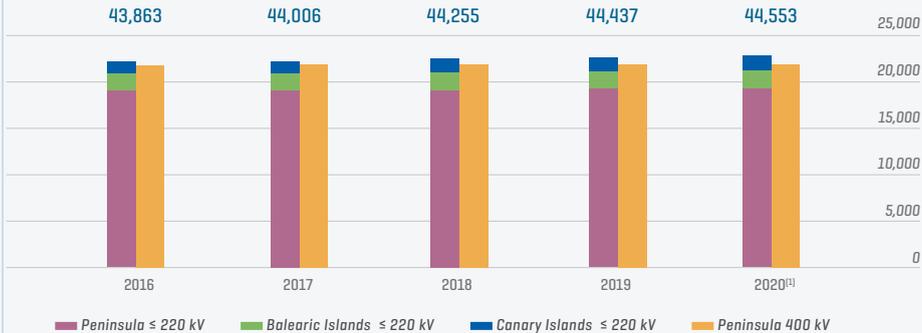


The development of the **electricity transmission grid** in Spain during 2020 registered an increase of 116 km of new line circuit and 1,080 MVA of new transformer capacity, which together help bolster the reliability and security of a transmission grid that is smarter and more sustainable and has an increasingly higher level of grid meshing.



TRANSMISSION GRID
44,553 km
of line circuit as at year-end 2020

Evolution of the electricity transmission grid in Spain km of circuit



[1] Provisional data pending audit (currently in progress).

Cumulative figures regarding kilometres of line circuit as at 31 December of each year. Includes the transmission grid assets of those utility companies whose electricity distribution facilities are considered as an integral part of the overall transmission grid infrastructure nationwide.

Electricity transmission grid facilities in Spain

	400 kV		≤ 220 kV		Total
	Peninsula	Peninsula	Balearic Islands	Canary Islands	
Total line circuit (km)	21,753	19,310	1,929	1,561	44,553
Overhead lines (km)	21,636	18,549	1,141	1,235	42,562
Submarine cable (km)	29	236	582	30	877
Underground cable (km)	88	525	206	296	1,115
Transformer capacity (MVA)	84,514	1,563	3,838	3,630	93,545

Provisional data pending audit (currently in progress).

Cumulative figures regarding kilometres of line circuit and transformer capacity as at 31 December of each year. Includes the transmission grid assets of those utility companies whose electricity distribution facilities are considered as an integral part of the overall transmission grid infrastructure nationwide.

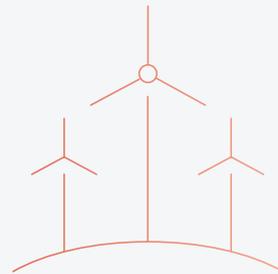




Peninsular system

Electricity demand on the Spanish Peninsula has suffered a setback in 2020 falling by 5.1%, even though it was a year which saw all-time record figures being set in terms of clean electricity generation.

With regard to electricity generation on the Spanish Peninsula, noteworthy was the increase in production using technologies that do not emit CO₂ eq. emissions, reaching a share of almost 70% of the total peninsular generation mix. This fact, associated with the lower production of and coal-fired power stations, has led to a 27.9% decrease in CO₂ eq. emissions from electricity generation compared to the previous year, reaching an all-time low in 2020 of 29.5 million tCO₂ eq.



236,525 GWh

PENINSULAR DEMAND 2020

69.9 %

OF TOTAL GENERATION IN THE PENINSULAR SYSTEM WAS FREE OF CO₂ EQ. EMISSIONS

Evolution of electricity demand on the Spanish Peninsula

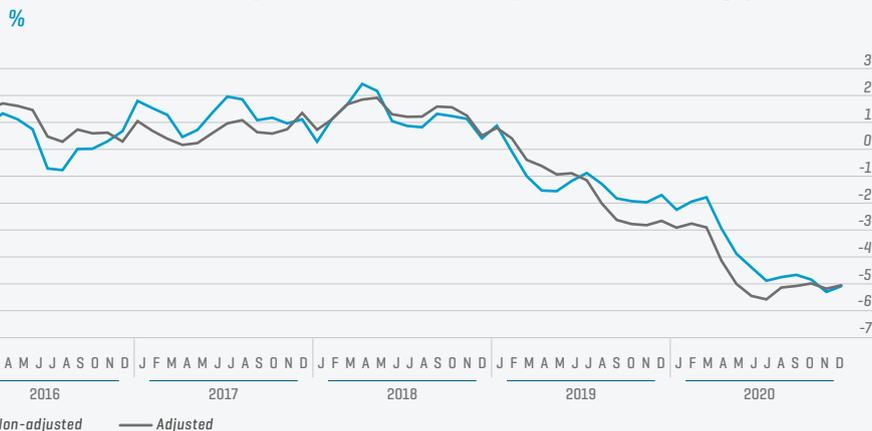
	Demand (measured at power station busbars)		Components [%]		
	GWh	Annual [%]	Work calendar	Temperature	Adjusted
2016	249,680	0.7	0.3	0.1	0.3
2017	252,506	1.1	-0.1	-0.2	1.4
2018	253,566	0.4	-0.3	0.2	0.5
2019	249,257	-1.7	0.7	0.2	-2.7
2020	236,525	-5.1	-0.1	0.1	-5.1

Monthly variation in peninsular electricity demand. 2020

%				
	Monthly	Cumulative	Monthly	Cumulative
January	-3.1	-3.1	July	-3.3
February	-1.6	-2.4	August	-2.1
March	-4.5	-3.0	September	-2.8
April	-17.2	-6.3	October	-2.8
May	-12.7	-7.6	November	-5.9
June	-8.1	-7.7	December	1.4

Variation with respect to the same month the previous year.

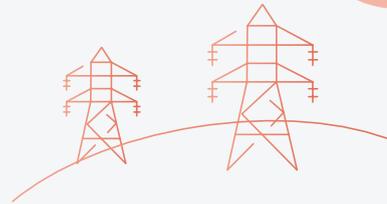
Annual variation in peninsular electricity demand. Rolling year



Peninsular electricity demand, according to provisional data, closed 2020 at 236,525 GWh, a fall of 5.1% compared to the previous year. Even after factoring in the influence of seasonal and working patterns, the estimated annual variation rate of the demand remains unchanged [-5.1%].

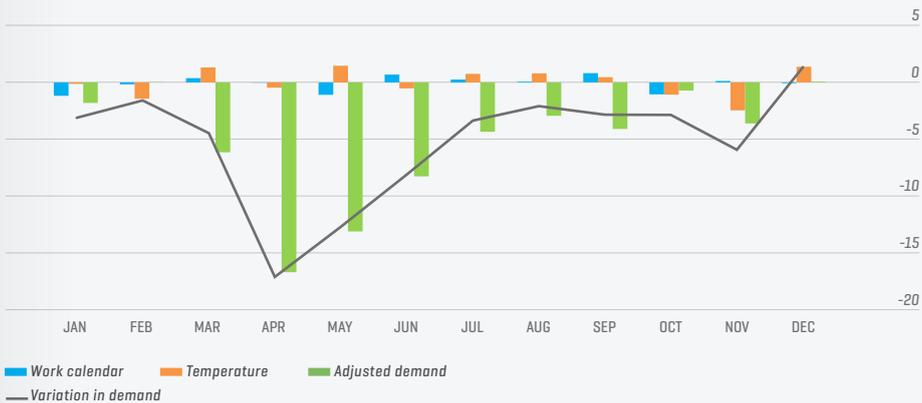
Temperatures have had an impact of 0.1% on the evolution of consumption and the work calendar had an impact of -0.1%.

-5.1 %
COMPARED TO
2019



236,525 GWh
PENINSULAR DEMAND 2020

Components of the monthly variation in peninsular electricity demand. 2020
%



The **Red Eléctrica Index (IRE)** is an electricity consumption indicator whose objective is to provide, in advance, the data regarding the evolution of the demand of large power consumers. In 2020, the composition of the work calendar had a positive impact of 0.3 percentage points on the evolution of the IRE, while temperature levels increased the evolution of the IRE by 0.1%. After having factored in the influence of both elements, the general index has decreased by 7.7% year-on-year, a figure which represents the highest negative variation of the index since it began in 2013.

By sector, the industrial sector showed a downward trend, closing the year with a percentage of -7.0%, compared to the adjusted figure that showed a

decrease of -3.7% in 2019. For its part, of note is the sharp decline registered in the services sector (the one most impacted by the pandemic), a sector that showed an annual adjusted variation of -10.7%, compared to the adjusted figure that showed a fall of -0.1% in 2019.



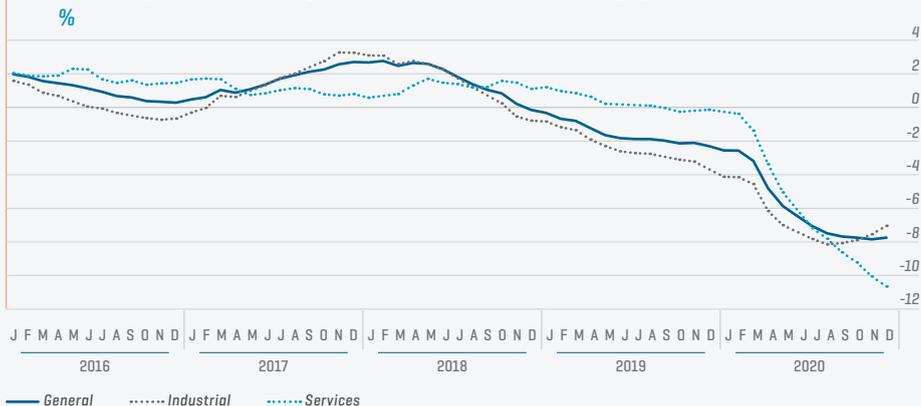
-7.7%

IRE (ADJUSTED FIGURE DEMAND OF LARGE POWER CONSUMERS)

IRE: Components of annual variation 2020

%	<u>Gross</u>	<u>Work calendar</u>	<u>Temperature</u>	<u>Adjusted</u>
General	-7.3	0.3	0.1	-7.7
Industrial	-6.6	0.3	0.1	-7.0
Services	-10.3	0.3	0.1	-10.7
Other	-4.6	0.1	0.9	-5.6

Monthly evolution of the adjusted IRE. Rolling year



The **maximum instantaneous power demand** on the Spanish Peninsula was recorded on 20 January at 8:22 p.m. when it reached 40,423 MW, a value 0.1% lower than the previous year's maximum which was recorded in January, but this figure still far from the all-time high of 45,450 MW set in December 2007. The maximum hourly demand was also registered on 20 January between 8:00 and 9:00 p.m., when it reached 39,997 MWh, a value 0.3% lower than the maximum figure registered in 2019.

-0.1%
COMPARED TO
2019

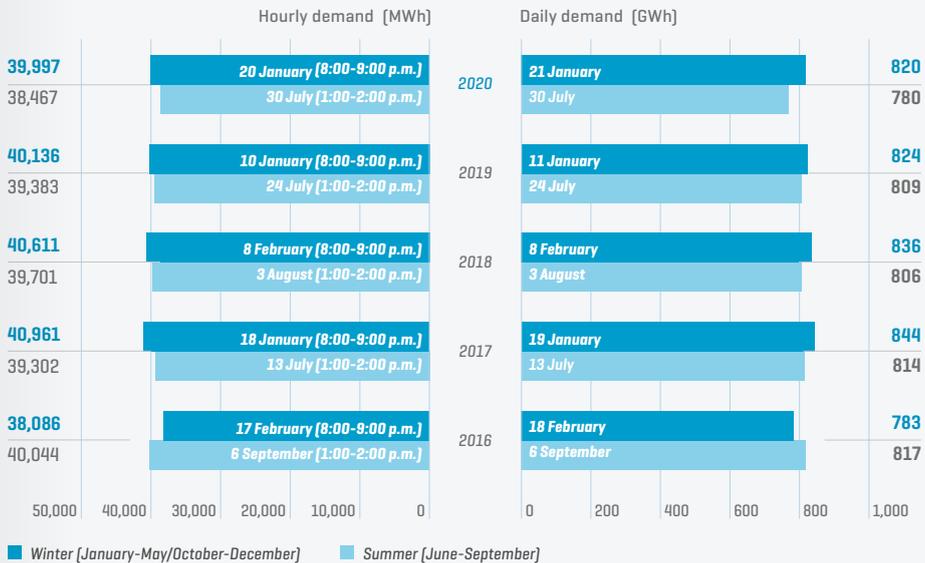
MAXIMUM INSTANTANEOUS
POWER DEMAND

40,423 MW

20 January

8:22 p.m.

Maximum annual peninsular demand values



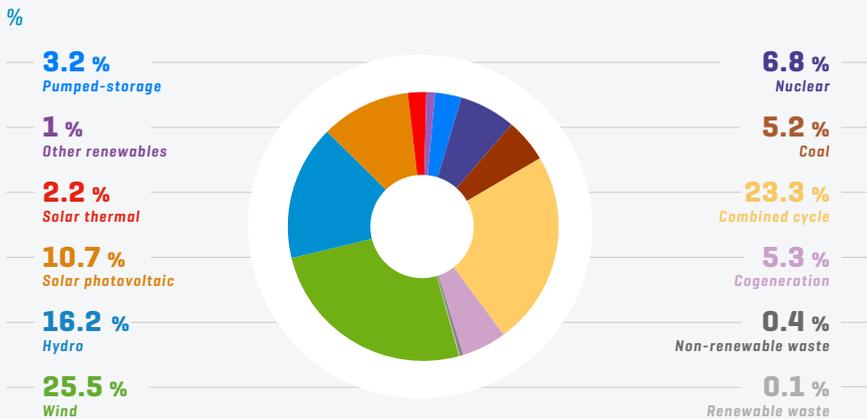
In terms of **demand coverage**, the most noteworthy development has been the increase in the contribution technologies that do not emit CO₂ eq. emissions. In this respect, nuclear once again tops the list with a contribution of 23% [22% in 2019], followed closely by wind power with 22.2% [20.9% in 2019]. The contributions of hydro and solar photovoltaic are also worth a mention, with shares of 12.6% and 6.1% respectively.

In terms of fossil-fuelled technologies, noteworthy are the decreases in the contribution of [15.8% coverage compared to 20.1% in 2019] and coal [2% compared to 4.2% in 2019], with the latter technology registering its all-time lowest value.

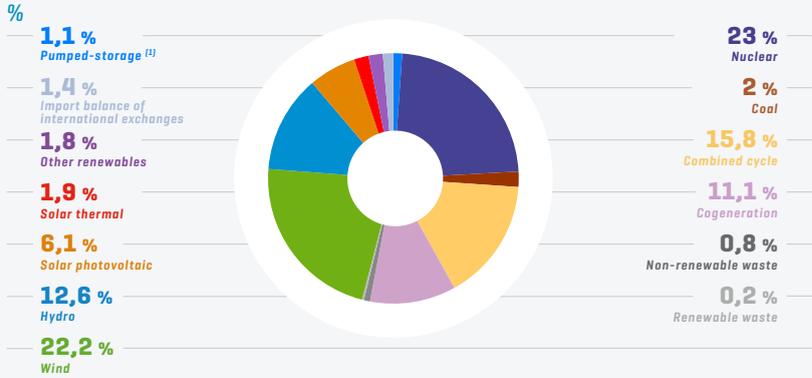
55.8% of the peninsular installed power capacity comes from renewable sources.

105,224
MW

Installed power capacity on the Peninsula as at 31 December 2020



Electricity demand coverage on the Peninsula. 2020



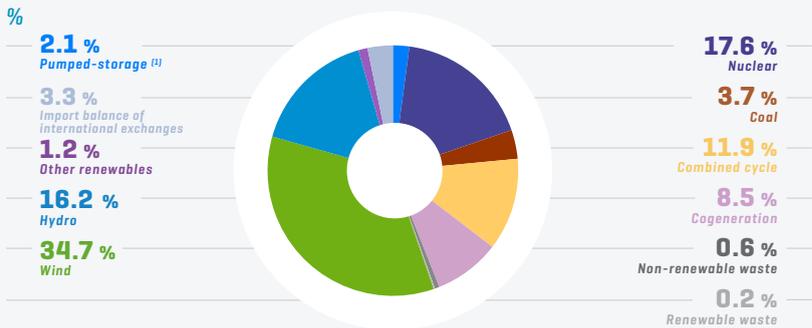
[1] Pure pumped-storage + estimated mixed pumped-storage.

In 2020, 69% of the peninsular electricity demand was covered by generation technologies that do not emit CO₂ eq. emissions, the highest value since records began.

39,997
MWh

Electricity demand coverage. Maximum hourly demand coverage on the Peninsula. 2020

20 January 2020 (8:00-9:00 p.m.)



[1] Pure pumped-storage + estimated mixed pumped-storage.

Renewable energy has increased its share in the overall peninsular electricity generation mix, rising from 38.9% in 2019 to an all-time high of 45.5% in 2020. By technology, wind power stands out with 22.5% of total electricity production, followed by hydro and solar photovoltaic with 12.8% and 6.2%, respectively. In 2020, several maximum values in wind and photovoltaic generation have been reached.

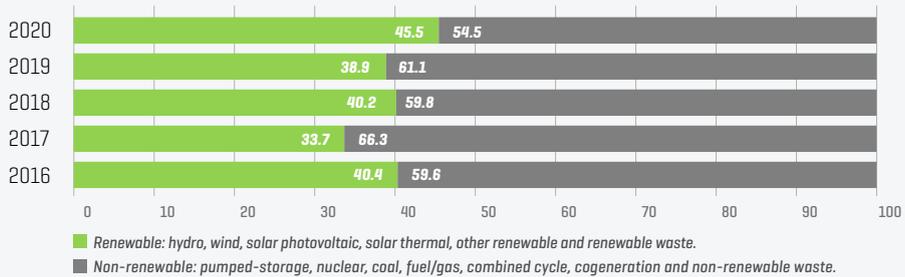


ALL-TIME HIGH

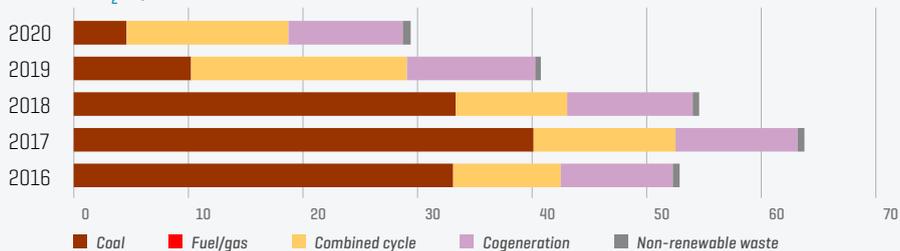
45.5%

SHARE OF RENEWABLES IN THE OVERALL
PENINSULAR ELECTRICITY GENERATION MIX

Evolution of renewable and non-renewable peninsular electricity generation %



Evolution of CO₂ eq. Emissions associated with electricity generation on the Peninsula Million tCO₂ eq.



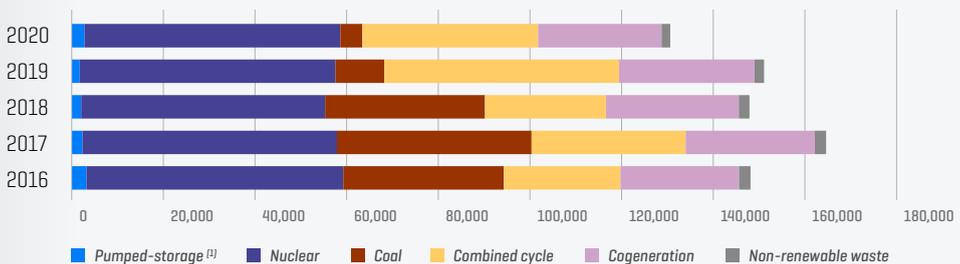
Evolution of renewable electricity generation on the Peninsula GWh



-27.9%
CO₂ eq.
EMISSIONS

CO₂ eq. emissions derived from peninsular electricity generation decreased 27.9% due to the lower level of production from combined cycle and coal-fired power stations.

Evolution of non-renewable electricity generation on the Peninsula GWh



[1] Pure pumped-storage + estimated mixed pumped-storage.

Producible hydroelectric registered a value of 30,512 GWh, a value very similar to the average historical value and 17.4% higher than that registered in 2019. Hydroelectric reserves of the complete set of reservoirs closed 2020 with a fill level of 50.8% of their total capacity (51% in 2019).

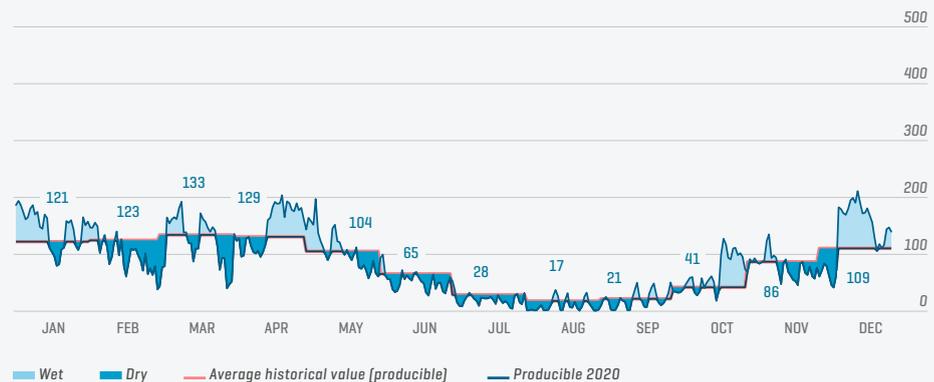
Producible hydroelectric was 17.4% higher than the value registered in 2019.

Producible hydroelectric energy on the Peninsula

	GWh	Index	Probability of being exceeded (%)
2016	34,667	1.1	37.3
2017	15,972	0.5	99.3
2018	37,403	1.3	17.2
2019	25,995	0.9	63.7
2020	30,512	1.0	44.2

Daily producible hydroelectric energy on the Peninsula in 2020 compared with the average historical value (producible)

GWh





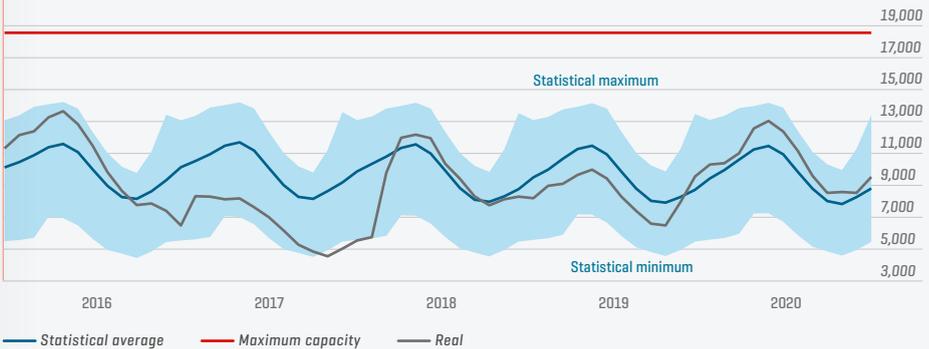
50.8%

HYDROELECTRIC
RESERVES
IN 2020

Peninsular hydroelectric reserves as at 31 December 2020

	Capacity	2019		2020	
		GWh	% Fill level	GWh	% Fill level
Annual management regime	8,967	5,895	65.7	5,564	62.0
Hyper-annual management regime	9,571	3,557	37.2	3,855	40.3
Total	18,538	9,452	51.0	9,419	50.8

Evolution of peninsular hydroelectric reserves
GWh

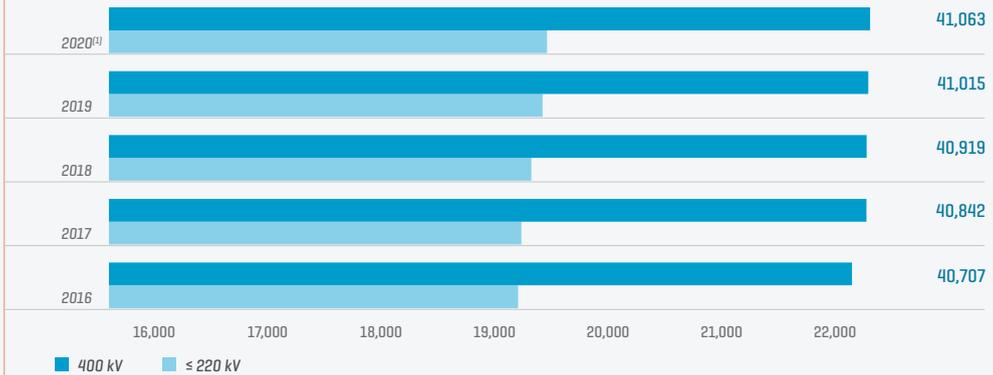


Statistical maximum and minimum: average of the maximum and minimum values of the last 20 years.

According to provisional data, the **peninsular electricity transmission grid** registered an increase of 49 km of line circuit during 2020 and increased its transformer capacity by 920 MVA, bringing the total km of line circuit in the peninsular transmission grid at year-end to 41,063 km.

New infrastructure to bolster grid meshing and shape a safer, more resilient and sustainable transmission grid.

Evolution of the peninsular transmission grid km of line circuit



[1] Provisional data pending audit (currently in progress).

Cumulative figures regarding kilometres of line circuit as at 31 December of each year. Includes the transmission grid assets of those utility companies whose electricity distribution facilities are considered as an integral part of the overall transmission grid infrastructure nationwide.

Evolution of the electricity transmission grid on the Peninsula

	2016	2017	2018	2019	2020 ^[1]
400 kV Circuit (km)	21,616	21,725	21,727	21,738	21,753
220 Kv ≤ Circuit (km)	19,092	19,117	19,192	19,277	19,310
Transformer capacity (MVA)	81,525	82,075	84,357	85,157	86,077

[1] Provisional data pending audit (currently in progress).

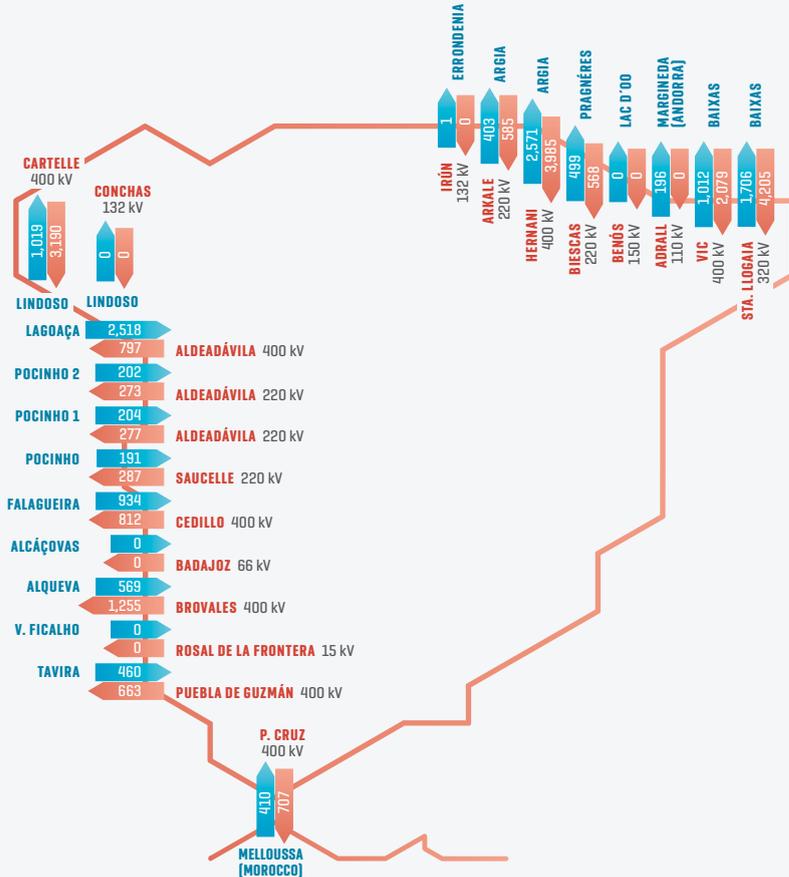
Cumulative figures regarding kilometres of line circuit and transformer capacity as at 31 December of each year. Includes the transmission grid assets of those utility companies whose electricity distribution facilities are considered as an integral part of the overall transmission grid infrastructure nationwide.

Balance of international physical electrical energy exchanges GWh

	France	Portugal	Andorra	Morocco	Total
2016	7,802	5,086	-278	-4,951	7,658
2017	12,465	2,685	-233	-5,748	9,169
2018	12,047	2,655	-210	-3,389	11,102
2019	9,697	-3,399	-208	773	6,862
2020	5,229	-1,457	-196	-297	3,280

Positive value: importer balance; Negative value: exporter balance.

International physical electrical energy exchanges. 2020 GWh





Non-peninsular systems

In 2020, electricity demand fell in all the non-peninsular electricity systems. The Canary Islands electricity system covered more than 17.5% of its demand with renewables, registering a new all-time high, a noteworthy value for an isolated electricity system.

In 2020, the energy transferred from the Spanish Peninsula, through the link with the Balearic Islands, has reached a total of 1,427 GWh, representing 28.9% of the annual electricity demand of the archipelago.



13,294 GWh

*ELECTRICITY DEMAND IN
NON-PENINSULAR SYSTEMS IN 2020*

-13.7%

COMPARED TO 2019

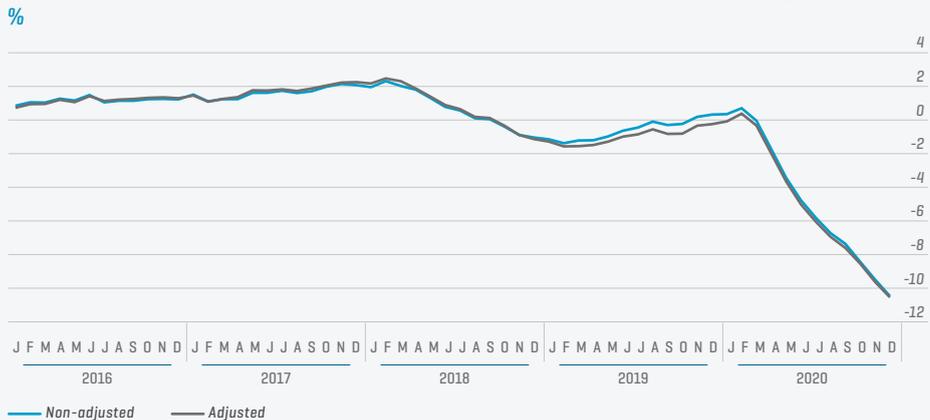
Evolution of non-peninsular electricity demand

	Balearic Islands		Canary Islands		Ceuta		Melilla	
	GWh	Annual (%)	GWh	Annual (%)	GWh	Annual (%)	GWh	Annual (%)
2016	5,823	0.6	8,744	1.3	211	3.3	208	-2.3
2017	6,016	3.3	8,931	2.1	203	-3.7	210	1.0
2018	6,057	0.7	8,842	-1.0	207	2.2	213	1.2
2019	6,115	1.0	8,875	0.4	206	-0.6	211	-1.0
2020	4,941	-19.2	7,945	-10.5	199	-3.3	208	-1.4

Annual variation of electricity demand. Balearic islands. Rolling year



Annual variation of electricity demand. Canary islands. Rolling year

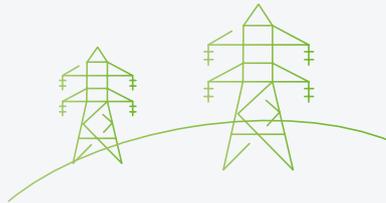


Electricity demand on the Balearic Islands

closed 2020 at 4,941 GWh, representing a decrease of 19.2% compared to 2019.

In 2020, the energy transferred from the Spanish Peninsula, through the submarine link with the Balearic Islands, contributed to covering 28.9% of the demand of the Balearic Islands.

-19.2%
COMPARED TO
2019



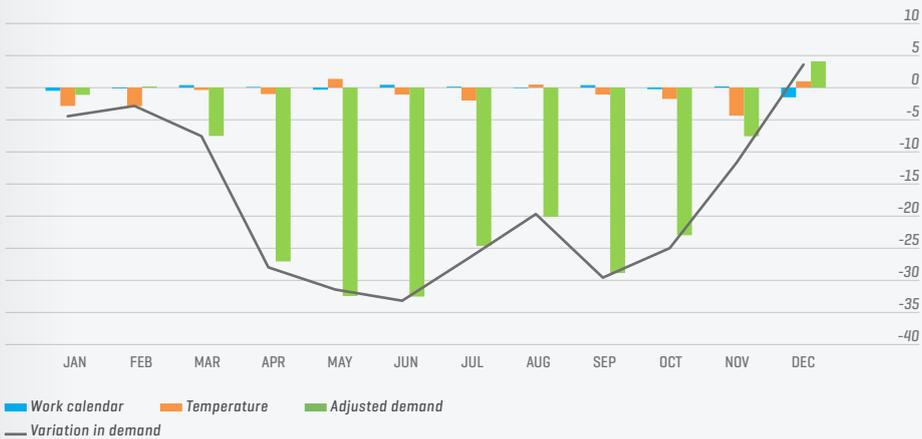
4,941 GWh

DEMAND ON THE BALEARIC ISLANDS IN 2020

28.9% of the demand of the Balearic Islands was covered by energy transferred from the Spanish Peninsula.

Components of the variation in monthly electricity demand. Balearic islands. 2020

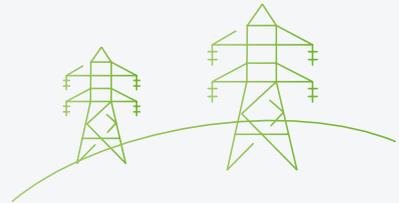
%



Electricity demand on the Canary Islands closed 2020 at 7,945 GWh, representing a fall of 10.5% with respect to 2019.

The decreases in demand in the electricity systems of **Ceuta and Melilla** were not as marked, registering negative variations of 3.3% and 1.4%, respectively.

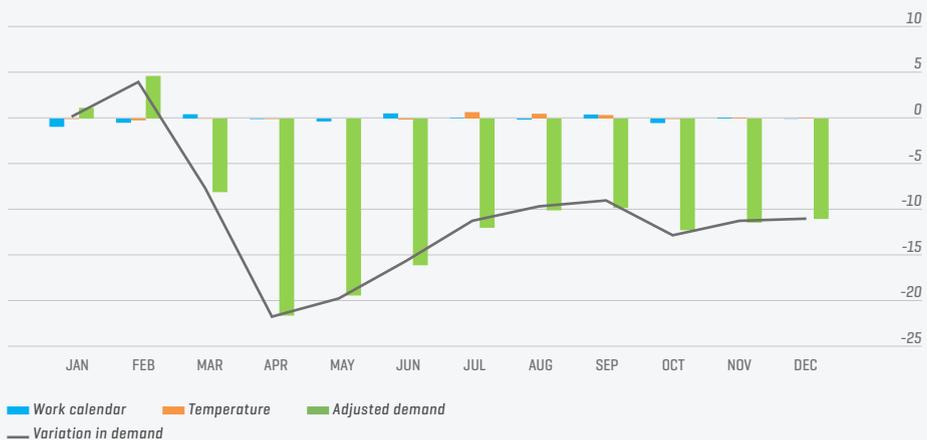
-10.5 %
COMPARED
TO 2019



7,945 GWh
DEMAND ON THE CANARY
ISLANDS IN 2020

**Components of the variation in monthly electricity demand.
Canary islands. 2020**

%



The **maximum hourly demand on the Balearic Islands** occurred on 31 July, between 1:00 and 2:00 p.m., when it reached 1,088 MWh, a value 15.4% lower than the 2019 maximum recorded on 9 August, between 1:00 and 2:00 p.m.

The **maximum hourly demand in the Canary Islands** was recorded on 23 January, between 8:00 and 9:00 p.m., with 1,351 MWh, a value 1.6% lower than the maximum of 2019 registered on 2 October, between 8:00 and 9:00 p.m.

Monthly variation of non-peninsular electricity demand. 2020

%

	<u>Balearic Islands</u>	<u>Canary Islands</u>	<u>Ceuta</u>	<u>Melilla</u>
January	-4.5	0.2	0.0	-3.9
February	-2.9	4.0	-1.6	-0.9
March	-7.6	-7.6	0.1	-5.3
April	-27.9	-21.8	2.0	-4.2
May	-31.4	-19.8	-5.5	-8.2
June	-33.1	-15.7	-4.8	-2.1
July	-26.5	-11.2	-1.5	5.8
August	-19.7	-9.7	-3.0	4.9
September	-29.5	-9.0	-4.4	0.8
October	-25.0	-12.8	-8.9	-5.5
November	-11.7	-11.2	-8.0	-3.8
December	3.6	-11.0	-3.7	2.7

Variation with respect to the same period of the previous year.

Maximum annual demand values (non-peninsular systems). 2020

MWh

Hourly demand (MWh)		Daily demand (GWh)	
893	13 January (8:00-9:00 p.m.)	Balearic Islands	13 January
1,088	31 July (1:00-2:00 p.m.)		31 July
1,351	23 January (8:00-9:00 p.m.)	Canary Islands	21 January
1,339	27 August (8:00-9:00 p.m.)		27 August
34	21 January (8:00-9:00 p.m.)	Ceuta	22 January
33	11 August (1:00-2:00 p.m.)		25 August
35	21 January (8:00-10:00 p.m.)	Melilla	21 January
41	5 August (1:00-2:00 p.m.)		3 August
			16,011
			21,277
			25,412
			26,224
			627
			634
			626
			799

■ Winter (January-May/October-December)

■ Summer (June-September)

Installed power capacity of non-peninsular systems remained stable in nearly all systems except for that of the Balearic Islands, which registered a decrease of 9.1%. This decrease is due to the decommissioning of generating units 1 and 2 of the Alcudia coal-fired power station in Majorca.

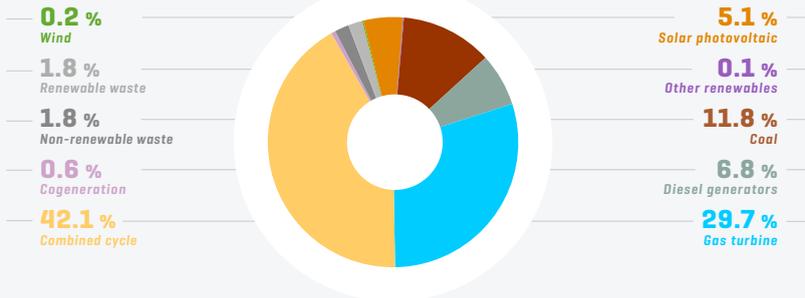
In terms of **demand coverage** in the Balearic Islands, noteworthy is the sharp drop in the use of coal-fired production in their generation mix which stood at only 4.5% [32.7% in 2019].

Also of note is the increase of combined cycle in the archipelago's generation mix, which reached 48.8% [17.1% in 2019]. The decrease in the share of coal was due to the lack of generation from this technology during the first eight months of the year, motivated by the limitation of operating hours established for generating units 3 and 4 of the Alcudia power station. Of note is that renewable energy covered more than 17.5% of the demand in the Canary Islands, the highest value ever registered to date, and a significant value for an isolated electricity system.

2,039
MW

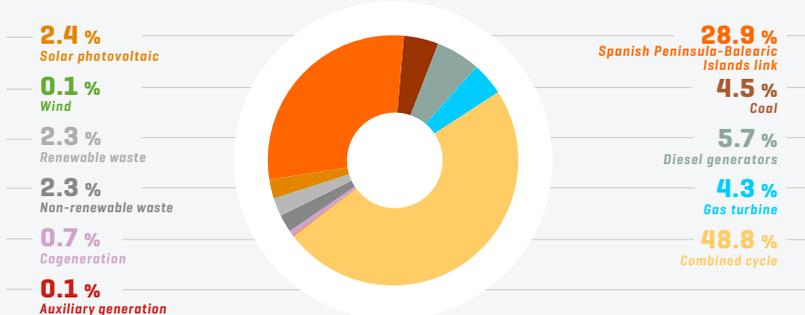
Installed power capacity as at 31 december 2020. Balearic islands

%

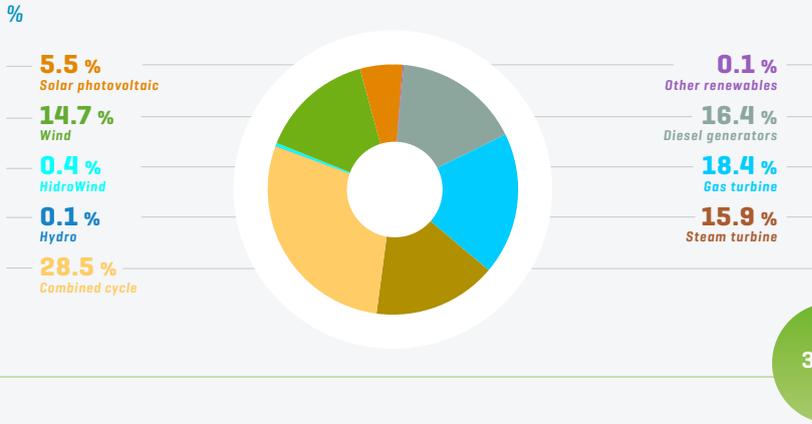


Electricity demand coverage. Balearic islands. 2020

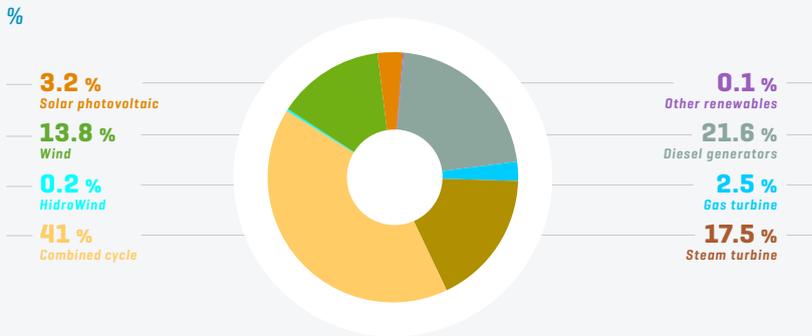
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Installed power capacity as at 31 december 2020. Canary islands



Electricity demand coverage. Canary islands. 2020



Evolution of the non-peninsular electricity transmission grid

		2016	2017	2018	2019	2020 ^[1]
220 kV Circuit (km)	Balearic Islands	432	432	432	448	448
	Canary Islands	220	220	239	239	239
	Total	652	652	671	687	687
132 kV Circuit (km)	Balearic Islands	472	472	517	520	576
	Canary Islands	-	-	67	125	126
	Total	472	472	584	646	701
≤ 132 kV Circuit (km)	Balearic Islands	897	905	905	905	905
	Canary Islands	1,134	1,135	1,176	1,185	1,196
	Total	2,031	2,040	2,081	2,090	2,102
Transformer capacity (MVA)	Balearic Islands	3,463	3,463	3,463	3,838	3,838
	Canary Islands	2,250	2,810	3,310	3,470	3,630
	Total	5,713	6,273	6,773	7,308	7,468

[1] Provisional data pending audit (currently in progress).

Cumulative figures regarding kilometres of line circuit and transformer capacity as at 31 December of each year. Includes the transmission grid assets of those utility companies whose electricity distribution facilities are considered as an integral part of the overall transmission grid infrastructure nationwide.



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