
The Spanish Electricity System

Summary

2020

*For a renewed future,
a renewable present*



RED
ELÉCTRICA
DE ESPAÑA

National electrical energy balance in 2020 broken down by Autonomous Community ⁽¹⁾

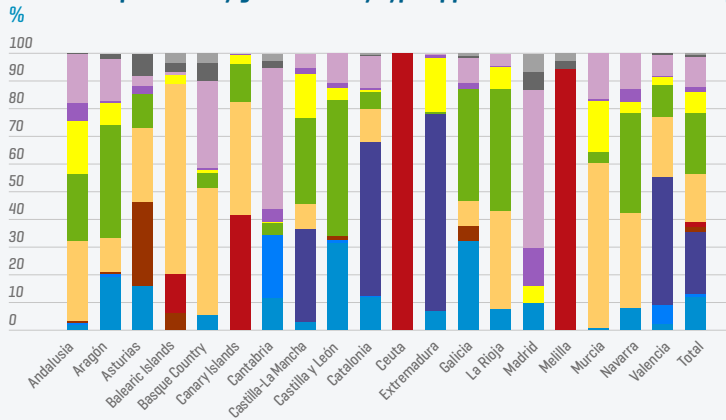
GWh	Andalusia	Aragón	Asturias	Balearic Islands	Basque Country	Canary Islands	Cantabria	Castilla-La Mancha	Castilla y León	Catalonia
Hydro	544	3,466	1,492	-	351	3	191	689	8,027	5,135
Wind-Hydro	-	-	-	-	-	20	-	-	-	-
Wind	6,725	7,314	1,153	4	326	1,100	74	7,165	12,574	2,556
Solar Photovoltaic	3,474	1,506	1	118	62	258	2	3,081	1,115	379
Solar Thermal	1,978	-	-	-	-	-	-	597	-	60
Other renewables ⁽²⁾	1,677	43	264	1	56	9	79	489	417	151
Renewable waste	-	-	-	114	204	-	41	-	-	115
Renewable Generation	14,399	12,329	2,910	237	999	1,391	387	12,022	22,133	8,396
Pumped Storage (Net Supply) ⁽³⁾	224	231	11	-	-	-	373	27	331	175
Nuclear	-	-	-	-	-	-	-	7,715	-	23,887
Coal	179	151	2,827	222	-	-	-	-	299	-
Fuel/gas ⁽⁴⁾	-	-	-	497	-	3,301	-	-	-	-
Combined Cycle ⁽⁵⁾	8,152	2,226	2,513	2,412	2,828	3,254	-	2,050	-	5,264
Cogeneration	5,026	2,799	347	34	1,944	-	835	1,121	2,669	5,108
Non-Renewable Waste	0	305	726	114	397	-	41	-	-	123
Non-Renewable Generation	13,581	5,713	6,425	3,278	5,169	6,555	1,248	10,913	3,299	34,556
Pumped storage consumption	-319	-296	-16	-	-	-	-543	-23	-1,023	-326
International energy exchange balance ⁽⁶⁾	11,407	-7,637	-591	1,427	8,788	-	2,814	-11,167	-10,974	1,365
Demand (measured as busbars) 2020	39,067	10,109	8,728	4,942	14,955	7,946	3,906	11,745	13,435	43,991
Demand (measured as busbars) 2019	39,871	10,809	9,393	6,115	16,284	8,875	4,188	12,135	14,182	47,025
% 2020/2019	-2.0	-6.5	-7.1	-19.2	-8.2	-10.5	-6.7	-3.2	-5.3	-6.5

	Ceuta	Extremadura	Galicia	La Rioja	Madrid	Melilla	Murcia	Navarra	Valencia	TOTAL
Hydro	-	1,471	7,917	140	125	-	93	540	430	30,614
Wind-Hydro	-	-	-	-	-	-	-	-	-	20
Wind	-	117	9,994	791	-	-	431	2,378	2,198	54,899
Solar Photovoltaic	-	2,389	21	143	82	0	1,852	279	526	15,289
Solar Thermal	-	1,776	-	-	-	-	40	-	87	4,538
Other renewables ⁽²⁾	-	261	461	7	177	-	45	305	36	4,480
Renewable waste	-	-	163	-	83	6	-	-	-	726
Renewable Generation	0	6,015	18,557	1,081	466	6	2,461	3,501	3,277	110,566
Pumped Storage (Net Supply) ⁽³⁾	-	22	21	-	-	-	-	-	1,334	2,748
Nuclear	-	15,263	-	-	-	-	-	-	8,892	55,757
Coal	-	-	1,344	-	-	-	-	-	-	5,022
Fuel/gas ⁽⁴⁾	199	-	-	-	-	197	-	-	-	4,194
Combined Cycle ⁽⁵⁾	-	-	2,212	635	-	-	6,130	2,266	4,081	44,023
Cogeneration	-	55	2,258	76	741	-	1,683	843	1,468	27,008
Non-Renewable Waste	-	-	163	-	83	6	-	-	59	2,015
Non-Renewable Generation	199	15,340	5,999	711	824	202	7,812	3,109	15,833	140,767
Pumped storage consumption	-	-63	-268	-	-	-	-	-	-1,743	-4,621
International energy exchange balance ⁽⁶⁾	-	-16,340	-6,915	-171	25,609	-	-1,066	-1,767	8,499	3,280
Demand (measured as busbars) 2020	199	4,951	17,372	1,621	26,899	208	9,208	4,844	25,866	249,991
Demand (measured as busbars) 2019	206	4,966	18,449	1,701	28,455	211	9,436	5,150	27,210	264,664
% 2020/2019	-3.3	-0.3	-5.8	-4.7	-5.5	-1.4	-2.4	-5.9	-4.9	-5.5

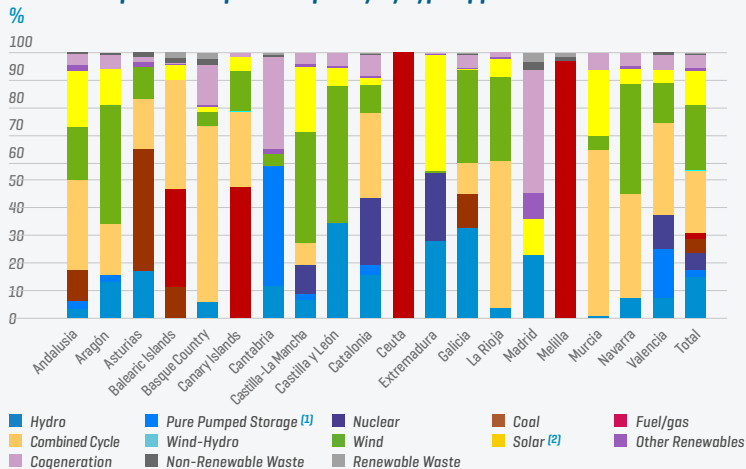
⁽¹⁾ Allocation of generation units based on primary fuel. The net production of non-renewable and non-Hydro Management Units (HMU) facilities have their own consumption discounted. In these types of production, negative generation indicates that the electricity consumed for the power station's uses exceeds its gross production.
⁽²⁾ Includes biogas, biomass, marine and geothermal.

⁽³⁾ Pure pumped storage (net supply) + estimate of mixed pumped storage (net supply). ⁽⁴⁾ The Balearic Islands electricity system includes generation with auxiliary generation units. ⁽⁵⁾ Includes operation in open-cycle mode. The Canary Islands electricity system uses diesel as its main fuel. ⁽⁶⁾ Includes the balance of energy exchanges between autonomous communities and the cross-border physical energy exchange balance. A positive value indicates an importer balance, and a negative value indicates an exporter balance.

Structure of electricity generation by type of power station



Structure of installed power capacity by type of power station

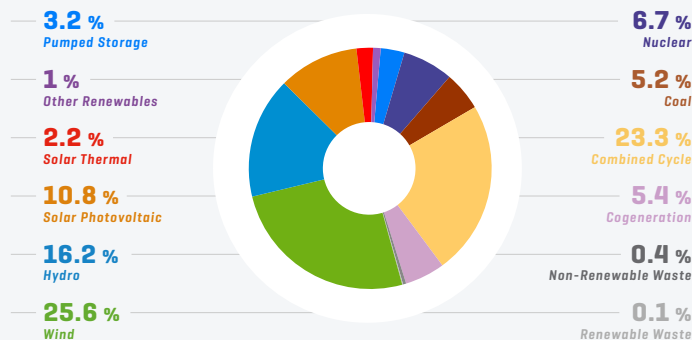


[1] Pure pumped storage (net supply) + estimate of mixed pumped storage (net supply).

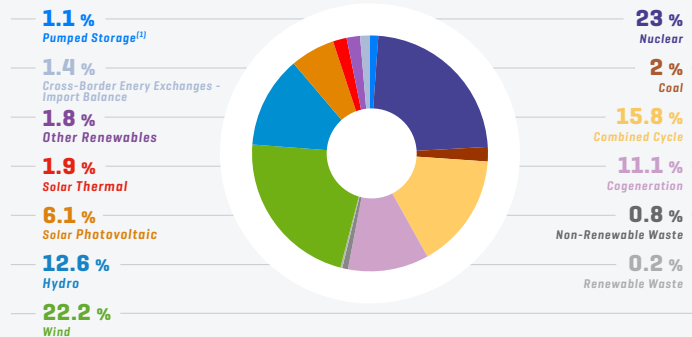
[2] Includes solar photovoltaic and solar thermal.

Breakdown of installed power capacity as at 31.12.2020 Peninsular electricity system

105,881
MW

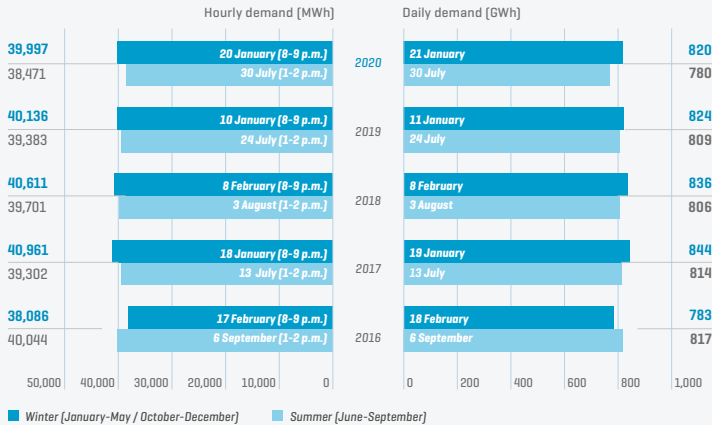


Annual electricity demand coverage broken down by installed power capacity Peninsular electricity system



[1] Pure pumped storage (net supply) + estimate of mixed pumped storage (net supply).

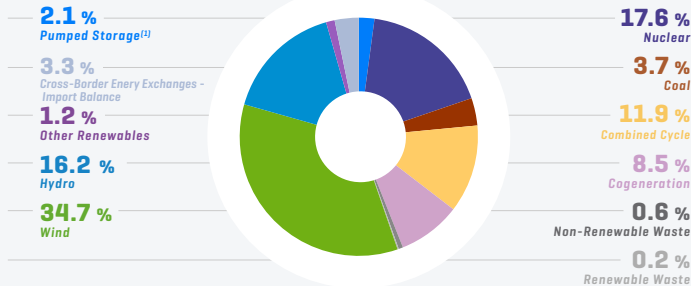
Maximum values of hourly and daily electricity demand. Peninsular electricity system



Coverage of the maximum hourly demand in 2020. Peninsular electricity system

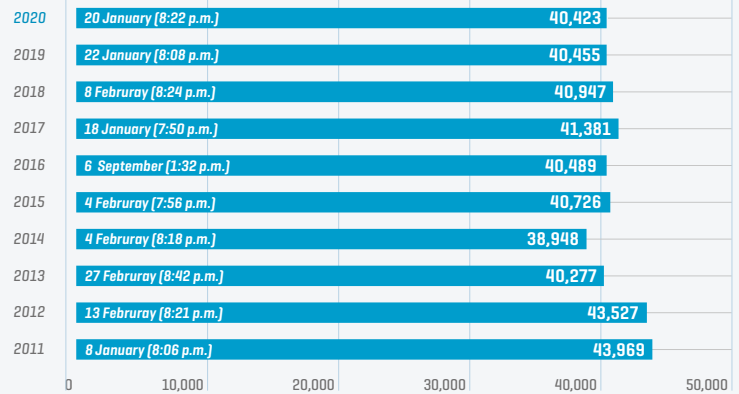
20 January 2020 [8:00-9:00 p.m.]
%

39,997
MWh



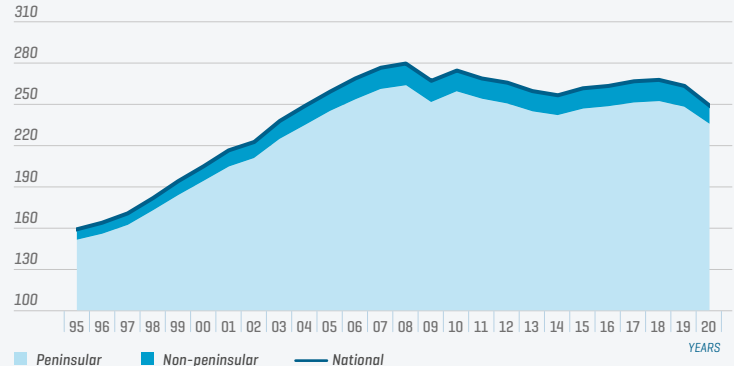
[1] Pure pumped storage [net supply] + estimate of mixed pumped storage [net supply].

Maximum value of instantaneous electricity demand ^[1] Peninsular electricity system MW



[1] All-time high of 45,450 MW, registered on 17 December 2007 [6:53 p.m.].

Evolution of electricity demand (measured at power station busbars) TWh



Annual evolution of Spanish GDP and peninsular electricity demand

	Demand			GDP ^[2]
	GWh	Δ (%)	Δ Adjusted ^[1] (%)	
2016	249,680	0.7	0.3	3.0
2017	252,506	1.1	1.4	3.0
2018	253,566	0.4	0.5	2.4
2019	249,257	-1.7	-2.7	2.0
2020	236,697	-5.0	-5.0	-10.8

(Δ) Variation with respect to the previous year.

[1] Due to the influence of seasonal temperatures and working patterns.

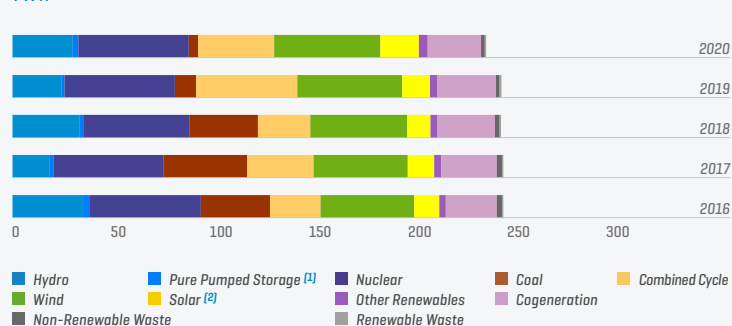
[2] Source: Spain's National Statistics Office (INE)

Annual evolution of electricity demand. Non-peninsular systems

	Balearic Islands		Canary Islands		Ceuta		Melilla	
	GWh	Δ (%)	GWh	Δ (%)	GWh	Δ (%)	GWh	Δ (%)
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	4,942	-19.2	7,946	-10.5	199	-3.3	208	-1.4

(Δ) Variation with respect to the previous year

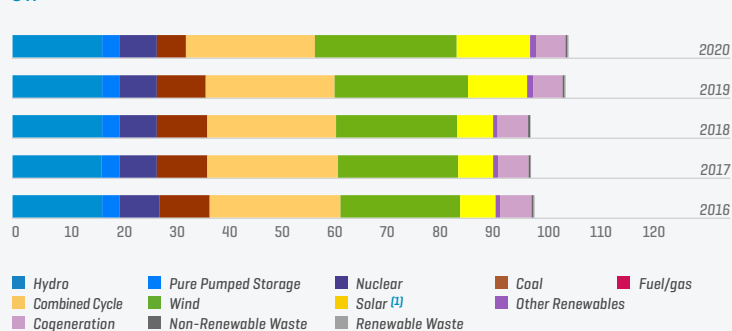
Annual evolution of the electricity generation structure. Peninsular electricity system



[1] Pure pumped storage [net supply] + estimate of mixed pumped storage [net supply].

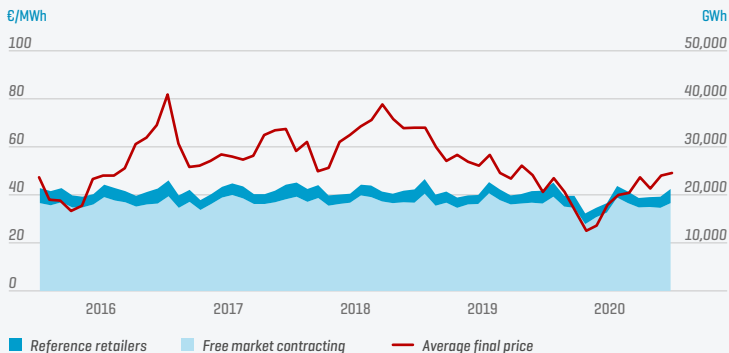
[2] Includes solar photovoltaic and solar thermal.

Annual evolution of installed power capacity. Peninsular electricity system

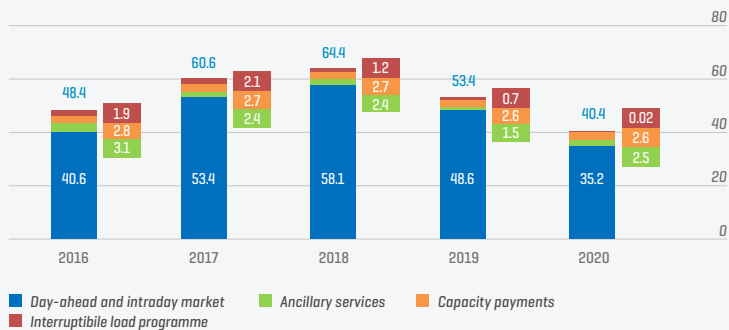


[1] Includes solar photovoltaic and solar thermal.

Evolution of monthly energy and average final price of energy in the peninsular electricity system



Evolution of the components of the average final price of energy in the peninsular electricity market



Energy requirements covered through ancillary services GWh

	2019		2020		%20/19	
	Upward	Downward	Upward	Downward	Upward	Downward
Technical constraints (PDBF) ⁽¹⁾	6,801	257	9,431	548	38.7	113.3
Secondary control	971	1,679	1,212	1,631	24.9	-2.8
Tertiary control	1,351	681	1,543	1,061	14.2	55.8
Replacement reserves (RR)/Deviation management ⁽²⁾	2,225	866	2,107	872	-5.3	0.6
Real-time technical constraints	101	193	728	366	620.1	89.2
Total energy	15,126		19,499		28.9	

Does not include energy managed through cross-border balancing services, nor the application of the interruptibility service (interruptible load programme) due to economic criteria.

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

[2] Energy requirements of the Spanish System allocated via Deviation management until 2 March, and as of that date, allocated through the European platform for the exchange of balancing energy from replacement reserves (RR).

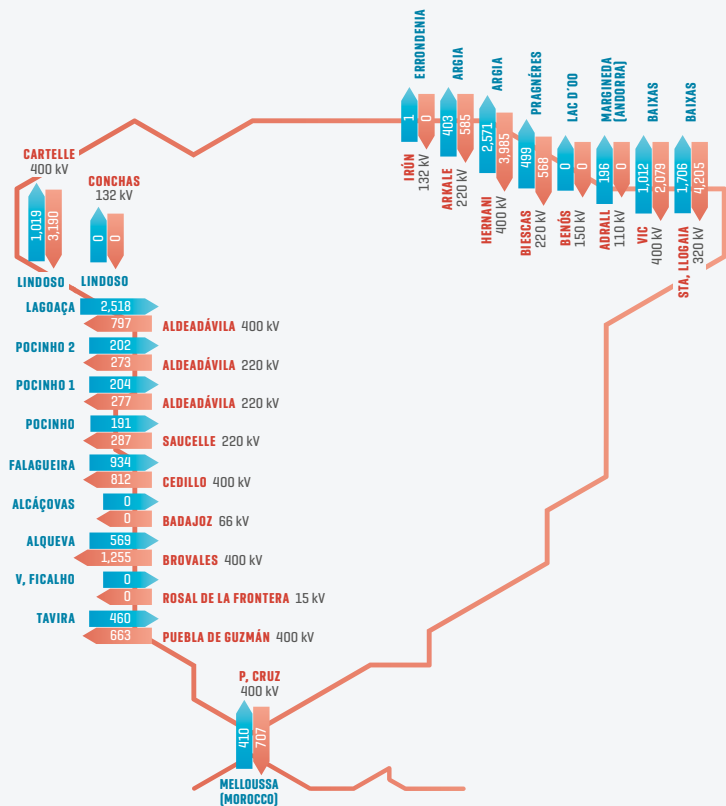
Average weighted energy prices in the peninsular system's ancillary services €/MWh

	2019		2020		%20/19	
	Upward	Downward	Upward	Downward	Upward	Downward
Technical constraints (PDBF)	81.4	46.1	75.3	30.7	7.5	-33.3
Secondary control	54.7	39.4	35.8	29.0	-34.6	-26.5
Tertiary control	57.3	31.9	42.6	19.3	-25.7	-39.4
Replacement reserves (RR)/Deviation management ⁽¹⁾	56.2	32.6	43.1	22.0	-23.4	-32.3
Real-time technical constraints	105.9	16.0	146.7	7.4	38.4	-53.5

[1] Balancing energy from replacement reserves has a single price. The values represented in the table correspond to the average weighted price depending on whether it was upward or downward energy that was needed to cover the requirements of the Spanish Electricity System. Up to and including February 2020, the average weighted price of the upward energy managed through the generation-consumption deviation management service is provided.

International physical energy exchanges through cross-border connections

GWh



Cross-border energy flows - physical energy exchanges

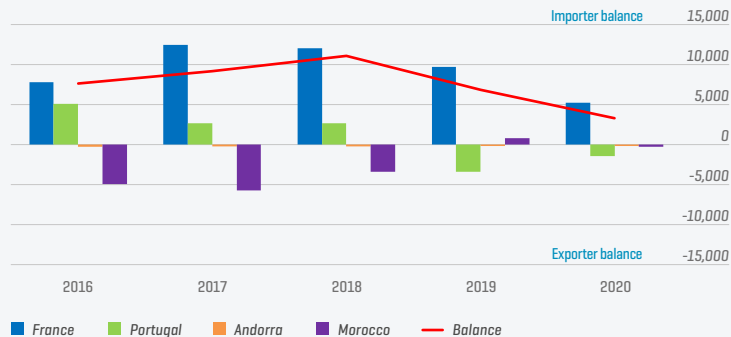
GWh

	Import		Export		Balance ^[1]	
	2019	2020	2019	2020	2019	2020
France	12,813	11,422	3,116	6,192	9,697	5,229
Portugal	4,700	6,097	8,099	7,554	-3,399	-1,457
Andorra	0	0	208	196	-208	-196
Morocco	1,208	410	435	707	773	-297
Total	18,721	17,928	11,859	14,649	6,862	3,280

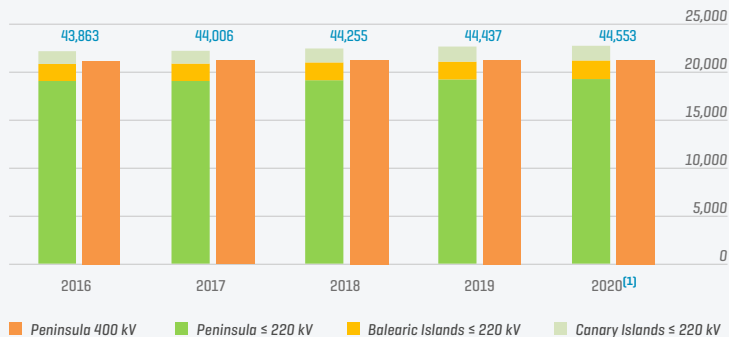
[1] Positive value: importer balance; negative value: exporter balance.

Evolution of the balance of international physical energy exchanges

GWh



Evolution of the electricity transmission grid in Spain km of circuit



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

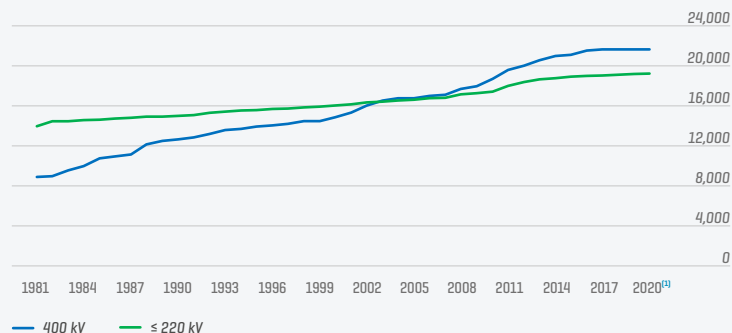
Facilities in the electrical energy transmission grid in Spain in 2020 ^[1]

	400 kV		≤ 220 kV			Total
	Peninsula	Peninsula	Balearic Islands	Canary Islands		
Total lines (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)	84,864	1,563	3,838	3,630	93,895	

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

Cumulative data for kilometres of line circuit and for transformer capacity as at 31 December 2020.

Evolution of the 400 and < 220 kV transmission grid. Peninsular electricity system km of line circuit



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

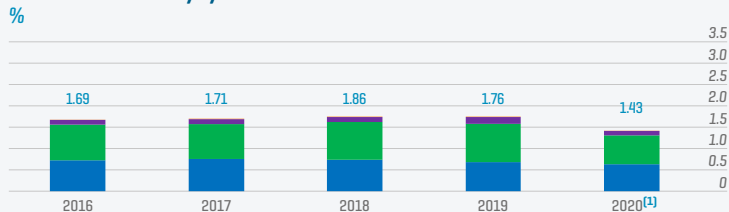
Energy Not Supplied (ENS) and Average Interruption Time (AIT) of the electricity transmission grid

Year	ENS (MWh)			AIT (minutes)		
	Peninsula	Balearic Islands	Canary Islands	Peninsula	Balearic Islands	Canary Islands
2016	78	0	457	0.16	0.03	27.45
2017	60	33	47	0.13	2.88	2.75
2018	250	38	63	0.52	3.27	3.77
2019	47	1	2,626	0.10	0.09	155.52
2020 ^[1]	95	4	65	0.23	0.47	4.28

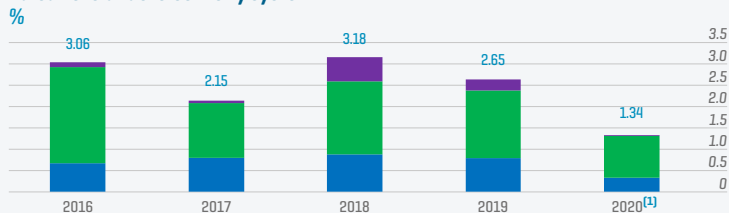
Average Interruption Time (AIT) = Energy Not Supplied (ENS) / Average System Power.

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

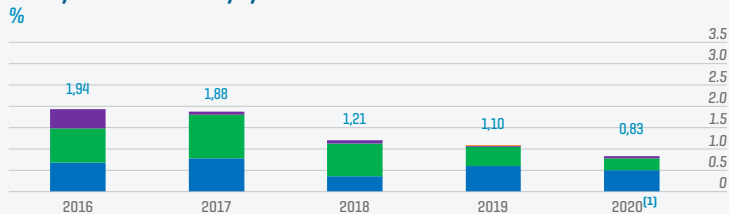
Annual evolution of the non-availability rate of the electricity transmission grid. Peninsular electricity system



Annual evolution of the non-availability rate of the electricity transmission grid. Balearic Islands' electricity system



Annual evolution of the non-availability rate of the electricity transmission grid. Canary Islands' electricity system



■ Non-programmed due to fortuitous circumstances ■ Non-programmed due to corrective maintenance
■ Programmed for causes not due to maintenance ■ Programmed for predictive and preventative maintenance

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).

Electricity demand and consumption per capita of ENTSO-E member states

	Demand (TWh)		Consumption per capita (kWh/hab.)	
	2020	% 20/19	2020	% 20/19
Albania ^[1]	-	-	-	-
Austria	61	-3.5	6,840	-3.9
Belgium	81	-4.5	7,042	-5.0
Bosnia-Herzegovina	11	-6.5	3,192	-6.5
Bulgaria	37	-2.7	5,251	-2.0
Croatia	17	-5.2	4,173	-4.8
Cyprus	4	-2.8	4,084	-4.1
Czech Republic	64	-2.8	6,012	-3.2
Denmark	34	1.7	5,856	1.4
Estonia	8	-3.4	5,983	-3.7
Finland	78	-6.1	14,181	-6.2
France ^[2]	444	-4.9	6,602	-5.1
Germany	484	-2.4	5,814	-2.6
Greece	49	-5.4	4,559	-5.4
Hungary	43	-1.5	4,390	-1.4
Iceland ^[1]	-	-	-	-
Ireland	29	-0.3	5,833	-1.5
Italy	273	-7.1	4,581	-6.8
Latvia	7	-2.4	3,698	-1.7
Lithuania	12	-2.7	4,238	-2.7
Luxembourg	4	-4.7	5,806	-6.6
Montenegro	3	-6.4	5,116	-6.3
Netherlands	108	-5.1	6,213	-5.7
Norway	133	0.9	24,753	0.1
Poland	165	-2.2	4,354	-2.1
Portugal	49	-3.0	4,741	-3.2
Republic of North Macedonia	6	-8.1	2,765	-8.1
Romania	58	-3.4	3,004	-2.9
Serbia	39	-0.9	5,628	-0.4
Slovak Republic	28	-3.5	5,134	-3.6
Slovenia	13	-5.2	6,399	-5.8
Spain	238	-4.8	5,027	-5.6
Sweden	133	-2.5	12,874	-3.4
Switzerland	62	-1.6	7,253	-2.3
United Kingdom ^[3]	285	-5.7	4,258	-6.2
Total	3,061	-3.9	5,625	-4.1

Consumption per capita = Total consumption / no. of inhabitants.

Source: data obtained from the ENTSO-E Transparency Platform as at 26/2/2021. The data is governed by Regulation (EU) No 543/2013, and is obtained from real-time systems and therefore differs from the consolidated data used for the specific case of Spain at national level, which is obtained using a power measurement system.

[1] Data not available.

[2] Data includes population in Spanish non-peninsular territories.

[3] Includes Northern Ireland.



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